

**School of Pharmacy**

**An Investigation of the Current Management of Asthma in  
Adolescents and Children in Saudi Arabia, Barriers to Optimal  
Care, and the Influence of Patient Education**

**Sultan Saad Al Thagfan**

**This thesis is presented for the Degree of  
Doctor of Philosophy  
of  
Curtin University of Technology**

**April 2012**

## **Declaration**

To the best of my knowledge and belief this thesis contains no material previously published by other person except where due acknowledgement has been made. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature:

Date

## Abstract

The incidence of childhood asthma in the kingdom of Saudi Arabia (KSA) ranges from 4% in some regions to 23% in others. Although international and national guidelines have been issued to improve the management of asthma, their implementation has not been as expected or hoped for. For instance, while the guidelines recommend the use of inhaled corticosteroids (ICS) as the first choice in chronic asthma treatment, international research shows that the use of these agents is suboptimal. This holds true in KSA. Many reasons have been suggested for the lack of implementation of guidelines and the inappropriate use of corticosteroids, including poor patient knowledge, attitudes and education, physician confidence and performance, health care costs, and available facilities.

This research consists of four phases investigating the current practice of asthma management among both patients (children and adolescents) and physicians in primary health care in KSA with regard to the Saudi National Protocol for the Management of Asthma; it identifies barriers affecting young and adolescent patients' and their families' adherence with asthma management protocols and adherence with ICS use. It also evaluates the effects of education intervention and the provision of asthma action plans (AAPs).

The first phase documents current patterns of management of asthma in children and adolescents in KSA, to assess the pattern and appropriateness of corticosteroid use in childhood asthma and to evaluate asthma management practice in primary health care centres (PHCCs) against the national protocol. A total of 230 respondents (56.1% male and 43.9% aged 5 to <10 years), comprising patients (or their carers) from Asser and Riyadh, completed a survey using a translated hybrid of the FACCT quality measures (Adult Asthma Measurement Survey-version 2.0) and Asthma Therapy Assessment Questionnaire (ATAQ) to provide data on patterns of asthma treatment, degree of asthma control, use of AAPs and PFMs (peak flow meters), and levels of patient education and knowledge. The majority of respondents in both regions had asthma classified as either mild or moderately severe (85.7%). Only 34.8% used ICS, while around two thirds (60.6%) used a  $\beta_2$  agonist only. Low adherence with PFM, spacer, and AAP use, and poor patient education, were found;

as were regional variations. The conclusion is that asthma management tends to be inconsistent with national guidelines. Poor knowledge, attitudes, behaviours and self-efficacy, as well as lack of communication between patients/ carers and professionals, contribute to unsatisfactory management outcomes. The majority of study subjects did not have well controlled asthma.

The second phase investigates physicians' compliance with the National Protocol Asthma Guidelines in two regions of KSA. A total of 87 physicians from Riyadh (44) and Asser (43) completed a survey of strategies for management of asthma. The majority reported access to The National Protocol for the Management of Asthma at the point of care. Information about medication was provided by 78.2% of physicians to patients with moderate asthma and by 85.1% to those with severe asthma. AAPs were provided by 36.8% of physicians for patients with mild asthma, 55.8% for patients with moderate asthma, and 69.0% for those with severe asthma. Recommendations to use ICSs varied from 16.1% to 88.5% amongst six vignettes reviewed by the physicians. Bronchodilators were commonly recommended, and in some cases oral corticosteroids were deemed inappropriate. Compliance with national guidelines was found to be less than optimal. Poor communication between health care providers and patients/ carers was observed.

A third survey uses The Illness Management Survey (IMS) and ICS scales for the purpose of identifying the barriers affecting Saudi asthma patients; it finds that 40% of participants believed that medications were unhelpful and doctors did not involve the patient in decision-making. Fewer than 40% of respondents reported adequate access to information. Low use of AAPs and PFMs, with inappropriate treatment, was observed; and ICS use adherence in this phase was low, with less than one third of respondents reporting daily use of ICSs. A majority reported more than five barriers to adherence with asthma management in general and ICS use especially, including lack of knowledge, patient behaviours and attitudes, lack of self-efficacy, misconceptions, misunderstandings among patients/ carers, poor communication, and lack of motivation and social support.

The fourth phase evaluates the impact of an educational intervention and the provision of AAPs on asthma management outcomes. One group of patients was provided with education alone; a second group received education plus an AAP.

Both groups A (n = 105) and B (n = 99) completed pre-intervention and post-intervention surveys. Both groups completed three steps: (1) a baseline self-administered questionnaire, (2) an education program, (3) a three-month follow-up period with the re-administration of the baseline questionnaire at the conclusion. Group A patients were also provided with an AAP. The education program improved patients'/ carers' knowledge, behaviours/ attitudes, and self-efficacy, as well as their ability to communicate with health care providers; and resulted in improved asthma management outcomes. Use of controller medication and adherence increased. Furthermore, patients in the intervention stages had fewer asthma symptoms and better control of their asthma, which resulted in better quality of life. The conclusion is that the education program coupled with the provision of AAPs and follow-up achieved significantly better results.

The overall of the study has found a number of differences in asthma management in KSA. In particular, an intervention and provision of AAPs and follow-ups led to notable improvements in patient outcomes.

## **Acknowledgments**

First I thank Allah for all His blessings on me and His help in making my dreams come true, and aligning the right people in my life. This thesis would not have been completed otherwise.

I would like to take this opportunity to thank and extend my deepest gratitude to both my supervisors, Professor Jeff Hughes and Professor Bruce Sunderland, for all their assistance, advice, contributions, encouragement, and support. To my main supervisor, Jeff Hughes: thank you for your assistance, both academically and socially, during these years of study, and for reminding me that 'if there's a will, there's a way' and nothing is impossible once adequate effort has been applied. Thank you for your patience, attention, and exciting comments. Thanks also to Bruce Sunderland for your endless support, motivation, and valuable aid in this research. Thank you for your gratefully received respect and kindly attitude, which affected my own attitudes positively. Without endless and valuable support and expertise from you both, this research would not have reached the level that it now has. Thanks are barely enough to reflect my feelings.

I would also like to take this opportunity to thank and acknowledge my parents: my father, who put dreams in my heart early in life and has now passed away, and my mother, who is patiently awaiting my return to my homeland. Without their support and assistance I would never have got ahead in life to accomplish my dreams.

I would like to thank the Government of Saudi Arabia, Ministry of Health, and King Saud University, who gave me the scholarship to pursue my higher education and encouraged this venture. I would like to thank all the staff in the Saudi Embassy and Saudi Arabia Cultural Mission in Canberra for their support and assistance.

Special acknowledgement goes to Curtin University staff and especially the Pharmacy School staff for all their support and assistance, and for supplying the resources necessary to complete this research. Special acknowledgment to Dr Satvinder Dhaliwal, Dr Richard Parsons, and Mrs Jenny Lalor who helped with vast knowledge and expertise in statistics. Also I would like to thank Professors Ricardo Mancera, Michael J Garlepp, and Moyez Jiwa; Dr David Packer, Mr Dean Newman,

Ms Lauren Burgess, Ms Kathy Whiteman, Mrs Alison Smith, and John Hess for their help, support and assistance. Special thanks to Dr Margaret Johnson for her cooperation and effort in editing this thesis.

I cannot forget my family – many thanks to my wonderful family, my beloved wife Badriha who did everything for me and took care for the family with full responsibility; and my lovely children, Felwa, Faisal, Norah, and Abdul Aziz, for their support, patience, and sacrifices during these years of study. I pray to Allah that He may give me the chance to reflect my gratitude for all the care you provided during my research years.

I would like to thank my extended family, brothers, sisters, and my uncle Haif Ali Al Haif and all his family members who encouraged and supported me emotionally, financially and practically during my life and study. Special gratitude to my brother Professor Abdullah Al-Thagfan for his support and advice.

I would also like to thank all my colleagues and friends for their support and advice, especially Dr Abdullah Al-Zahrani, Dr Saad Al-Kahtani, Mr Ahmad Alsheri, Mr Hussain AlMohiy, Mr Abdullah Al Zahrani, Mr Mojeb Al Zahrani, Mr Masood Al Qahtani, Mr Ahmed Hatlan, Mr Nife Al Obod, Mr Saab Al Harbi, Mr Ali Alalmi, Mr Shalan Al Bashi, Mr Bader Abo Thman, and all my other friends for their valuable advice and assistance. Also, special thanks and appreciate to Eng. George Tobia for his support and kindly social assistance.

Finally, to all whom my memory did not serve to remember their contributions and assistance, thank you.

## **Presentations and Publications**

Al-Thagfan S., Hughes J. Pharmacotherapy indications for synthetic corticosteroids in bronchial asthma in Saudi Arabia. 2006 annual conference of the Australasian Pharmaceutical Sciences Association (APSA), 3–5 Dec, Adelaide, Australia.

Al-Thagfan S., Hughes J. Physician's management of bronchial asthma in Saudi Arabia. 2007 annual conference of the Australasian Pharmaceutical Sciences Association (APSA), 8–11 Dec, Sydney, Australia.

Al-Thagfan S., Hughes J. Barriers affecting inhaled corticosteroid use and adherence amongst young asthmatics in Saudi Arabia. 2008 annual conference of the Australasian Pharmaceutical Sciences Association (APSA), 9–11 Dec, Hobart, Australia.

Al-Thagfan S., Hughes J., Sunderland B. Barriers affecting inhaled corticosteroid use and adherence amongst young asthmatics in Saudi Arabia. HDR research seminar, 30 Sep, 2009, Perth, Australia.

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## Abbreviations

AAP	Asthma Action Plan
ATAQ	Asthma Therapy Assessment Questionnaire
FACCT	Quality measures (Adult Asthma Measurement Survey-version 2.0)
FEV1	Forced expiratory volume in one second
GINA	The Global Initiative for Asthma
GP	General practitioner
ICS	Inhaled corticosteroid
IMS	The Illness Management Survey
KSA	Kingdom of Saudi Arabia
LABA	Long Acting Beta Agonist
NAEPP	National Asthma Education and Prevention Program, expert panel report: Guidelines for the diagnosis and management of asthma
PFM	Peak Flow Meter (peak expiratory flow)
PHCC	Primary health care centre
QOL	Quality of life
SHCC	Secondary health care clinic
THCC	Tertiary health care clinic
β <sub>2</sub>	Beta 2 Agonist

## Factor List

### List one: IMS

Medication issues, consisting of 6 variables ( $\alpha=0.74$ );

Doctor and other relationships, with 7 variables ( $\alpha=0.76$ );

Adherence influences, with 6 variables ( $\alpha=0.64$ );

Self-efficacy, with 4 variables ( $\alpha=0.60$ );

Negativity, with 4 variables ( $\alpha=0.55$ ).

### List two: ICS

Health and medication literacy, consisting of 6 barriers ( $\alpha=0.82$ );

Patients'/ families' concerns and fears, with 4 variables ( $\alpha=0.76$ );

Peer influence and personal beliefs, with 4 variables ( $\alpha=0.67$ );

Treatment cost, convenience, and need, with 3 variables ( $\alpha=0.57$ ).

# Chapter 1

## Background

This chapter provides the background on asthma among children and adolescents, backed by an in-depth literature review on patient self-management, patient education, and the role of physicians and the KSA primary healthcare service in asthma management.

Asthma is considered one of the highest-incidence disorders in the world and is becoming more common in both adults and children, with about 300 million people worldwide suffering from it now and 400 million expected to suffer from it in 20 years' time (1). In Australia, 11.2 to 13.5% of children and 10 to 17.5% of adults have asthma (2). In 2002, 20 million Americans, more than 6 million of them children aged between 0-17, were diagnosed with asthma (3). KSA is an Asian country located in the Middle East. It is divided into 13 regions. In 2006 the KSA total population was 23,678,849, with 5,751,559 occupying the Riyadh region and 1,733,845 the Asser region. The prevalence of asthma in general ranges between 4-23%. The prevalence of asthma in Riyadh was 10% while in Asser it was 13% (4). It is one of the most common diagnoses made in health care centres (5). The total number of primary health care centre visitors in Saudi Arabia during 2004 was 911,999, of whom 183,718 were aged 5 to 14, and 456,551 were aged 15 to 44 (6). Most people who are hospitalized because of asthma are children, or those aged 65 and over (5).

There has been a decline in mortality from asthma in some parts of the world. For example, in Australia mortality declined from 397 in 2002 to 314 in 2003 (7). The numbers of deaths in which asthma was a secondary cause in the United States decreased from 5637 in 1995 to 4657 in 2002 (3, 7). In KSA during 2001, 1305 died of respiratory system disease, compared with 1718 in 1999 (6). Nevertheless, the mortality rate remains high in many parts of the world: WHO statistics show that 180,000 people die each year from asthma (8). However, it has been shown that the most of the deaths are preventable (9). One study reveals that 90% of asthma deaths in the United Kingdom were from avoidable factors (10). According to other studies,

the high level of morbidity is due to a number of factors, such as negative personal perception of patients about their own condition, lack of knowledge about asthma and medications, poor practice in the use of inhaler devices, and non-compliance with self-management. These strongly suggest that patient education has a role in decreasing morbidity and mortality amongst asthma sufferers (11-13).

Asthma, like other chronic diseases, is associated with high social and financial costs (12). In addition to health care costs, there is loss of valuable time, whether of school or work. A greater proportion of people with asthma have been found to have days away from work or study (11.4%) than people without asthma (7.9%) (14). The estimated direct and indirect costs of asthma in Australia range from \$585 to \$720 million annually (15); in 1998, the total cost in the United States was put at \$11.3 billion (3).

## **1.1 Definition of Asthma**

Asthma is defined as

A chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular, mast cells, eosinophils, T lymphocytes, macrophages, neutrophils and epithelial cells. In susceptible individuals this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial hyper-responsiveness to a variety of stimuli. (14)

Asthma may be classified as intrinsic (non-allergic) or extrinsic (allergic), as intermittent or persistent (mild, moderate or severe), according to severity and the presence and frequency of daytime and night-time symptoms; and as acute or chronic. Asthma symptoms are shared with other diseases such as viral infections, particularly in young children and the elderly. This feature makes it difficult to differentiate asthma from other wheezing disorders and to obtain an accurate measurement of how many children have asthma.

The causes of asthma are not fully understood, but some potential causal factors include atopy (allergy) and a family history of asthma, hay fever, or eczema. Some factors increase the risk of asthma development or trigger symptoms in people with asthma, including both internal and external environmental elements such as infections, air pollutants, inhaled allergens, weather changes, chemicals, living in disadvantaged areas, occupational hazards, drugs, smoking, levels of exercise, educational status, economic status, emotional stress and certain foods (4, 14, 16-18). Indoor factors (in the home, school, and work place) are most commonly cited, as most asthmatic patients tend to spend more time indoors (19-27). Other factors that aggravate asthma include under-diagnosis, lack of education, and poor health facilities and choice of treatment (28-35).

Asthma treatment and optimal asthma control are affected by patient knowledge, education level, behavioural changes, adherence to management components, physician experience and confidence, and the availability of health care facilities. International and national guidelines have been developed to assist health care providers and patients achieve optimal asthma control; their recommendations include enhancing corticosteroid prescription, minimizing  $\beta_2$  agonist use, educating patients, and developing self-management skills.

## **1.2 Asthma Management**

### **1.2.1 Asthma guidelines**

Asthma cannot be cured. However, symptoms can be prevented and controlled in most cases when the disease is diagnosed during the early stages, therapy guidelines are adhered to, and patient education is improved (36). To improve care, international guidelines (such as GINA, Australia and Canada guidelines) and national guidelines (KSA guidelines) for asthma diagnosis and treatment have been developed and updated over the past decade to help physicians and patients achieve treatment goals such as preventing chronic symptoms, decreasing morbidity and mortality, normalizing the patient's daily activity levels, decreasing hospital admissions and emergency visits, reducing exacerbations of disease, maximizing lung function levels, prescribing suitable drugs to minimize adverse effects, reducing patients' negative perceptions, and promoting physician and patient education; these also save time and money (4, 37, 38). The question is: have the international and

national guidelines achieved these goals in the world generally, and in KSA in particular? In specific, have these guidelines been disseminated to health care providers, and implemented?

Scholars are divided. The guidelines are based upon strong, clear evidence, and studies show that they have helped to achieve the main objectives as far as diagnosing and treating asthma (39, 40). However, other studies such as Asthma in America, Asthma Insights and Reality in Europe (AIRE) and Asthma Insights and Reality in the Asia-Pacific (AIRIAP) indicate that asthma management falls well short of that recommended by the guidelines (10, 38, 41). For example, only 35% of American children can totally control their asthma (42). Furthermore, numerous studies indicate that the guidelines are not fully implemented by health care providers: two studies in KSA alone reflect this: the first conducted in the Emergency Department in King Fahd National Guard Hospital and the second in the National Guard Iskan Primary Care Centre (41, 43). Reasons for the lack of implementation as well as adherence to guidelines components are identified; they include under-diagnosis of asthma, patient perceptions of asthma and its management, inappropriate medication choice, and the type and quality of the health care centre – including the qualifications of its professionals, facility and costs, culture, communication, and health education (10, 42, 44-46).

### **1.2.2 Asthma control**

Asthma control is the main goal of treatment underpinning asthma management guidelines, yet even its definition, classifications (from total to poor control), and assessment tools are controversial. Within guidelines, suggested measures of asthma control include minimizing day and night symptoms, bronchodilator use, and hospitalization or emergency room visits; preventing asthma attacks, and maintaining normal activity levels as well as normal lung function (47-50).

Assessment of both asthma control and severity can depend on one or more of the following: symptoms, changes in expiratory flow, and airway inflammation. Assessment of results vary depending on the methods used, as asthma is a chronic disease with varying severity and levels of control over time, making it difficult to accurately assess it with one method at a particular point in time (51-53); hence, the

use of more than one method has been suggested in asthma control. Asthma control and degree of severity are related, yet, practically, they are different. Control is defined as sufficient disease treatment; severity is concerned with the fundamental process of the disease (54-56). However, some studies support the use of asthma control based on an asthma management approach rather than on severity (50, 54-57). Five symptoms, namely being awoken at night, limitations of daily activities, morning waking with symptoms, dyspnoea, and wheezing, as well as short  $\beta_2$  agonist use and deficiency of lung function, are listed as the most important indications for control assessment in national guidelines across different countries (1, 4, 14, 49, 50). Despite the existence of such guidelines, achievement of optimal control is still lower than expected (57-63). A study conducted in Turkey, which involved children and adult asthma patients, used the Asthma Insights and Reality (AIR) surveys to estimate asthma control levels based on the Global Initiative for Asthma (GINA) guideline classifications. Only 1.3% of patients were found to have achieved an optimum control level, and around 75% and 90% of children and adults respectively were experiencing daytime symptoms (59). Patients tend to underestimate the severity of their asthma while overestimating their control level, and this phenomenon seems to yield similar results in several countries where AIR surveys have been carried out (57, 59). Inhaled corticosteroids (ICSs) have been recommended in persistent (mild, moderate, and severe) asthma, but the success of asthma control is largely dependent on adherence to ICS daily use (9, 64). Other self-management activities, such as education, peak flow meter (PFM) use, monitoring of medication, trigger avoidance, inhaler practice, and use of asthma action plans (AAPs) are also mentioned as contributory factors (9, 61, 65, 66).

The underestimation of asthma symptoms and severity level as well as overestimation of control level (reported among many asthma patients) (59) is one of several factors, which also include professional deficiencies in asthma care practices (diseases estimate, illness causes/ allergens, treatment, education, and follow-up of patients), comorbidities and the use of other medication, lack of self-management and lack of patient knowledge, low behavioural adjustment, economic, social and environmental factors, and poor adherence to asthma management guidelines (67). Research has found that the main factors contributing to patient noncompliance were costs of medication and time lost waiting at the pharmacy (68). Social and

environmental factors including lifestyle factors such as smoking, diet, and low physical activity, and less controllable elements like air pollution, have been associated with uncontrolled asthma.

## **1.3 Corticosteroids**

### **1.3.1 Steroid use**

Corticosteroids are the cornerstone of asthma management, as asthma is now regarded as an inflammatory airway disease. The most common medical condition in children is viral infection inflammation combined with allergy (22, 69-72). In the past, asthma management used to be concentrated on asthma symptom treatment with the use of bronchodilators, and this method (that is, the use of  $\beta$  agonists) remained common in some areas despite the possibility of it causing fatal or near fatal asthma (38, 73-78). Currently, international and national guidelines focus on the use of corticosteroids as the first line of defence in asthma management. Studies indicate that corticosteroids have a positive effect on inflammation control, symptoms prevention, lung function, and quality of life, with a related reduction in asthma exacerbations, emergency department utilization, and hospitalization (79-82). Corticosteroids are widely reported to be more effective than other asthma drugs as long-term control agents (37, 50, 83, 84), yet they are used less frequently than expected (38, 85-87). International surveys show that inhaled corticosteroid (ICS) use ranges from 5.5% to 26% (57-59, 88). While some studies report an increase in the use of ICSs, their use is still considered suboptimal (38, 54, 85, 89, 90). A British study showed that the daily dose of ICS prescriptions increased from 69 million in 1992 to 124.7 million in 1998, compared with  $\beta_2$  agonist, which increased from 130 million to 170 million during the same period (75). Not only was low use of ICSs reported, but also non-adherence to regular daily use (74, 82, 85, 90-92). Such non-adherence to treatment could be due to a number of factors such as lack of knowledge, poor self-efficacy, poor communication, misperceptions of the patient, age, level of education, health beliefs, accuracy of diagnosis, availability of health care facilities, cultural issues, and costs (66, 77, 91-95).

### **1.3.2 Dosage and dosage form**

There is controversy over the most appropriate dosage and dosage form of corticosteroids, especially in regard to early treatment, dosage doubling, combination therapies (ICS and LABA), and route of administration. The National Asthma Education and Prevention Program (NAEPP) reported that the use of inhaled corticosteroids in mild or moderate persistent asthma in children was effective in controlling asthma with appropriate dose adjustment (37). Studies have shown that the most effective dosage for fluticasone and beclomethasone dipropionate (BDP) or the equivalent is 250 micrograms and 400 micrograms daily, respectively. Using a higher dosage, in the case of both drugs, or adding salmeterol to beclomethasone, slightly improves effectiveness (96, 97). However, the study by Reddel (33) noted that patients achieved total control with low doses. The percentage of exacerbation reduction was obvious in all groups, including those groups without total control. Rodrige's study showed that early treatment using ICS and repeated doses of inhaled fluticasone of more than 3000 micrograms/ hour over 3 hours, compared with 500mg IV hydrocortisone, produced best results and earlier improvement for acute asthma patients (98).

Despite some of the previous guideline recommendations that doubling the maintenance ICS dose may prevent and treat exacerbations, a study has shown that 40% of both patient groups, those using maintenance (MS) doses and those doubling doses (DP), suffered from exacerbations (78). Interestingly, another study also reported that using four times the dosage of MS prevented exacerbations (99). In studies comparing inhaled, oral, and systematic (IV or IM) routes of corticosteroids for acute asthma treatment in children from 1–18 years, the systemic route was found to be more effective, capable of reducing both time spent in the emergency department and hospitalization (100).

Although both international and national guidelines recommend regular ICS use as long-term control in asthma management, Boushey et al. (101) have shown that it is possible to treat mild asthma with short, discontinuous courses when needed. In contrast, Fabbri (83) has suggested that such irregular use may result in a change of asthma severity, and may affect lung function. One study that involved a comparison between adjustable maintenance and fixed doses with ICS/ LABA found that

adjustable maintenance doses minimized exacerbations, reduced the number of inhalations per patient per day, and increased the control of asthma and so could lower treatment costs (102). The addition of LABA to ICS as long-term medication to control moderate asthma has many advantages, such as improving lung function and alleviating symptoms, and reducing the need for short-acting  $\beta_2$  agonists (61, 84). Bateman et al. (40, 84) found that total control was reached by 41% of those on fluticasone and salmeterol (FS), compared to 21% for those on fluticasone alone (F), while good control was achieved for 71% on FS compared to 59% of those on F. Fluticasone and salmeterol's low dose and fast reaction resulted in a reduction in the exacerbation rate. Varying results were found in the OPTIMA study, where budesonide combinations and budesonide alone were compared as treatments of mild asthma patients. The difference in exacerbation reduction was negligible, but the investigators found that adding formoterol for patients who used an ICS was more effective than doubling the corticosteroid dose (103). Lemiere et al. recommended that initial mild asthma should be treated with ICS alone. This same study showed that combinations increased treatment costs, and that non-response to corticosteroids could have resulted from other factors (104).

### **1.3.3 Adverse effects**

The side effects of corticosteroids range from local effects such as mouth infections and hoarseness of the voice to systemic effects such as endocrine abnormalities, fluid and electrolyte imbalance, and problems of the eyes, bones, muscles, immune system, and skin. Not all patients suffer these adverse effects, as their development is dependent on the dosage of corticosteroid, the dosage form used, and the duration of usage (105-108). There is clear evidence to suggest that ICSs are safe and effective in children when used at the recommended dose. Studies show that ICSs have a slight effect on growth in the initial stage of use (37, 84, 109), although it is suggested that their effects increase with higher doses and longer duration of use (109-111). However, there is also evidence that this effect may be due to other factors such as the illness itself or genetic or socioeconomic factors (106, 110, 111). Some research suggests that high doses of ICSs may result in adrenal suppression (105, 112). Studies differ in their findings regarding adverse effects of ICS on bone and eye (37, 84, 113). Tattersfeld et al. (112) found that moderate and high doses of ICS increased the risk of fractures with long-term use, but recommended that ICS

should be used to reduce the requirement for oral corticosteroid administration and to improve the quality of life of asthma sufferers. Calam et al. suggested that psychological problems were common among asthma patients, but noted that this may have been caused by general lack of health rather than by asthma itself (114).

#### **1.4 Inhaler technique**

The preferred mode of administration of asthma medications is by inhalation, which has been proven to be better than oral administration in terms of cost, effectiveness, rapidity of onset of action, and minimization of side effects (115, 116). However, these benefits may not be fully recognized by many patients, who lack knowledge, asthma education, understanding of their disease and its management, and the ability to use inhaler devices appropriately (68, 115-119). These problems may contribute to poor asthma management, including misuse of medications, overdose, poor asthma control and repeat hospitalizations, resulting in increases in both direct and indirect treatment costs (115, 116, 120). Suboptimal use and inadequate inhaler technique have been reported in many studies, even amongst patients who were educated (68, 116, 117, 120, 121). A review by Cochrane found that, overall, patients took the recommended doses of their inhaled medication on 20% to 75% of days, and that the frequency of efficient inhalation technique ranged from 46% to 59% (117). Another study reported that 28% to 68% of patients were unable to use their inhaler properly (115). Factors contributing to such outcomes may relate to patients and their families, the physician, the illness, or the inhaler itself (117, 119). Lack of knowledge, education, and understanding of instructions, combined with a lack of skill amongst patients and their families, were considered to be the main contributors to non-compliance with inhaler use. A study conducted in the Netherlands involving 66 patients (newly referred) aged 1–14 years, and a control group with 29 patients aged 5–10 years, evaluated the skills needed for inhaler use (101). Almost 91% of the 66 newly referred patients had been given some inhaler instruction, and 97% believed they demonstrated inhaler technique properly; however, just over half (58%) of the 66 children correctly applied all the steps necessary to get optimal inhalation, compared with 93% from the control group, who were educated more than once and received a six-week follow-up (121). Similar results were obtained in a study performed on a sample of 331 patients over 7 years of age in Trinidad, West Indies. Respondents were 10% children, 8% teenagers, 62% adults, and 20% elderly.

The study showed that 49% of children and 23% of teenagers had obtained instruction on correct inhaler technique, compared to 6% of the elderly group. While 90% of the total sample reported that they had had a demonstration of the appropriate inhaler technique and 92% believed they were applying the appropriate technique, in fact only 41% applied all the correct steps (68). Education, training, and follow-up showed an increase of patients'/ carers' ability to use inhalers correctly (117, 122). In another recent study, 81% of the children surveyed demonstrated improved inhaler technique at the end of an education session combined with demonstrations and follow-up by health care providers, compared with 8% before (120).

In addition, education, demonstrations, written instructions, motivation, and follow-up may improve patient compliance. A return to old behaviour or developing new errors over time was found in 50% of patients who reported poor compliance (120). Other factors reported to contribute to the failure of patients and their families to adhere to proper inhaler technique include patient/ family and health care provider relationships, their beliefs and preferences, psychosocial and economic factors, and the total number of inhalers in use (68, 115, 117, 120). Calculating remaining doses is another problem for patients using Metered Dose Inhalers (MDI) (68, 115).

While health care providers' qualifications, confidence, and understanding of proper inhaler technique enabled patients to use their inhalers properly and encouraged compliance with their medication, researchers have found that in some cases there is a lack of knowledge on the part of the physician and other staff (115, 123, 124). Comparison studies on the knowledge of health care providers, including house staff, nurses, GPs, pharmacists, and respiratory therapists (RTs), in MDI technique found that consultant staff (RTs) were more likely to understand the steps in the correct order of inhalation technique compared to others, but that most health care providers in all groups could not outline all steps accurately (123-125). Another study compared the use of MDI among patients who received prescriptions from the hospital and from their GP. Results indicated that hospital patients were likely to be more knowledgeable (126).

Time pressure and lack of information sources were reported as the major factors influencing the health care provider (127). Kamps et al. reported on 29 patients who had been educated about inhaler use in a pharmacy and 31 patients who had been

educated in GP offices. They found 79% and 39% respectively were using their inhalers appropriately. The main difference between two groups was the education time (121).

Regardless of the type of inhaler device, treatment efficiency is expected to be similar (115, 116, 128). It has been reported that there may be some confusion caused by having different types of inhalers, which may increase misuse among patients. Patients have demonstrated correct inhaler technique more often when they were using only one type of inhaler device than if they had to switch between two or more devices (115). Further, recent studies have found that patients are more likely to be tolerant of combination therapy (ICS and LABA) using a single inhaler than when using two inhalers (129-131).

Inappropriate use of inhalers is primarily due to lack of knowledge and understanding about inhaler technique, combined with differences in the various types of inhalers. For example, inhalers that have a holding chamber (spacer) have advantages in that they simplify the process of receiving the inhalant and reduce the oropharyngeal airway drug deposition; yet spacers may affect the cost, cause patient error, and increase the size of the inhaler (68). In one study, only 18% of patients in the sample had advice about spacers (68). These examples demonstrate the need to educate patients with simple instructions together with demonstrations, with follow-up by health care providers. The cost of medication also influences adherence of inhaler use (132, 133).

International and national guidelines suggest that health care providers need to demonstrate accurate medication techniques and educate their patients in the type of medication delivery system used. Asthma guidelines recommend the steps that health professionals may use to educate their patients about inhaler technique, including coaching their patients through written instructions, giving practical demonstrations by a professional, requesting that the patient demonstrate the steps, and providing follow-up sessions to observe skills and deliver feedback to patients on how they could improve their use of the device.

## **1.5 Asthma Self-management**

Because asthma is a chronic disease, patients play a major role in controlling their condition, in partnership with health care providers (84). Through self-management, the patients and their carers can make day-to-day decisions about actions to be taken to control and to minimize the impact of the disease. The actions to be performed in order to prevent and treat asthma attacks are usually included in the self-management process (134). Self-management, in this thesis, is defined as

effective behaviour regarding asthma, based on sufficient knowledge about asthma and its provoking factors, adequate coping behaviour, compliance with inhaled medication, attention to changes in disease severity, adequate inhalation technique, and the correct use of a peak flow meter. (135)

Changes to the behaviours, skills, and understanding of patients, combined with emotional support, may affect their ability self-manage their condition. Self-management, developed through patient–health professional relationships, may improve patients’ and their carers’ self-efficacy by providing and developing skills such as problem solving and goal setting, and by influencing behaviour which will help to improve asthma management outcomes and reduce both mortality and morbidity (136, 137). Self-management may also affect the socioeconomic factors of asthma for both patients and their families and for asthma carers. Achieving better asthma management is not easy. Barriers which may have a negative impact on successful self-management of the condition include patients’ emotional state, psychological influences, knowledge, literacy, race, language, and socioeconomic status, in addition to poor communication between patients and their family or health care provider (138, 139). A successful self-management intervention may reduce these barrier effects and improve management outcomes (13, 137, 140). Self-management interventions may include self-monitoring, regular asthma and medication review, a written asthma action plan, and exchange of information (8, 14, 73, 141). These may lead to improvements in treatment outcomes, and reduce disease-related events including hospitalization, emergency room visits, unplanned doctors’ visits, and absence from school or work, as well as improving the quality of life (141, 142). Gibson reported that risk of hospital admission was reduced by 39% when asthma self-management interventions were introduced (143). Interventions

based on PFMs and adequate follow-up were found to have the greatest effect (142). An asthma self-management plan, coupled with education and regular follow-up, has been proposed as a key strategy in achieving the best possible outcomes in asthma management (1, 135, 144). Further, direct or indirect costs can be reduced with self-management interventions combined with self-monitoring, asthma action plans (APPs) and regular reviews (141, 142).

### **1.5.1 Self-monitoring**

Symptom and lung function monitoring are important issues in asthma management (84). The chance of having an asthmatic attack during the succeeding year, in a sample of children, doubled when the child was suffering from significant airway obstruction [Forced Expiratory Volume in one second (FEV1) < 60%] (145). Monitoring processes can assist patients and physicians or other health care providers to recognize an asthma attack early and control the disease. This may significantly influence health care costs and the value of health services (144). Monitoring may be used to determine disease severity, identify trigger factors, and assess response to treatment and the need for medication adjustment. As such, monitoring provides the necessary information for decision-making (90, 146).

Airflow measurement by Peak Expiratory Flow (PEF) or FEV1 has been recommended by guidelines as a tool for self-monitoring. A PFM is cheap, easy to use, and readily available, which contributes to its wide use and popularity (18, 147). A PFM is used for initial diagnoses especially in patients with poor symptoms, for the detection of exacerbating factors, and in patient follow-up (18, 84, 148). PFM can help to evaluate the efficacy of treatment and the need for any dosage adjustment. PFM when combined with other interventions may also improve patients' compliance with asthma self-management (147, 148); however, it has been found to be less reliable than other tools such as FEV1. Variations in PEF values among patients, and disagreement between some different types of PEF monitoring equipment values, have been reported (84, 143, 147).

Guidelines recommend regular home monitoring of PEF to assess airway obstruction. The use of these devices encourages patients to actively engage in their care management, which may contribute to more effective decision-making.

However, low use of PFMs and low compliance with usage among both adults and children with asthma have been reported in several studies (87, 118, 143, 147, 149). Other studies have argued that the regular use of PEF measurement is not important in all cases (144, 146, 147), and some have reported that PFM is of no value in accurately predicting asthma severity and nor are asthma diaries; and that asthma action plans based on symptoms alone are as effective as those reliant on PFM, indicating that routine monitoring of PEF may not be necessary in all children (147, 150). Whilst it has been suggested that having AAPs based on symptoms and PFM together may help to achieve better health management outcomes and reduce adverse effects such as patient poor perception of symptoms and over treatment (1), studies do not support this (143, 144). PEF monitoring may increase the cost of treatment, and so may lead to low adherence to self-management plans (18, 144). Other potential problems with PFM are the lack of conformity and dependability of written PEF diaries (144, 146, 147), time effectiveness (144), lack of compliance, data misrepresentation, and inconsistency of PEF charts (146). Studies have shown that compliance with PFM is high during the early stages of use amongst patients, but reduces to nil over a short duration (146, 147). Recently, electronic PEF monitoring, provisional communications through the Internet and SMS, and patient education have been suggested as ways to enhance adherence (143, 146, 151). Patients should be educated and trained about self-monitoring tools such as how to use and read, record, and express (communicate) the results, as well as be motivated to use them; and they should be followed up (118, 143).

### **1.5.2 Asthma Action Plans (AAP)**

Although some studies have found that an AAP based on PFM is helpful, a plan based on PFM or symptoms or both is recommended (37). Turner and colleagues compared PFM-based and symptoms-based AAPs coupled with education amongst adult patients (118). Although some improvements were found in asthma management outcomes, there were no significant differences between groups. AAP compliance in both groups (PFM and symptoms) was less than optimal (65% vs. 52%) (144). Jin et al. reported that patients with an AAP based on PFM required fewer emergency room visits than groups with no AAP or with AAPs based on symptoms. Although asthma control was improved in all intervention groups, the effectiveness of the peak flow-based action plan as a short-term protection from

asthma severe exacerbations was indicated (152). Bhogal et al. found similar results for children when reviewing five studies comparing patients with AAPs based on symptoms and PFM results (128). No differences in outcomes were found between groups, including rate of exacerbations requiring oral steroids or hospital admission, absence from school, lung function, symptom score, and quality of life (153).

Lefevre et al. reviewed nine studies which compared the effect of AAP with or without peak flow monitoring or action plan on asthma management outcomes. They reported that the effect of AAPs on the outcomes did not support their use in all patients, so that to insist upon them might be a waste of resources (154). Zemek et al. found that using AAPs based on symptoms was more helpful, and favoured by children over a PFM-based AAP; however, other studies have found that there is no difference in outcome between AAPs based on PFM or on symptoms (1, 155, 156).

As the asthma experience differs from one patient to another, a tailored AAP needs to be developed to suit an individual's needs (156). Guidelines recommend a self-management plan as an important component of asthma treatment. It may be based on PFM, or symptoms, or both. Improvement in asthma management outcomes such as asthma control, quality of life, medication use and modification, reduction in disease morbidity, and health care consumption, were found when a written AAP and patient education were part of the treatment, among both adults and children (156).

AAPs have been recommended to all patients. One study showed a significant decline in asthma attacks requiring urgent treatment in a group of patients who used AAPs based on PFM after six months:  $p=0.002$  (152). Adams et al. reported that the use of an AAP was more likely to reduce a patient's hospital admissions and re-admissions (157). Another study reported a significant decrease in  $\beta_2$  agonist daily use ( $p=0.008$ ) and an increase in daily ICSs ( $p=0.001$ ) with patients who had an AAP based either on PFM or on symptoms, combined with education (144).

Additional information included in an AAP includes trigger factors, emergency contact numbers, and exercise instructions; these are aimed at improving outcomes of asthma management and enhancing communication between patients and parents or physicians. There was some indication that patient behaviour can be changed with the use of an action plan: Adams et al. found that patients who had an AAP were

more likely to interact and participate in decision-making (158). At least 53% of a sample of 228 coronary heart disease patients reported continued behaviour change three weeks after the date when they were provided with an action plan (159). Furthermore, a recent study of 70 participants, conducted to estimate exacerbation frequency and usefulness of an AAP, divided responses into a yellow zone in which albuterol was used more than three times a day and/ or more than two nights episode; and a red zone where systematic corticosteroid or urgent health care visit were required; it revealed that nearly 80% had persistent asthma. More than 66% of the sample had experienced yellow-zone exacerbation at least once during the three-month period of the study, and 27% had experienced red- zone exacerbation. Ninety percent of the patient carers in this study agreed that the asthma action plan was helpful in asthma exacerbation treatment (160); however, use and adherence to AAP still remains suboptimal (38, 61, 87, 89, 90, 158, 161-163). Wilson et al. found that the use of self-management asthma plans in South Australia decreased from 42.3% in 1995 to 22.2% in 2001, while the disease prevalence increased from 8% to 12.8% for the same period (164).

There is evidence that physicians have a role to play in the lack of AAP deployment and guideline implementation (153, 165, 166), as do patients and their families who, while having an AAP, question its usefulness either because they do not have enough information about asthma and possess inadequate self-management skills, or because they have a low level of communication with health care providers and limited involvement in decision-making (153, 160, 166-168). A number of studies have suggested that self-management behaviour and asthma management outcomes may be improved by providing intervention programs for patients and/ or their family as well as for professionals, influencing patient-provider partnerships and medical review (156, 165-169).

## **1.6 Education**

Asthma management is not limited to medication: as Fink declared, ‘Management of asthma disease is 10% medication and 90% education’ (170). Education is instrumental in encouraging the implementation of guidelines to manage chronic diseases such as asthma. For best results, education should be aimed at all concerned parties: patients, families, and health service providers.

Education can include aspects of the pathophysiology of the disease, symptoms, triggers, medication function, monitoring, device techniques, and self-management skills. Patients and their families should be educated in how to present information and discuss their issues with health care professionals. Improvement in asthma management outcomes have been reported after education programs, compared to usual care (171).

The objectives of education are broad-ranging and include not only delivering information but also implementing behaviour change and encouraging patients and health care professionals to incorporate this change into their daily practice. As the sole intervention, education may not improve some aspects such as self-efficacy and outcome expectancy; so it is suggested that intervention programs should also include workshops, focus groups, feedback, and follow-up (172).

A study in New York which surveyed 6,672 patients and parents found that 78% could recognize primary asthma symptoms and 87% knew how to manage an asthma exacerbation (85). The study found that 89% of participants were provided with good or very good information from their health providers, while more than 80% were supplied with a written action plan, and were taught about inhaler and PFM use. However, 84% of participants reported using their medication only when they had symptoms; of the 75% who used ICS, only 38% reported daily use; and while 51% reported PFM possession only 18% of these had changed their medication as a result of PFM monitoring (85). From these results, the authors indicated that a relationship between communication and education as well as compliance with management regimens could be inferred; they suggested focusing on the quality of education. Guidelines consider education to be part of asthma management, but a lack of education among asthma patients has been reported: a lack of knowledge about asthma, the disease and its management, as well as misunderstandings regarding device use, have been reported (59, 65, 68, 77, 90, 161, 173-176). A study conducted in 29 countries revealed that 39–70% of patients believed that their asthma was well controlled or under complete control, when in fact they had moderate symptoms (58). One survey showed that 67% of respondents reported familiarity with reliever medications, yet only 59% of these correctly identified the one they used and 24% believed that it should be used daily. Further, 74% of respondents reported controller

term knowledge, with 63% of these correctly identifying the one they had and 26% believing that it should be used on an as-needed basis (90).

Patients' attitudes, perceptions, beliefs and behaviour skills have been reported as another concern. Patients make decisions depending on their knowledge, beliefs, and experience. A number of studies have reported low ICS use and/ or adherence among asthma patients (38, 57, 58, 65, 177). It has been suggested that patient/ family concerns about the disease and medication, such as side effects, lack of understanding the role of medications, inhaler technique problems and poor communication with their professionals, are all reasons behind the low adherence to ICS use (54, 65, 85, 90, 177-179). Boulet (179) found that 59% of respondents were afraid of using ICSs, and 39% reduced the prescribed dose. Low ICS use was reported amongst patients with severe asthma, with 50% or fewer having had the chance to contact a health care professional in the previous three months (180). Burkhart et al. found that 92% of respondents were incorrectly using their inhaler during a pre-intervention or test; 19% made mistakes even after an intervention. It is indicated that one-time instruction may be inadequate (176) .

Any shortfall in education may result in mortality, morbidity, and high health care costs. One study showed that 90% of asthma deaths in the United Kingdom were avoidable. In some cases, patients and/ or their family did not believe that asthma is chronic disease (9, 58, 173). Forty per cent of asthmatic patients reported they had a chronic disease while 53% reported they had asthma only when they had symptoms, and they were less adherent with ICS use and other self-management skills (65). Further, increased consumption of health resources may associate with a lack of education. Lack of self-management may lead to unscheduled clinic visits, hospital admissions, and emergency room attendances. It has been reported that the frequency of unscheduled clinic visits ranges from 25% in Western Europe to 47% in Japan (58); further, 13% and 23% of Japanese and United States patients respectively present to the emergency room each year (58). Another study has shown that 44.2% and 30% of participants had unscheduled clinic visits or emergency attendances respectively during a single year (54). Of 206 children involved in a study in KSA, 30% had more than 50 visits and 3.5% had more than 100 visits during a 6-year period (43).

Parents' knowledge, beliefs, worries and psychosocial issues may be important factors affecting asthma management, particularly in young children (134, 160, 181-183). It has been suggested that parents often lack necessary information about how their child should use their medication and inhalation device. This is a concern; in one study which reported a lack of patient knowledge regarding some aspects of asthma and its managements, a number of patients reported that they usually received their education from their family and/ or friends, and in 21% of cases these were the only sources for education (161).

A recent study was conducted on 67 patients and parents to determine the correlation between parents' concerns about preventer medication and adherences: 75% of parents strongly believed that their child's medication was necessary for their health and 34% reported that they worried about the medication. Poor adherence among patients whose parents held greater concerns was recorded (183). An Australian study found that more than half (51%) of parents reported they lacked adequate information about asthma triggers, 60% of children had low adherence to preventer medication and 48% did not have an AAP (162). These findings support the need to involve parents in asthma education programs.

Lack of knowledge about asthma diagnosis, its management, and the use of inhalers, self-efficacy and outcomes expectancy, together with poor communication skills and compliance with management guidelines and variations amongst the practices of health care providers, have been reported in several studies (90, 115, 184-195). Some of these investigators and others suggest that education programs for health care providers may improve asthma management outcomes (55, 90, 190-192, 196-199). One study in Canada showed that only 6% of physicians (specialists and primary care) always, and 33% sometimes, followed the guideline recommendations (90). Cloutier et al. found that physicians' adherence to recommendations, such as prescribing ICSs, improved amongst those who undertook an education program, and this contributed to reduced hospital admissions and emergency room attendances among child with asthma (199). Further, educating health care providers improved their relationship with patients and their communication skills, which positively affected asthma management outcomes and compliance among patients/ family (180, 182, 187, 189, 196). Poor education is expected to result in poor management

adherence, strained patient-physician relationships, and suboptimal asthma care outcomes.

It is evident that patient knowledge, literacy level, socioeconomic status, psychological and cultural factors, and familiarity with asthma care may all affect patient participation, which, in turn, influences compliance with asthma management (58, 90, 197, 200, 201). Simplifying the education materials, utilizing the available resources, using supporting media, and encouraging the participation of health care providers may positively influence the education process (202, 203).

## **1.7 Barriers to Adherence to Asthma Management Guidelines**

ICSs are recommended in international and national asthma management guidelines based upon evidence that they can improve treatment outcomes. A number of studies have found that there is a correlation between non-adherence to controller medication (corticosteroids) and both morbidity and mortality among asthmatic patients, as well as an increase in health care service utilization and cost (79, 80, 82, 204, 205). Suissa et al. found that hospital admission and readmission rates were reduced by 31% and 39% respectively amongst patients adherent to their ICS regimen (80). However, numerous studies have shown that the use of ICS amongst patients is low, and that adherence to therapy is also poor (38, 54, 57-59, 74, 85-88). Several studies have reported barriers that may reduce patient adherence to asthma treatment in general and to treatment with ICS in particular. These barriers are related to the medication (corticosteroid), the patients and their families, and physicians and other health workers (34, 183, 206-214). Lack of knowledge, misconceptions, beliefs, concerns and attitudes regarding asthma and its management, coupled with patients' and carers' characteristics such as lack of self-efficacy, limited physical ability, and socioeconomic and psychological barriers may contribute to low adherence, as may poor communication between patients/ carers and health care providers. Patients and/ or carers may be affected by one or more of these barriers (85, 86, 91, 93, 207, 214, 215). Bender et al., when reviewing 29 studies conducted to evaluate patients' (adult, adolescent, children and/ or their parents) barriers to adherence income status classified the most common of these barriers according to their significance (i.e. either having low or high patients emphasis). In addition there were differences in the barriers reported and emphases placed on barriers by adults, children and/ or

parents as well as those in the low income group. Stigmatization barriers were found to have the most influence on children, while concerns about medication side effects were reported among all groups as one of the most common barriers (204). Steroid phobia has been reported as the most important barrier in a number of studies (177, 179, 204, 209, 215). Mothers who feared there would be corticosteroid side effects were less likely to let their children use ICSs and more likely to reduce the dose when they did (215). Drug and health service costs also tended to reduce ICS use (133, 204, 216) (14, 17, 19-21). For example, one study found that families with low incomes were less likely to use ICS (216).

Knowledge is a further barrier. Patients' understanding of their disease and its severity, together with the function of medication, influences treatment adherence (65, 177, 179, 209, 212). Some patients believe that they have to use their medication only when they have symptoms (65). It has been found that misunderstanding of the drugs' side effects (i.e. the belief that it causes addiction) may cause patients to reduce ICS use (215). Lack of education, low income, type of information sources, culture, time, age, gender, patient-physician relationship, and poor perceptions of the utility of ICS are other barriers relating to patients or families that have been reported as factors contributing to decreased ICS use (179, 210, 211, 213, 215, 217): Gazala et al. reported that mothers with concerns about ICSs tended to be influenced by information received from unqualified sources (215). In addition, patients' or their carers' psychological, social and personality barriers such as forgetfulness, reluctance or denial, difficulty using an inhaler, peer or family influence, absence of motivation, inconvenience, time, and embarrassment were found to be barriers to adherence (93, 204, 207-209, 218). Rhee et al. found that 63% and 53% respectively of participants reported reluctance and forgetfulness as the main barriers affecting their adherence (207).

Health care providers also have an effect on ICS use. Physician-patient relationships, good communication, patient discussion, and follow-up are factors noted in several studies as important elements which may affect ICS prescription and adherence (93, 177, 218, 219). Boulet found that while most participants reported concerns about their medication, only one third of respondents had discussed their ICS concerns with their health care providers (179). Logan et al. grouped adherence barriers in four

domains: disease/ regimen issues, cognitive difficulties, lack of social/ self-efficacy, peer/ family issues, and denial/ distrust factors (206).

## **1.8 Value of Asthma Education Programs and Asthma Action Plans**

Daily responsibility for chronic disease management lies mostly with patients and their family members. As the majority of the patient's time is spent away from health care centres, self-management is an important component of chronic disease management. Through effective self-management, patients are able to assess their current health status and make whatever clinical, cognitive, behavioural and emotional adjustments are needed to sustain a reasonable quality of life (140, 142, 220, 221). Traditional patient education may improve chronic disease management outcomes; however, intervention programs based on both social learning and self-regulation theories have proven to provide better results in terms of clinical outcomes and improvement in self-management skills than traditional education programs (140, 142, 221-223). In addition, a strong sense of self-efficacy, which is defined by Bandura as 'one's capabilities to organize and execute the course of action required to manage prospective situations' (142), has proven to be beneficial for patients' ability to manage their own chronic illness, which in turn has been related to a range of positive outcomes such as improved health, better accomplishment, and social integration (223-225). Furthermore, collaborative care, where the health care decision is taken by both the patient and his/ her health care provider through a continual working relationship that results from understanding of roles and tasks, sharing goals, and acquiring skills for executing their roles combined with self-management education, is more valuable than traditional advice (140, 220, 223, 226). Knowledge, self-efficacy, involvement in decision-making, and behaviour have improved among patients and carers who undertook intervention programs. These factors contribute to enhancing asthma management outcomes (35, 67, 135, 173, 203, 225, 227-235). From the previous studies, it should be noted that intervention programs may differ, depending on who delivers them (such as a health care provider or peer), the setting (clinic, school, home) and presentation methods (computer, DVD, chalkboard). Knowledge has also been reported to improve among family members who undertake intervention programs (134, 135, 203, 234). The influence of knowledge and understanding is illustrated by a study in which patients answered

80.7% of a questionnaire in a correct manner after undertaking an education program, compared with 60.4% before the program (135). Furthermore, improvement in asthma control, symptom-free days and/ or nights, enhancement of quality of life and better health care usage were found among asthma patients who had been educated (134, 223, 227, 228, 230-239). Studies have indicated that patients with AAPs and a training program reported fewer hospital and unscheduled physician visits, emergency room attendances, school or work absences, all of which resulted in reduction in asthma-related costs compared with patients receiving normal care (67, 173, 228, 230, 232, 233, 235, 237, 240-243). Kelly et al. found that emergency room attendance and hospital admission rates amongst an intervention group declined from 3.6 to 1.7 and 0.6 to 0.2 per patient/ year, respectively (241). Costs for the intervention group reduced by \$721 per patient/ year compared with \$178 in the control group; most of this saving was due to reductions in hospital admissions (241). Evans et al. found that the patients' school performance improved more amongst the educated group than the control group, although no significant differences in school attendance were reported; the authors suggested that this might be because the majority of the sample had only mild severity asthma (227). Similar results were reported by Clark et al. (238).

Intervention programs may influence compliance with medication and improve inhaler technique (135, 173, 223, 232, 233, 237, 239, 241). For example, in an educational intervention study, ICS daily usage as a controller drug increased from 58.8% to 91.8% and inhaler technique improved from 38.2% to 95.6% amongst patients after the education program (173). Another study found that using anti-inflammatory drugs increased from 34% at baseline to 95% after a year amongst the intervention group, but only from 60% to 65% in the control group, although the latter reported higher percentage use at baseline than the intervention group (241). Turner et al. found similar results, with adult patients using AAPs who were educated for a period of six months showing a reduction in their daily use of  $\beta$ 2 agonist and increased use of ICS (144). AAPs and education with follow-up are recognized as major factors in achieving best asthma treatment outcomes. Intervention programs and asthma self-management plans may improve the asthma and medication knowledge of patients and carers, as well as self-efficacy and behaviour (134, 135, 225, 234, 239, 244). Recent studies suggest that while

knowledge is influenced by education, sharing decisions with the patient/ carer and providing AAPs improve health outcomes as result of better compliance with asthma management (203, 235, 239, 245). It is clear that when it comes to chronic disease control, not just medication but education plays an important role. Education duration and follow-up, the suitability of programs (whether interview, individual consultation, written instruction), delivery method and content, facility and setting, plus the age, culture, socioeconomic and education level of the patient have been demonstrated as factors that can influence the outcomes of intervention programs (13, 67, 173, 203, 225, 234, 235, 239, 246).

## **1.9 Quality of Primary Health Care Centres**

Worldwide, many patients suffer chronic illnesses. One study shows that 120 million Americans suffer from one or more chronic diseases, with the cost of treatment representing 70–80% of total health care costs (221). In general, primary health care centres (PHCs) are the first choice of patients. Recent studies in KSA found that primary health care centres were preferred by 60% of participants for the management of their illness (247). Worldwide, it is evident that most patients do not have good quality health services (41, 43, 248-251). Lack of, or wide variance in the quality of, primary health care has been reported within and between countries (247, 252-254). Poor health care may be the result of one or more problems of access and effectiveness, which may affect some or all services in PHCs (255, 256). A review of 31 studies evaluating the quality of PHCs in KSA regarding access to and effectiveness of clinical and interpersonal care found that while good access and effectiveness were reported of some services such as immunization programs, there was poor access to and low effectiveness of other services, including chronic disease management and education programs as well as specialist referral and prescribing patterns (247). Interpersonal care was affected by differences in culture and language between patients and health care providers, contributing to poor communication (247, 256). A study of PHCs in Riyadh, Saudi Arabia, found that while patients and their families reported satisfaction with some aspects of their care, there was dissatisfaction with other aspects such as PHC locations, working hours, waiting times, overcrowding, lack of specialized clinics, inadequate medicine and equipment, unsatisfactory health care provider skills, language barriers with professionals, poor communication, and inadequate consultation times (255-257). Other studies have

reported a number of barriers to health care quality (41, 247, 254, 256). These barriers may relate to PHC settings and the organization or patients and their families, as well as of health care providers. They include poor implementation and adherence to guidelines and recommendations such as prescribing patterns, lack of follow-up, patient education or referral to specialists, poor qualifications and training, lack of motivation among administrative and professional staff, inadequate care environments, poor team work, language and cultural differences, short consultation times which may lead to insufficient communication between patients and professionals, and a lack of resources and facilities such as essential medications, laboratory items, devices, information system access and care centre access (166, 247, 250, 252, 255). Added to these, patients' and their families' knowledge, satisfaction and compliance with management care plans are other potential barriers to the quality of PHC care, particularly with chronic diseases (166, 247, 250, 252).

Facilities at PHCs may also not be suitable for treating patients of chronic diseases if there is a lack of proper medicine and equipment (42). One study evaluated the concerns of 49 GPs divided into six groups, from urban and rural areas, regarding the achievement of optimal outcomes in asthma patients and the care delivery barriers they faced (141). It was reported that education for both patients and professionals was the major priority of all groups. Medication availability and safety, regular treatment review, consultation time, and costs were other concerns (165).

Worldwide, health services may be inadequate in some areas due to the lack of facilities and/ or capable health staff (50, 187, 247). For example, in the United Kingdom, 58% of the asthma patients in one study were prescribed inappropriate medication and were treated primarily by GPs in PHCs (258).

### **1.10 Physicians' Use of Guidelines**

Guidelines have been developed to assist health care providers in clinical practice to provide quality asthma care. Attributes such as adequate knowledge, experience, communication skills, and confidence are all identified as essential. These attributes are important in all aspects of asthma management practice, including diagnosis, treatment, caregiver–patient collaboration, patient education, and follow-up. Health care providers' adherence to such guidelines may improve the quality of care, and so

lead to optimal asthma management outcomes including improved patient knowledge and behaviour, self-management, adherence to treatment regimens, quality of life, asthma control, and a decrease in the socioeconomic effects of asthma. However, adherence to guidelines amongst health care providers remains limited. Physicians' non-adherence can be observed in their inadequate assessment of asthma severity and the consequent inadequate treatment, in addition to an increase in hospital admissions and ER attendance. A study of 101,544 consultations by 235 general practitioners across several countries found that asthma ranked as the sixth most common diagnosis, varying from 1.8% in Italy to 5.8% in Ireland (259). However, it was also found that most asthma outpatient clinics were inadequately managed (259). A study conducted in 15 health care facilities in the United States surveyed 254 adult asthma patients and found comparable results: about 15% of patients had been hospitalized for asthma at 1-year follow-up, and only 22.9% of these patients had PFMs; 56% of patients with allergies had been educated in how to avoid allergens, and had been recommended for official allergy testing (260). A high percentage of patients (94.6%) used  $\beta_2$  agonist inhalers either in overdose or in combination with an oral  $\beta_2$  agonist. Patients also tended to have a lack of understanding about acute asthma attacks (260).

Often asthma patients present at Emergency Departments (ED) having had visits to the primary care facility where they may not have received appropriate management, exemplified by such problems as low use of ICS, lack of an AAP, no PFM, or delayed follow-up (161, 187). Reeves et al. in their evaluation of asthma care and management for children before their attendance at three ED locations (urban, suburban, and rural) found that 54% of the 197 participants had persistent asthma and 61.4% had attended ED at least once the previous year (187). They found that PHCs were the main setting for regular asthma management, with 187 (95%) of patients reporting they had access to a PHC. The authors reported that physicians did not always adhere to some of the NAEPP recommended guidelines (187). For example, only 18% of patients had seen a specialist; 61% and 43% had a PFM and an AAP, respectively. Only 14.5% of patients who had a PFM used it regularly. More than one third (36.5%) of the patients were considered undertreated (with no controller medication). While most patients reported they had been well educated about some issues such as medication, asthma triggers, nebulizer use, and asthma

attack management, 41% and 46% had received no instruction on how to use a PFM or an AAP, respectively. Differences were evident between primary clinic provider practices in aspects such as PFM use, hospitalization, and the use of preventer medications, although the authors noted that this could have been due to the small sample of participants from each site (187).

Most the asthma patients are treated by general practitioners (GPs). No significant differences in medication use between patients treated in asthma clinics and those treated in non-specialist clinics were discovered in a study conducted in England at six general practices, five of which had asthma clinics (258); however, more than half (58%) of the patients were prescribed an inappropriate drug which was not consistent with the guidelines. The authors concluded that physicians' experience, age, and education might affect their compliance with guideline recommendations (258). Other studies have shown that GPs' practices often fail to comply with guideline recommendations (87, 184, 195, 261). In Belgium, a study comparing 356 GPs' assessment and treatment of 1376 patients with the GINA Guidelines found that the asthma severity of 78% of patients was correctly assessed, while 20% were under-estimated and 2% over-estimated (261). Only 37.5% of the sample were correctly treated accordingly to the GPs' severity assessment and the guidelines, while 29.6% and 32.9% were under- and over-treated, respectively (261).

Inaccurate assessment of asthma severity by physicians leads to inappropriate management. Studies conducted with asthmatic adults and children to assess the effect of asthma severity assessed by physicians found that patients with poor outcomes including asthma control, ICS prescription, and PFM use had had the severity of their asthma underestimated by their physicians (193, 262).

Variation in asthma management practices between countries has been reported (38, 259). Jepson et al. conducted a comparison of the prescribing patterns in primary care of 235 GPs from six European countries (259). Variations in asthma prescribing practices were found: for instance, the use of ICSs in children ranged from 12% in Portugal to 34% in Ireland, while in adults it ranged from 14% in Italy to 31% in Ireland. A wide range of ICSs, such as beclomethasone, fluticasone, and budesonide, were used. There were wide variations in the use of  $\beta$ 2 agonist (short- and long-

acting) in children and adults (259). These studies and others illustrate that poor adherence to guideline recommendations are common (38, 184, 187, 189, 260, 262).

Practice has been shown to vary between physicians. It has been found that specialist physicians and experts are more likely to comply with asthma guidelines than their GP counterparts (115, 163, 186, 193-195, 263, 264).

A number of issues which may relate to health care providers, patients and their families, primary health care facilities, and lack of resources have been recognized as probable barriers to effective guideline adherence among primary health care management. These constraints may have different effects on all or some of the guideline recommendations, such as use of ICSs, PFMs, written AAPs, avoidance of triggers, and patient education (172).

### **1.11 Barriers Affecting Physicians' Adherence to Guidelines**

There are many barriers influencing physicians' adherence to practice guidelines. These barriers are classified into three groups: 1) physicians' knowledge barriers (e.g. lack of awareness of or familiarity with the guidelines), 2) physicians' approach and ability barriers (e.g. lack of agreement, self-efficacy, outcome expectancy, and motivation/ inertia of previous practices) and 3) external barriers (e.g. guidelines, environmental, and patient-related factors) (265). These groupings were constructed by Cabana and colleagues after reviewing 76 studies of barriers to physicians' general guideline adherence (265). The study focused on barriers which might be changed by an intervention, and the grouping was based on the effect these barriers had on physicians' knowledge, attitudes or behaviours. It concluded that barriers are dependent on practice settings and that findings in one setting cannot be generalized (265).

As asthma is one of the chronic diseases, worldwide, several studies have been conducted to evaluate health care provider practices (163, 188, 190, 193-195, 198, 259, 264, 266, 267). Some of these, and other studies, have identified barriers to compliance with guidelines, and most have similar findings (172, 190, 191, 266-271): lack of physician knowledge, awareness, familiarity and agreement with guideline elements, in addition to lack of physician self-efficacy and outcome

expectancy, are the main barriers to successful implementation of asthma guidelines. Adherence to guideline recommendations may be affected by one or more barriers, (172), and associated factors may also influence compliance. For example, physicians' lack of awareness may be associated with their lack of time to become informed; and poor access to guidelines may be a result of poor self-efficacy associated with lack of time and resources to advise and discuss guideline recommendations with patients and family, a lack of training programs, of reimbursement, or of structures to ensure continuity of care through follow-up (191).

Lack of physician knowledge, awareness and familiarity of guidelines has been reported. Halterman et al. and Wolfenden et al. found that physicians underestimated the severity of asthma in most patients, and so provided them with insufficient therapy (189, 262). As few as 40% and 50% respectively of the participants in their studies were given an accurate estimation of their asthma severity and control medication (189). The primary reason was considered to be limited physician awareness of guideline recommendations. A study conducted in Karachi, Pakistan, to evaluate national guideline adherence among physicians' current practices found that lack of knowledge, approach, and poor adherence to guideline recommendations including high use of short-acting  $\beta$ 2-agonists and low prescribing of steroids with a variety of doses, forms, and routes of administration, contributed to poor adherence (184). Another study of 62 participants showed that more than half (33) did not have an AAP; of these 33, only 11 reported that AAP was prescribed to them by their physicians (168). In a further study, Cabana et al. found that physicians' unfamiliarity with guideline recommendations was more likely to affect adherence than lack of awareness of guideline recommendations (172).

There are variations in asthma care and management at different levels of health care professionals (187, 193, 263, 272); and it is possible that the qualifications of health care providers, their self-efficacy, and their confidence may hinder adherence. It has been reported that specialists, experts and well trained physicians are more likely to follow guidelines, including which maintenance medication to prescribe, the use of lung function monitoring, and instructions on avoiding asthma triggers, than are GPs (263, 268, 272). Laforest et al. found that patients treated by specialists were less likely to use short-acting beta agonists, antibiotics, or antitussive drugs, and more

likely to be prescribed a combination of long-acting beta agonists and ICSs (194). Further, the asthma control level was higher in patients treated by specialists than in other groups (194). Such variations in management practice have been found by other studies of asthma control and management practices in different countries (38, 188, 190, 198, 259, 270).

Primary health care professionals reported limited disagreement with some guideline recommendations (185, 264, 266), and physicians reported different barriers to compliance in their practices. Some of these differences were associated with factors such as age, specialities, training, and experience. One study of paediatricians in primary care investigated the barriers affecting adherence to four recommendations (ICS prescribing, PFM use, smoking cessation counselling and allergen exposure counselling); it examined three focus groups based on graduation year, including 21 paediatricians and a nurse (191). Lack of agreement on the prescription of corticosteroids for long term use, lack of self-efficacy in using PFM, and lack of outcome expectancy of smoking cessation due to concerns about side effects of corticosteroids, how to interpret readings of PFM, and patient non-compliance were reported among senior physicians; less concern with using corticosteroids or provision of smoking cessation counselling were reported amongst younger physicians, due to a lack self-efficacy and training (191). The inertia of previous practice barriers was not addressed by younger physicians, but, all groups reported lack of agreement, self-efficacy and outcome expectancy as barriers to allergen counselling, and time limitations as a barrier for all four recommendations (191). Another self-report study estimated the barriers affecting 455 paediatricians' adherence to ICS prescribing, PFM use, and patients' and parents' smoking cessation counselling (172). In the previous study, physicians' adherence to all recommendations ranged from 39% to 53%. Both access to and awareness of guideline recommendations were reported by the majority of the 455 participants (81% and 88% respectively). Lack of familiarity and external barriers were also reported, with a significant association with all recommendations. Lack of agreement for both corticosteroid prescription and PFM use were recorded by 17.5% and 7.7% of respondents respectively, with 2.5% and 27.4% of the same respondents reporting a lack of confidence in the outcomes. Lack of outcomes expectancy for both patients'

and parents' smoking counselling affected 61% and 67% of respondents' decisions, respectively (172).

In an evaluation of specialists (allergists and pulmonologists), a high proportion of respondents disagreed with the current asthma severity classifications (185). In contrast, physicians may have an awareness of and/ or agreement with the guidelines, yet their practices may still reflect poor adherence to them (38, 172, 188). In East Harlem, New York, a study evaluating the practices of primary health care providers was undertaken to identify the barriers to various guideline components, including use of ICSs, PFM, AAPs, allergy testing and influenza vaccination. Of the 202 health care professionals surveyed, 79% had received training in asthma guidelines, and 70% reported awareness of these guidelines (268). Moderate to strong agreement with ICS, PFM, AAP use and influenza vaccination were reported as follows: 66% (95% CI, 59–73%), 63% (95% CI, 56–70%), 55% (95% CI, 48–62%) and 70% (95% CI, 63–77%). However, more than half (54%) of respondents did not use the guidelines to manage their asthmatic patients, with 62% and 73% reporting adherence to ICS use and influenza vaccination, while low adherence was reported with PFM use (34%), AAP use (9%), and allergy testing (10%). Low adherence to all five recommendations was associated with lack of familiarity, lack of provider self-efficacy, and outcomes expectancy barriers (268).

Limited time and restricted resources have also been identified as potential barriers which may lead to poor health care provider adherence to guideline recommendations (77, 163, 172, 182, 186, 187, 190, 191, 265, 268).

Medications and device-related barriers such as beliefs, perceptions, and cost may also affect health care providers' practices. Their awareness of medication costs, treatment fears, and misunderstanding may contribute to their non-compliance (68, 77, 191, 258, 266, 273). A better understanding of medication function has been shown to change behaviour and lead to better asthma care outcomes (274). Long waiting periods at pharmacies have been suggested as a reason for 34% of non-compliance among patients, with 30% of non-compliance attributed to medication costs (68). In addition, both the complexity of the guidelines and the number of practice guidelines provided may affect professionals' adherence rates (261, 265).

As the compliance process is dependent on patients, families, and health care providers, it can be expected that good relationships between these parties will improve care outcomes. These relationships are dependent on the quality of communication (182). A barrier to professionals' guideline compliance is inadequate communication with their patients and/ or families due to inadequate consultation time or poor communication skills (163, 166, 181, 182, 201, 272). The lack of communication may also be related to patients' or their family's knowledge, beliefs and perceptions of asthma and its management. It has been found that patients do not present their symptoms accurately, which may lead to inappropriate diagnosis (182, 189, 261). In addition, it has been reported that patients who visit their physician at least every six months receive proper diagnosis (189).

Collaboration between health care providers and patients/ families is required to improve self-management of asthma (169, 182, 220). Collaborative care and self-management education are the basis for a partnership, distinct from traditional care, with better use of behavioural and social learning theory, greater recognition of the problem, of goal setting, problem solving, shared decision-making and internal motivation (140, 169, 220, 221). For instance, collaborative goal-setting coupled with action plans has been reported to be valuable in changing coronary heart disease patients' behaviours in a primary care setting (169).

Ferguson et al. have found that culture and language may affect patients' involvement in decision-making (201). Patients' and their families' education level may also be considered a factor affecting health care provider-patient relationships, and may result in low compliance with asthma care and management by both patients and professionals. This is because most health care literature is written in sophisticated language that may not be the primary language of either health care providers or patients, making it challenging for many patients and their families with a low to medium literacy level to understand, while physicians may assume that patients have higher literacy than they possess; patients may be too shy to clarify doubts with their physicians (275, 276).

Adherence to guidelines can be improved by addressing a number of barriers including lack of awareness, knowledge, agreement, and familiarity with guideline recommendations, as well as professionals' self-efficacy, outcome expectancy and

communication skills. These may be modified through education interventions tailored for individual health care providers, a course that has the potential to contribute directly to the enhancement of asthma care management and patient outcomes such as adequate diagnosis, proper treatment, and reduced health care costs (38, 55, 172, 184, 187, 188, 191, 196, 198). Physicians can improve asthma care and self-management by following the guideline, particularly regarding appropriately prescribing ICSs, developing AAPs, utilizing lung function monitoring, educating patients, referring patients to specialists, ensuring regular follow-up visits, building good communication channels with their patients, and taking into consideration their socioeconomic status (38, 198, 272). Physicians should also provide support for self-management by scheduling group meetings for interested patients. Efforts in this area by health care providers are considered to contribute to better outcomes in asthma care (221). A team approach to asthma management may also be useful, especially in cases where physicians' lack of knowledge or training in some aspects of asthma management, or their time limitations, hinder their application of guideline recommendations (144, 277).

## **1.12 Summary**

Asthma is a chronic disease that affects both adults and children world-wide. There have been advancements in medications used to treat the disease, and guidelines have been developed in an attempt to standardize practice and improve treatment outcomes. However, adherence to recommended asthma practices remains limited amongst both patients and physicians, and many patients fail to achieve optimal control of their disease, the primary goal of asthma management.

In order to attain greater success in control, both patients and their families and physicians should take more responsibility, to limit morbidity and mortality as well as reduce the burden of health care costs.

Poor asthma care and self-management in some parts of the world are associated with lack of knowledge, understanding, and education, exacerbated by communication barriers between patients and health providers; all these result in poor outcomes. Low numbers of ICS prescriptions, high use of short-acting beta agonists, irregular medication use, inappropriate inhaler technique, and poor

adherence to self-management components such as self-monitoring have been reported as contributors to poor disease management. Several barriers affecting patient and/ or family adherence have been identified, including patients' and carers' knowledge, their behaviours, and their self-efficacy; asthma management outcomes have been improved in those who have participated in interventions programs built around education.

The literature reveals that to improve asthma care and self-management, the following need to be addressed: patients' and their families' knowledge of and understanding about asthma, treatment regimens, and self-management, which result in changes in behaviours and attitudes, increasing confidence in and adherence to management components. These outcomes depend largely on health care professionals' practices and their relationship with their patients and their families. The lack of physician knowledge (awareness, familiarity), confidence (self-efficacy, outcome expectancy), and other external factors such as lack of time and resources have been associated with poor adherence to guidelines. The education process is an important aspect of asthma care that encourages the contributions of patients and their families as well as of health care providers to achieve better management outcomes.

### **1.13 The Focus of this Study**

Chronic asthma in children and adolescents is a worldwide health phenomenon, and so are reports of poor asthma management. This thesis addresses the following questions:

- What is the level of asthma management in KSA?
- How are children and adolescents managed?
- What are the current practices in the primary health care centres (PHCCs)?
- What is the level of knowledge of patients/ families and physicians regarding asthma and its management?
- To what extent have the national asthma guidelines been implemented in KSA?

Another important question to consider is what factors contribute to low utilization of ICSs.

The current study comprised four phases. The first phase was a patient survey administered through PHCCs in KSA, to identify current knowledge and understanding of asthma, attitudes towards the disease, and management practices among children and adolescents. The second phase was to ascertain physicians' patient education strategies, asthma treatment practices, their involvement of patients in management decisions, and patient and physician compliance with the KSA asthma guidelines. A third phase was conducted to identify the barriers affecting Saudi asthma patients' management adherence generally, and adherence to ICS use specifically, in PHCCs. The last phase evaluated the impact of an education program and provision of AAPs on Saudi asthma patients' and their carer's knowledge, self-efficacy and behaviour, in addition to asthma management health outcomes.

#### **1.14 Reasons for the Study**

As asthma is one of the most common diseases in KSA, it was expected that corticosteroids would be widely prescribed: in particular, that corticosteroids would be the drugs of first choice for the management of chronic asthma in accordance with the Saudi National Protocol for the Management of Asthma. However, poor asthma management compliance including inaccurate diagnoses, inappropriate medication use, poor patient knowledge, low understanding of the disease, unsatisfactory self-management adherence, incorrect technique in administering inhalant medications, and insufficient education were known to exist. Although a national protocol for asthma management was developed in 1995, data on the level of its implementation, patient and practitioner compliance, and the outcomes of the guidelines in health centres, are lacking. This research provided a useful insight into current patterns of asthma management in children and adolescents in KSA, the extent of guideline implementation in PHCCs, and the use of corticosteroids by chronic asthma patients. The research also provided information about the barriers affecting KSA's asthmatic patients' ICS use. The use of AAPs, patient education and PFMs have been recommended as there is evidence that they improve asthma management outcomes by encouraging better compliance with treatment. Interventions in this study were designed to enhance guideline implementation and increase the use of ICSs, AAPs

and PFMs, with the aim of improving appropriate medication use, knowledge, and asthma control, and of reducing disease morbidity and enhancing the quality of life of Saudi children and adolescents with asthma.

## **Chapter 2**

### **Aims and Hypotheses**

This chapter includes the aims and hypotheses for the research phases.

#### **2.1 Phase 1: A Survey of Children and Adolescents with Chronic Asthma (or of their Carers)**

##### **2.1.1 The aims of this study**

- To compare the current practice of asthma management in Saudi Arabian primary health care centres against the national protocol for asthma management.
- To document current patterns of asthma management in children and adolescents in KSA.
- To assess the patterns and appropriateness of corticosteroid use in childhood asthma.
- To assess patients' and/ or their relatives' understanding of the level of asthma management.

##### **2.1.2 Null hypotheses**

The study aimed to test the following three null hypotheses:

H<sub>0</sub>: current patterns of asthma management in children and adolescents in KSA are not influenced by gender

H<sub>0</sub>: current patterns of asthma management in children and adolescents in KSA are not influenced by geographical region [Riyadh versus Asser].

H<sub>0</sub>: the current practice of asthma management in Saudi Arabia primary health care centres (PHCCs) is not in compliance with the national protocol for asthma management.

## **2.2 Phase 2: A Survey of Physicians in Primary Health Care in Riyadh and Asser, KSA**

### **2.2.1 The aims of this study**

- To identify current physicians' practices for asthma management in KSA.
- To compare the current practice of asthma management in Saudi Arabian primary health care centres (PHCCs) with The National Protocol for the Management of Asthma.
- To assess the patterns and appropriateness of medication description.
- 

### **2.2.2 Null hypotheses**

The study aimed to test the following three null hypotheses:

H<sub>0</sub>: Current practice of asthma management in Saudi Arabia PHCCs is not in compliance with the national protocol for asthma management.

H<sub>0</sub>: Current practices for asthma management in PHCCs in KSA are not influenced by physicians' gender.

H<sub>0</sub>: Current practices for asthma management in PHCCs in KSA are not influenced by geographical region (Riyadh vs. Asser).

## **2.3 Phase 3: Barriers Affecting Inhaled Corticosteroid (ICS) Use and Patient Adherence**

### **2.3.1 The aims of this study**

- To identify the barriers affecting Saudi asthma patients' management adherence generally in PHCCs.
- To identify the barriers affecting Saudi asthma patients' management adherence to ICS use especially in PHCCs.

## **2.4 Phase 4: Impact of an Education Program and Provision of Asthma Action Plans on the Knowledge and Health Outcomes of Asthmatic Patients**

### **2.4.1 The aims of this study**

- To assess the impact of an education program and provision of asthma action plan (AAP) on Saudi asthma patients' and their carers' knowledge, self-efficacy, and behaviour.
- To assess the impact of an education program and provision of asthma action plan (AAP) on asthma management outcomes among Saudi asthma patients and their carers.
- To assess the impact of an education program and provision of asthma action plan (AAP) on Saudi asthma patients' and their carers' adherences.
- To compare the impact of an education program and provision of asthma action plan (AAP) with education alone on asthma management outcomes among Saudi asthma patients and their carers.

### **2.4.2 Null hypotheses**

The study aimed to test the following five null hypotheses:

H<sub>0</sub>: children and adolescents or their carers' knowledge, self-efficacy and behaviour are not improved after attending intervention programs and being provided with asthma action plans (AAPs).

H<sub>0</sub>: asthma management outcomes among children and adolescents or their carers are not influenced by any education program and provision of asthma action plans (AAPs)

H<sub>0</sub>: Children's and adolescents' or their carers' adherences are not improved after attending intervention programs and being provided with asthma action plans (AAPs) in the Riyadh region of KSA.

H<sub>0</sub>: Asthma management intervention outcomes in children and adolescents or their carers in Riyadh are not influenced by the provision of asthma action plans (AAPs)

$H_0$ : Asthma management intervention outcomes in Riyadh are not influenced by gender.

## **Chapter 3**

### **Methodology**

This chapter will describe the methodology of the research phases. Four phases were conducted: among children and adolescents (and their families) with chronic asthma, to estimate their current management (Phase 1); among physicians working in PHCCs to estimate their current practices and adherence to guidelines, involving children and adolescents (and their families) with chronic asthma (Phase 2); to estimate barriers affecting asthma management in general and inhaled corticosteroid (ICSs) adherence barriers in particular (Phase 3); and to evaluation the impact of an education program and provision of AAP on the knowledge, behaviour, self-efficacy and asthma management health outcomes of asthmatic patients in KSA (Phase 4). Data were collected via self-administered questionnaires.

#### **3.1 Phase 1: Patient Survey**

##### **3.1.1 Aims**

The aims of Phase 1 of the study were to assess patterns of asthma treatment and control through self-management, such as the use of asthma action plans and PFMs, and patients' education, knowledge, and behaviours.

##### **3.1.2 Participants and procedures**

Equivalent groups were surveyed in primary health care centres in two regions in KSA (Riyadh and Asser regions) during the period January–May 2006. The selection of these particular regions was to take advantage of prima facie differences in customs, geography, climate, education and health service provision in the two areas.

Outpatients (or their relatives, where appropriate) with chronic asthma, aged between 6 and 18 years, were included in Phase 1. This group was chosen because of their high number of visits to PHCC services: according to the Ministry of Health, in 2004 5–14-year-olds with asthma accounted for 20% of total PHCC visits (183,718 out of 911,999 total visits) (278). Furthermore, the health system in KSA has separate clinics for each gender with staff of the same gender. The research was designed to explore differences in services, education and management offered through both

gender clinics. Two hundred patients were recruited from each region, and PHCC directors were contacted two or three times to encourage responses. Anonymous responses were solicited to encourage truthful answers. No compensation was offered. The exclusion criteria were patients who had not been diagnosed by a physician as asthmatic, who were aged 5 and under or over 18, or who failed to answer five or more questions.

### **3.1.3 Survey instrument and data collection**

Data were collected by questionnaires administered to outpatients, using ATAQ (Asthma Therapy Assessment Questionnaire) (279) categories which reflect five asthma management domains: patients' control, knowledge, behaviour/ attitude, self-efficacy, and patient–health provider communication (279); plus FACCT quality measures (Adult Asthma Measurement Survey–version 2.0) (280) after modification to suit the study sample. Three questions on current medication used, medication side effects and whether there had been visits to the emergency room or hospital during the last three months were added. The general objective of the questionnaire was to estimate current asthma management, adherence to asthma guidelines, any effects of changes in behaviour and daily practice, patient knowledge and understanding, self-efficacy, and the impact of these on management outcomes. It was composed in English, translated into Arabic and back-translated into English by native Arabian speakers who were fluent in the English language [see Appendixes A and M for both versions of the questionnaire]. This required the revision of some questions to suit the different languages: for instance, one response, 'does not apply' from the answer options of questions 5, 6, 7, and 8 of section IV, was deleted as it created confusion in the Arabic translation.

A covering letter contained brief information about the study and its aims, plus contact details and confirmation that the collected information would be used for research purposes only. An appendix containing most of the medication used in asthma treatment (as a list and scanned box image) together with illustrations of spacer types, was attached. The phrase 'blue inhaler' was added in question Y: 'Does your child use a blue inhaler or a nebulizer for quick relief from asthma symptoms?' to simplify identification. Similar questions with different possible responses were used in order to test the following: estimates of current practices, patients answering

as accurately as possible, and estimates of patients' knowledge, understanding and behaviours. For example, the participants were asked about their asthma action plan, steroid use, control drug, and current medication.

The patient questionnaire contained the following sections: demographic details (age, gender), asthma symptoms, asthma severity and frequency, frequency of hospital admissions or ED visits for the last three months, medical history, treatment regimen, history of corticosteroid (usage level compliance, side effects), asthma education history (patient's and his/ her carers'), patient/ carer knowledge, attitude and behaviour regarding asthma management, presence of written asthma action, PFM, and patient/ health care provider communication.

#### **3.1.4 Face validity**

The questionnaires were examined by two consultants, a specialist, a health education specialist, a statistician from the health field, and an Arabic linguist.

#### **3.1.5 Questionnaire administration**

The questionnaire was self-administered. In Riyadh, copies were handed to each health centre director, who passed them out to physicians who distributed them randomly to patients or carers. In Asser, the questionnaire was handed to the region's professional supervisors, and it was passed along to health care centre directors, physicians, and patients. Where a child could not complete the questionnaire, it was done by a parent or carer.

#### **3.1.6 The setting**

Primary health care centres in two regions (Riyadh and Asser) were the settings. PHCCs are considered the front line in health care. According to the Saudi protocol of asthma management, patients with intermittent asthma should be managed at their PHCC, while patients with moderate or more severe asthma should be referred to secondary (SHCC) or tertiary clinics (THCC) for asthma treatment, then attend follow-up sessions at the PHCC.

Saudi Arabia is divided into thirteen regions. Research was conducted in two regions, Riyadh and Asser, which differ in geography, education level, facilities, and

to some extent in culture and customs, as well as pollution, moisture in the air, pollen count, average temperature, etc. For example, Riyadh is 608m above sea level, while Abha, the centre of Asser, rises 2190m above. The average temperature during summer in Riyadh ranges between 25C° and 43C°, while in Abha which the main city in Asser region it falls between 15C° and 25.5C° (281, 282). Riyadh is the capital city of Saudi Arabia, with a population over 4 million people, and there is a variety of health care settings, including private and military hospitals and outpatient clinics in addition to MOH care settings. The majority of the Asser area is considered rural, with less population and limited health care settings.

In 2003, according to the Ministry of Health Annual Report (278), Riyadh and Asser had 336 and 229 PHCCs, and 35 and 13 public hospitals, respectively. Riyadh had 336 PHCCs divided into 2 divisions (central and rural), the central division consisting of 125 PHCCs divided into 5 sectors and covering all Riyadh suburbs. Participants in this survey were selected randomly across all of these. Asser had 253 PHCCs divided into 16 sectors, and participants were selected from four: Abha, Magardah, Khames Meshait, and Mohail. There were 101 PHCCs in these sectors.

### **3.1.7 Outcomes**

Comparison of responses was by gender and region. The primary desired outcome was an assessment of use in accordance with asthma management guidelines by patients receiving ICS. The second outcome expected was an assessment of the knowledge of patients. The third outcome was the evaluation of self-management aspects of asthma treatment such as asthma action plans, use of PFM meters, and education intervention.

### **3.1.8 Data analysis**

Data were entered into SPSS version 14. Data were randomly checked to ensure accuracy, and double-checked to avoid entering mistakes. Appropriate statistical tests were used, including frequency estimates, cross tabulation, Fisher's exact test, students t-test and Chi-square tests, to find associations between the variables and the regions and gender. Logistic regression analysis was applied in order to estimate the relation between dependent variables (inhaled ICS, control, asthma action plan, possession of PFM and education) and the independent variables. Results were

considered to be significant at  $\leq 0.05$  level. The Kappa test was executed to evaluate agreement between participants' responses to the question, 'Do you/ does your child use inhaled steroids?' with the current list of medication used.

### **3.1.9 Ethical considerations**

Prior to the commencement of the study, approval was obtained from the Human Research Ethics Committee of Curtin University of Technology. Ethical approval was also sought from the Ministry of Health in Riyadh, Saudi Arabia. All information collected by the questionnaires remains confidential. All data are coded by number and stored on a password-protected computer hard disk. After completion of the study all materials will be stored in a secure archive at the School of Pharmacy for a minimum of five years.

## **3.2 Phase 2: Physician Survey**

### **3.2.1 Objective**

Phase two of the research aimed at identifying current physicians' practice in PHCCs in two regions in KSA with regard to asthma management (patient education strategies, treatment, and patient involvement), and areas of agreement and disagreement. Adherence to Saudi National Protocol for the Management of Asthma by PHCC physicians was also targeted.

### **3.2.2 Participants and procedure**

Participants were working in PHCCs in the Asser and Riyadh regions during the period January–June 2006. The survey covered 120 physicians, 60 from each region, to determine current practices and differences in health service provision. Inclusion criteria were

- The physicians worked in PHCCs.
- The physicians had worked in PHCCs for a minimum of one year.

### **3.2.3 Survey instrument and data collection**

Data were collected by questionnaires administered to physicians (Appendix B) (283). The questionnaire was administered in English. A covering letter was attached containing brief information about the study aims and contact details, and confirming

that collected information would remain anonymous and be used for research purposes only. The physician questionnaire consisted of both direct questions and case studies. It was designed to collect demographic data (age, gender, qualification, experience, and training) and to determine each physician's knowledge of asthma and use of patient educational activities in accordance with the national asthma guidelines. Model case scenarios were used to estimate both these and patients' involvement in their treatment decisions.

### **3.2.4 Face validity**

Face validity of the questionnaires was assessed by two consultants, one specialist working as a physician in PHCCs and SHCCs, one health education specialist and one statistician from the health field.

### **3.2.5 Questionnaire contents**

#### **3.2.5.1 Practice characteristics**

Demographic data (age, gender) and experiences, specialization, practice category, training, personal experience with asthma symptoms, professional assistance and practice load were collected. Four more questions concerned working place (government or private sector), nationality, access to national guidelines (hard copy, electronic), and access to other guidelines.

#### **3.2.5.2 Asthma education section**

This section aimed to determine physicians' involvement in patients' education. This section determined the extra information provided to patients about medication for mild, moderate and severe asthma: 1) General information about asthma. 2) Prescribed asthma medication. 3) Demonstrating the proper use of inhalation devices. 4) Information on avoiding asthma triggers, and on environmental control. 5) Information on the warning signs of worsening or uncontrolled asthma. 6) An asthma action plan based upon symptoms. 7) Information about monitoring peak flow rates. 8) An asthma action plan based upon peak expiratory flow rates in conjunction with symptoms. 9) Information about community non-profit organizations that provided further information about asthma. The physicians were asked to report their usual practices. Each question had three response options for

each degree of asthma severity (mild, moderate and severe): a) I do not provide this information; b) I provide this information only if the patient asks; and c) I provide this information without waiting for the patient to ask.

#### 3.2.5.3 Treating asthma

Six model case scenarios ranging in severity were presented to assess each physician's approach and compliance with guidelines. Each scenario included options to initiate treatment, delay treatment, or refer patient to ED. If treatment was initiated, there were six options to choose from: 1) inhaled B2 agonist; 2) inhaled Ipratropium bromide; 3) inhaled corticosteroid; 4) non-steroid anti-inflammatory; 5) oral theophylline; and 6) oral corticosteroid.

#### 3.2.5.4 Individual practice section

This section contained two questions about usual and ideal patients' involvement in asthma management decisions. Each question had five-answer options to reflect physicians' perceptions of the patient role in asthma management, ranging from low to high involvement.

Work place and nationality were included to determine any differences in asthma management practice between government and private sectors, as well as between Saudi and non-Saudi physicians.

### **3.2.6 Questionnaire administration**

The questionnaires were self-administered. In Riyadh, the questionnaire was handed to health centre directors, who passed it on to physicians. In Asser, the questionnaire was handed to the region's sector supervisors, then passed on to the health care centre directors and then to the physicians.

### **3.2.7 The setting**

PHCCs are considered the front line in health care. According to the Saudi Protocol of Asthma Management, patients with intermittent asthma should be managed through PHCCs, while patients with moderate or more severe asthma should be referred to the secondary or tertiary clinics for asthma treatment and return to the PHCC for follow-up visits.

### **3.2.8 Outcomes**

The results were analysed for gender and region interaction. The main focus was the level of physicians' compliance with the current Saudi National Protocol for the Management of Asthma. The second expected outcome was an assessment of physicians' knowledge on asthma management.

### **3.2.9 Data analysis**

Data were entered into SPSS version 14. Data were randomly checked. Results were analysed with cross tabulation and Chi-square tests. Results were deemed to be significant at  $\leq 0.05$  level. The current physicians' practices regarding the valid full sample (for both regions), and the differences between the two regional assessments, depended on self-reports using frequency estimates, cross tabulation and Chi-square tests. Assessment of physician agreement and disagreement with the option of case scenarios was only undertaken if at least 75% of the full study group or subgroups respondents agreed or disagreed with the action. The relationship between current physicians' practices for the full response and others' practice characteristics were assessed by using cross tabulation and the Chi-square test.

The focus was on

1. The level of physicians' awareness of the asthma guidelines.
2. The level of physicians' use of the guidelines in prescribing for and educating patients.
3. The influence of age, gender, experience, and training on physician's awareness and use of the guidelines and their components.
4. The level of physician compliance with the guidelines based on
  - i. Their assessment of test case prescribing;
  - ii. Their pattern of prescribing amongst PHCC outpatients.

### **3.2.10 Ethical considerations**

Prior to the commencement of the study, approval was obtained from the Human Research Ethics Committee of Curtin University of Technology. Ethical approval was also sought from the Ministry of Health in Riyadh, Saudi Arabia. All information collected by questionnaires will remain confidential, and no identifying

information will be used in this thesis or any subsequent publication. The information has only been made available to the researcher and his supervisor. All data are coded by number and stored on a password-protected computer hard disk. After completion of the study all materials will be stored in a secure archive at the School of Pharmacy for a minimum of five years.

### **3.3 Phase Three: Barriers Affecting Inhaled Corticosteroid (ICS) Use and Patient Adherence**

#### **3.3.1 Aims**

The aims of Phase 3 of the study were to identify the barriers affecting Saudi asthma patients' management of their asthma in general and adherence to ICS use in particular.

#### **3.3.2 Survey instrument**

The survey was divided into three parts. Part One contained questions related to demography (age, gender, level of education of patient and parents, level of income, presence of health insurance), asthma severity and symptoms, medication use and adherence, possession of AAP, PFM, patients'/ carers' beliefs about the usefulness of their medication, their involvement in treatment plans, and their access to information. Data in Part Two was collected by using the Illness Management Survey (IMS) (206), modified to suit the study sample; patients/ carers rated the degree to which they were affected by each barrier on a 5-point Likert scale (strongly disagree to strongly agree). The IMS's reliability was evaluated by its authors and showed high internal consistency (Cronbach's alpha =0.87. The authors of the IMS suggest a subclass of five factors solution accounting for 52.4% of variance: disease/ regimen, cognitive difficulties, lack of social support/ self-efficacy, denial/ distrust, and peer influences. In Part Three, a questionnaire was developed by the primary investigator to estimate barriers to ICS adherence in particular, in order to identify Saudi patients' non-adherence barriers; this was because although ICS is the cornerstone in asthma treatment, worldwide non-adherence to ICS use has been indicated. Patients may be confused between the steroid (the main control medication) and control expression, due to lack of knowledge and their understanding of relevant terminology.

Part Three contained 18 items related to knowledge, perception, social status, economic status, and education: those aspects relating to patients and family, medication and health care providers:

- Patients' knowledge of their disease and the function of their medication.
- Fear of medication, and their perception of its worth.
- Cost of medication and health services.
- Patient sources of information.
- Patient–physician relationship and communication.
- Social support

ICS's reliability was estimated and showed high internal consistency (Cronbach's alpha = 0.87). The patient questionnaire was translated and administered in the Arabic language, the main language of the Saudis, and the responses translated back into English by native Arabian speakers who were fluent in the English language.

### **3.3.3 Validity test**

In order to test the reliability and validity of the questionnaire:

- Face validity was conducted by proof reading by 15 experienced physicians in PHCCs.
- A pilot study was conducted with 60 students from departments of the Riyadh Health College.

The pilot study investigated to what extent the items and instructions for the measurements were clear to the participants, to determine what or where practical problems occurred, and to develop the measurements to be used in the main study; in these ways it was used to investigate the validity and reliability of the measurements.

#### **3.3.3.1 Participants and procedure**

The pilot sample consisted of 60 college students recruited from various disciplines within the College of Health Sciences at Riyadh, all aged between 18 and 25 years. The researcher informed them about the aim of the study and read them the instructions for the scales. Each one who agreed to take part signed a consent form; then the researcher handed them the questionnaire booklets in person.

### 3.3.3.2 Statistical analyses

To assess whether the same psychometric properties and analyses of each test were evident when administered to Arabic participants, the researcher used Cronbach's alpha to assess internal consistency. The results for the reliability of scales in the pilot study were: Cronbach's alpha for IMS scale = 0.79 and for ICS scale = 0.87.

### 3.3.4 Setting

A self-administered questionnaire was distributed by the primary researcher to outpatients (or their carers in the event that patients could not answer for themselves) in PHCCs in KSA, during the period between April and September, 2008. Patient (or carer) written consent was obtained prior to the administration of the questionnaire.

### 3.3.5 Participants

To determine the proportion of subjects who experienced different barriers to ICS use, a sample size of 92 respondents was required to achieve a 95% confidence interval equal to the proportion +/- 10%. Assuming that only 40% of respondents would complete and return their questionnaire, a sample size of 230 respondents was issued with the questionnaire. The respondents were either patients with chronic asthma aged between 5–18 years or their carers. Anonymous responses were solicited to encourage truthful answers. No compensation was offered. The exclusion criteria included patients who had not been diagnosed by a physician as asthmatic, those who were under 5 or over 18 years old, and those who failed to answer five questions or more.

### 3.3.6 Expected outcomes

It was expected that this phase of the study would provide information on

- Barriers affecting Saudi asthma patient's management adherences.
- Levels of patients' knowledge, behaviour and self-efficacy related to asthma medication, such as drug function, goals of drug treatment, side effects, and how to use the medications.
- Barriers affecting Saudi asthma patients' adherence to ICS use
- Patients' sources of information (and their quality and reliability), and the quality of the patient–physician relationship.

### **3.3.6 Data analysis**

Data were entered into SPSS version 17. Data were randomly checked to ensure accuracy, and double-checked to avoid entering mistakes. Appropriate statistical tests were used, including descriptive statistics, mean, standard, deviation, independent sample t-test and one-way ANOVA, to find an association between the variables with regard to age and gender. Factor analysis for IMS and ICS was also performed. Results were deemed to be significant at the 0.05 level.

### **3.3.7 Ethical considerations**

Prior to the commencement of the study, approval was obtained from the Human Research Ethics Committee of Curtin University of Technology. Ethical approval was also sought from the Ministry of Health in Riyadh, Saudi Arabia. All information collected by questionnaires remains confidential and no identifying information will be used in this thesis or any subsequent publication. The information was available only to the researcher and his supervisor. All data were coded by number and stored on a password-protected computer hard disk. After completion of the study all materials will be stored in a secure archive in the school of pharmacy for a minimum of five years.

## **3.4 Phase 4: Impact of an Education Program and Provision of Asthma Action Plans on the Knowledge and Health Outcomes of Asthmatic Patients**

### **3.4.1 Objectives**

The aims of Phase 4 of the study were to assess the impact of an education program and the provision of an asthma action plan (AAP) on asthma management outcomes among Saudi asthma patients and their carers, through self-management components including adherence to long-term treatment, use of asthma action plans and PFMs, and patients' knowledge and behaviour.

### **3.4.2 Procedure**

Participants were divided into two groups. One group was provided with education alone and the other with education plus an AAP based on symptoms, and/ or a PFM, to see if it improved management outcomes. The research comprised three steps: (1) a self-administered questionnaire to participants, (2) an education program (of two

sessions), and (3) a three-month follow-up period, with the re-administration of the baseline questionnaire at the end of the three months.

#### 3.4.2.1 Step 1: administration

A self-administered questionnaire was issued, similar in purpose, design and content to the questionnaire used in Phase 1 (Asthma Therapy Assessment Questionnaire ATAQ), and reflecting five asthma management domains: patients' control, knowledge, behaviour/ attitude, self-efficacy, and communication with health provider. Additional elements regarding quality of life were included:

- a. Disease severity and history.
- b. Patient's/ relative's knowledge and beliefs concerning disease, medication and illness management.
- c. Medication adherence or compliance.
- d. Asthma action plan (AAP).
- e. Peak flow meter (PFM).
- f. Perception of inhaler technique.
- g. Quality of life, such as limitations on physical activity, school absences, psychological and emotional stressors.
- h. Health care utilization (emergency room attendances and hospital visits).

The patient questionnaire was created in English, but translated and administered in the Arabic language, the main language of the Saudis. The responses were translated back into English by native Arabian speakers who are fluent in the English language. All patients/ carers provided written consent before participation in the study.

#### 3.4.2.2 Step 2: education program

Individual educational interventions (face to face consultation) was coupled with the provision of both electronic and written information in the form of a booklet compiled from the National Asthma Management Guidelines and other sources.

#### 3.4.2.3 Step 3: follow-up

After three months, the participants were requested to fill out the self-administered questionnaire again.

### **3.4.3 Intervention programs**

#### 3.4.3.1 Intervention content

The first session focused on the following:

- Disease pathophysiology: asthma was defined to patients, together with respiratory system structure and function, and the difference between episodic and non-episodic airway, symptoms, triggers and classifications of asthma were clarified.
- Treatment regime: treatment aims and trigger avoidance were defined with each patient, with advice on how to avoid triggers.
- Medication: this section covered asthma medication and devices, the function and goal of medication, when and how long to use it, medication concerns, types of inhalers, how to use them and how to avoid side effects, as well as lung function monitoring, PFM types, and diary use, with explanation of the importance of an asthma action plan.
- Patient and family role in asthma management: adherence to asthma management pros and cons, improving disease control and quality of life, were addressed, in addition to the effect of misconceptions, how to identify appropriate information resources, problems arising from lack of social support, and communication with the health care provider.

The second session focused on barriers that could affect the individual patient's asthma management, such as concerns about medication side effects, the cost of medication, the inconvenience associated with using medication, and lack of understanding about how and why asthma needs to be managed, as identified in Step 1, together with any queries raised by the patient and/ or their carers during the session. The second session was planned to take place at least three weeks from the first; it was delivered by the investigator.

#### 3.4.3.2 Tools

1. Models and pictures of two airways before and after an asthma episode.
2. Samples and models of medication and device (inhaler type and PFM).
3. Visual medication and device list.

### 3.4.3.3 Education procedure

Patients and/ or family were encouraged to ask about, discuss, or identify personal problems relating to them and their disease as a method of sharing decision-making about their situation.

1. Evaluation of patients'/ family's knowledge and behaviour regarding asthma and its medication. Patients were asked to use the samples provided to differentiate between normal airways and airways during an asthma episode, and to discuss the effect of triggers. They also were asked to identify triggers which stimulated their asthma, using the pictures provided, and encouraged to avoid them.
2. Patients were asked to identify their medication from the demonstrated samples and discuss its functionality, whether a reliever or controller, and to reveal their beliefs regarding side effects, and why, when, and how they should use medication.
3. Inhaler technique steps were explained using placebo samples and pictures, and patients were asked to repeat the steps and demonstrate the use of the inhaler using their own medication. The same method was used to explain PFM and diary use.
4. The advantages of an asthma action plan were described, and attendees were instructed in how to use it.

Patients/ family were asked after each section to indicate any point which was unclear or causing confusion.

At the end each patient was presented with a bag containing two CDs, one including information about asthma (pathology, symptoms, medications types, inhalers, triggers), the other containing a video explanation in Arabic on how to use an inhaler produced by the Saudi Pharmaceutical Association, PFM, brochures from the Saudi Thoracic Society (STS), a booklet, pen, and note book. The booklet contained, in addition to the actual CDs, a written manuscript of the CDs for patients/ carers who did not have PCs, as follows:

- a. Disease pathophysiology: definition, symptoms, structure and function of the lungs, classification of asthma, trigger avoidance.

- b. Treatment regimens: role and goal of medication (reliever and preventer or controller), side effects, compliance with and adherence with treatment regime, technique advice (inhaler and PFM).
- c. Management skills: the Asthma Action Plan, managing asthma attacks.
- d. Barriers to effective asthma management: such as a lack of knowledge and of information sources. The importance of asking, discussing, and sharing concerns with professionals.
- e. Diary: to report daily symptoms, school absences, PFM, hospital or ED visits.

#### **3.4.4 Face validity**

Face validity was conducted by proofreading by 15 physicians experienced in PHCC.

#### **3.4.5 Setting**

A self-administered questionnaire was distributed by the researcher to outpatients (or their carers in the event that patients could not answer for themselves) in primary and secondary outpatient clinics in KSA, between April and November, 2008. Patient (or carer) written consent was obtained by the researcher prior to the administration of the questionnaire.

#### **3.4.6 Participants**

To assess the effects of the asthma education program and asthma action plan, an intervention and a control group were used; 93 subjects in each group were required, to enable the detection of a difference of 20% at the 95% level of confidence and 5% level of significance. Assuming a dropout rate of 30%, 133 subjects were recruited in each group. The total sample for this Phase Four study was 266.

An entirely different sample of asthma patients aged 6–18 who had been prescribed with steroids or had started using steroids, or their carers, were recruited for this phase of the study.

### **3.4.7 Expected outcomes**

The following were the expected outcomes:

- That patient/ family knowledge about the disease, medication, illness treatment and triggers would be improved.
- That there would be changes in patients' behaviour and an increase in compliance with the following asthma treatment elements:
  - medication
  - use of AAPs
  - use of PFM and spacer
  - correct inhaler technique.
- That there would be an increase in the percentage of patients using ICS as controller. Phase One of the study demonstrated only 22(19.5%) of patients in Asser and 58(49.6%) in Riyadh used ICS.
- That asthma control would be enhanced (for example with symptom-free days, or no waking up at night).
- That there would be improved quality of life in areas such as daily physical activity, emotional and social improvement, and fewer school absences.
- That there would be reduced health care utilization, such as hospital visits and emergency room attendances.

### **3.4.8 Data analysis**

Data were entered into SPSS version 17. Data were randomly checked to ensure accuracy, and double-checked to avoid entering errors. Appropriate statistical tests were used, including descriptive statistics, Chi-square test, independent sample t-test and one-way ANOVA, to describe the results and to find any associations between the variables and patient demographics such as age and gender. In addition, these were used to compare responses before and after program implementation, within each group and between groups. Results were deemed to be significant at the 0.05 level.

### **3.4.9 Ethical issues**

Prior to the commencement of the study, approval was obtained from the Human Research Ethics Committee of Curtin University of Technology. Ethical approval was also sought from the Ministry of Health in Riyadh, Saudi Arabia.

## Chapter 4

### Phase One Results and Discussion

#### 4.1 Patient Survey Response

Survey response data in Table 4.1 show that two hundred questionnaires were administered in each region (Asser and Riyadh) with 152 (77.5%) and 162 (81%) returned respectively. Of these, 87 (21.8%) were excluded because of the respondent's age (under 5 or over 18 years) or were incomplete. There were 230 participants: 129 males and 101 females. The largest group of respondents was the under-10 year's segment (43.9%).

Table 4.1 Survey response data

Regions		Asser	Riyadh	Total
		N (%)	N (%)	N (%)
Questionnaires administered		200	200	400
Responses		151(75.5)	162(81.0)	313(78.3)
Usable responses	Male	58(51.3)	71(60.7)	129(56.1)
	Female	55(48.7)	46(39.3)	101(43.9)
	Total	113 (56.5)	117 (58.5)	230 (57.5)
Age of respondents	5 - < 10 yrs.	39(34.5)	62(53.0)	101(43.9)
	10 - <15 yrs.	36(31.9)	35(29.9)	71(30.9)
	15 - <18 yrs.	38(33.6)	20(17.1)	58(25.2)

#### 4.2 Severity of Disease

##### 4.2.1 Self-reported severity

Respondents were asked to classify their or their child's asthma severity across a range from very mild to very severe dependent on the patient's perception.

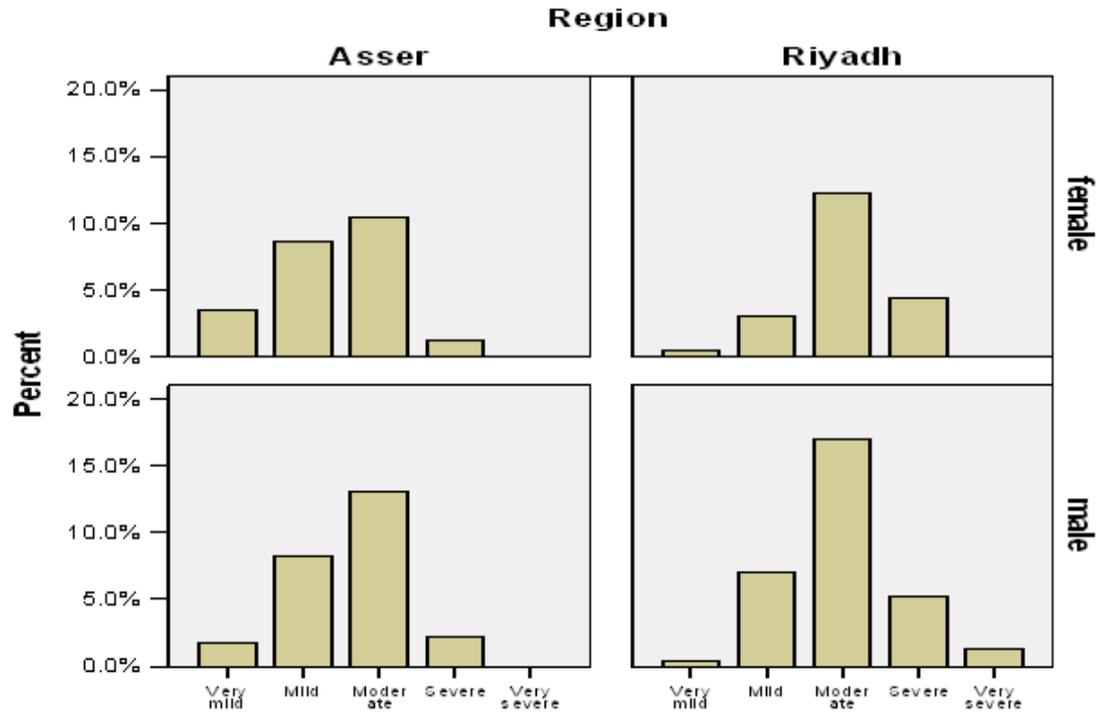
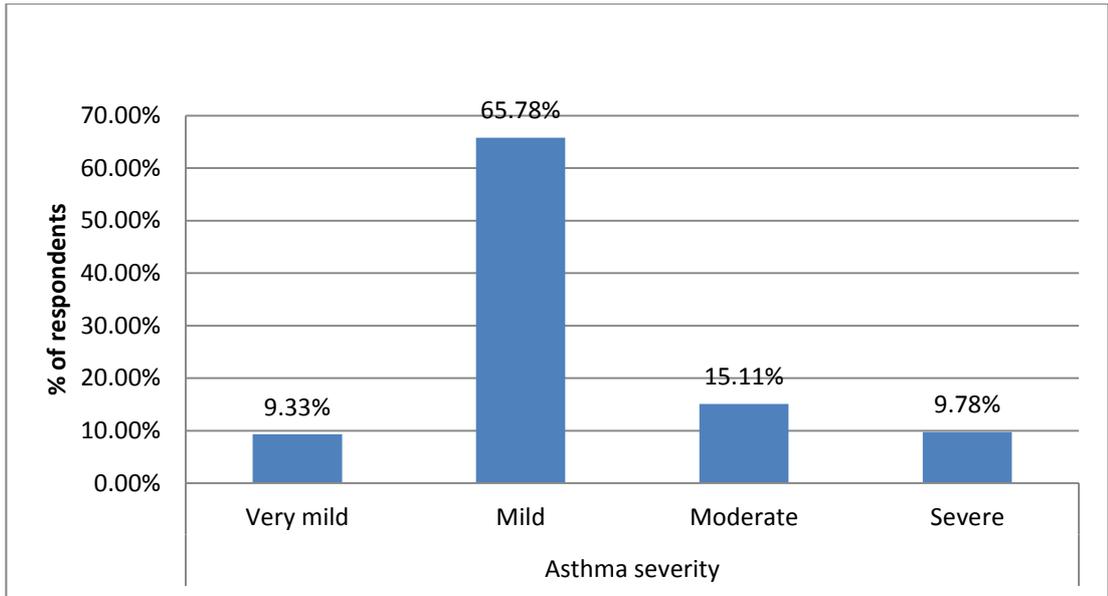


Figure 4.1 Patient self-assessment severity

Figure 4.1 illustrates that the majority of respondents from both regions, Asser and Riyadh, classified their asthma as moderately severe or less: 121 (52.6%) and 76 (33.1%) respectively reported their asthma as moderate, mild, or very mild. A significant difference was found between both regions. Riyadh patients were more likely to classify their asthma as severe than were Asser patients ( $p=0.000$ ). While 22 (18.8%) Riyadh patients classified their asthma as severe, 8 (7.1%) Asser patients did so; 2 (1.7%) and 12 (10.6%) respectively reported their asthma as very mild. There was no significant difference across gender (see Appendix E).

#### 4.2.2 Self-reported asthma severity according to patient answers to symptoms question (at least one symptom)

Based on patients' or their carers' responses to a series of five questions, their asthma severity score was calculated. Scores ranged from 3 to 18, with a score of 3 representing very mild, 8 mild, 13 moderate, and 18 severe asthma.



**Figure 4.2 Self-reported asthma severity classification according to patients' answers to symptoms question**

Figure 4.2 shows approximately two thirds (65.8%) of respondents from both regions, Asser and Riyadh, had asthma classified as mild, while 15.1% and 9.8% of respondents were classified as having moderate or severe asthma. There was no significant difference across regions or gender, although Riyadh patients were more likely to have severe asthma severity than Asser patients.

### 4.2.3 Patients' seasonal asthma symptoms

**Table 4.2 Patients' seasonal asthma symptoms**

Season	Region	Asthma symptoms			p value
		None	A little	A lot	
		N (%)	N (%)	N (%)	
Winter	Asser (112)*	10(8.9)	45(40.2)	57(50.9)	NS
	Riyadh(117)	4(3.4)	39(33.3)	74(63.2)	
	Total (229)	14(6.1)	84(36.7)	131(57.2)	
Summer	Asser (112)	25(22.3)	52(46.4)	35(31.3)	NS
	Riyadh(117)	32(27.4)	63(53.8)	22(18.8)	
	Total (229)	57(24.9)	115(50.2)	57(24.9)	
Spring	Asser (112)	10(8.9)	78(69.6)	24(21.4)	0.001
	Riyadh(117)	21(17.9)	52(44.4)	44(37.6)	
	Total (229)	31(13.5)	130(56.8)	68(29.7)	
Fall	Asser (112)	29(25.9)	59(52.7)	24(21.4)	NS
	Riyadh(117)	24(20.5)	60(51.3)	33(28.2)	
	Total(229)	53(23.1)	119(52.0)	57(24.9)	

\*One set of data missing

Respondents were asked if their asthma symptoms differed across seasons. As can be seen from Table 4.2, there was significant difference between patients in Riyadh and Asser during spring ( $p=0.001$ ). Both regions reported similar increases in symptoms during winter, and reduced symptoms in both summer and fall. The results were not influenced by gender (see Appendix E).

### 4.2.4 Asthma medication management (clinical category)

(See Appendix A: scoring instructions)

Respondents were asked about their asthma management, in particular their use of reliever and controller medication, using two questions, 'Does your child use an inhaler or nebulizer for quick relief from asthma symptoms?' and 'Has your child ever had a prescription for asthma medicine that is NOT used for quick relief, but is used to control your child's asthma?'. Responses can be seen in Table 4.3. They

were also asked about their level of use of controller medication if they had one, as can be seen in Table 4.4.

**Table 4.3 Clinical classification of patients based on reliever and controller medication use**

Questions	Answer option	Clinical category	Regions		Total N (%)
			Asser N (%)	Riyadh N (%)	
Use of an inhaler or nebulizer for quick relief from asthma symptoms.	No <b>AND</b> No	No asthma medication	15(13.3)	6(5.1)	21(9.1)
	Yes <b>AND</b> No	Use of quick reliever only	14(12.4)	29(24.8)	43(18.9)
Use of a control medication.	Yes <b>AND</b> Yes	Use of a quick reliever and has a controller	65(57.5)	66(56.4)	131(57.0)

**Table 4.4 Patients' adherence to controller medication**

Questions	Answer options	Clinical category	Regions		Total N (%)
			Asser N (%)	Riyadh N (%)	
Use of a control medication.	Yes <b>AND</b> Irregular use	Controller use is intermittent (not daily)	64(56.6)	56(47.9)	120(52.2)
Usage regularity	Yes <b>AND</b> Never took it	Controller prescribed but never taken	2(1.8)	0.00	2(1.8)
	Yes <b>AND</b> Take it every day	Controller used daily	18(15.9)	26(22.2)	44(19.1)

The data in Table 4.3 shows of the 21 (9.1%) of patients with no asthma medications, 15 were from Asser and 6 from Riyadh (13.3% vs. 5.1%). The proportion of Riyadh patients who only used quick reliever medications was double that of Asser (24.8% vs. 12.4%). With regard to use of a quick reliever and having a controller, both regions reported nearly the same percentage (57% approximately). From the data

summarized in Table 4.4 it can be seen that both regions showed low daily controller usage: Riyadh at 22.2% and Asser at 15.9%,  $p= 0.16$ .

### 4.3 Use of Inhaled Corticosteroids (Clinical Category)

In this instance rather than being asked if they used a controller, patients were asked if they used an inhaled steroid (with exceptions which were given); this was done to avoid confusion about the term ‘controller’ (as can be seen in Tables 4.5 and 4.6).

**Table 4.5 Clinical classification of patients based on reliever and inhaled corticosteroid (ICS) medication usage.**

Questions	Answer option	Clinical category	Regions		Total N (%)
			Asser N (%)	Riyadh N (%)	
Use of an inhaler or nebulizer for quick relief from asthma symptoms.	No <b>AND</b> No	No asthma medication	34(30.1)	15(12.8)	49(21.3)
Use of an inhaler steroids ICS.	Yes <b>AND</b> No	Use of quick reliever only	57(50.4)	44(37.6)	101(43.9)
	Yes <b>AND</b> Yes	Use of a quick reliever and has a ICs	22(19.5)	51(43.6)	73(31.7)

**Table 4.6 Patients’ adherence to use of ICS medication.**

Questions	Answer option	Clinical category	Regions		Total
			Asser N (%)	Riyadh N (%)	
Use of an inhaler steroids ICS.	Yes <b>AND</b> Irregular use	Controller use is intermittent (not daily)	13(11.5)	43(36.8)	56(24.3)
Inhaled steroid regularly	Yes <b>AND</b> Daily use	Controller used daily	9(8.0)	15(12.8)	24(10.4)

Table 4.5 categorizes patients based on their answers to the questions ‘Does your child use an inhaler or nebulizer for quick relief for asthma symptoms?’ and ‘Does your child use inhaled steroids for his/ her asthma?’ A total of 49 (21.3%) respondents had no asthma medication. Of these, 34 (30.1%) were from Asser and 15 (12.8%) from Riyadh. Most patients (101: 43.9%) in both regions were using a quick reliever only. Asser patients (50.4%) were more likely to use relievers only than Riyadh patients (37.6%); however, more than twice as many Riyadh patients (43.6%, than Asser’s 19.5%) fell into the ‘Use of a quick reliever and has a controller’ category. From the data represented in Table 4.6 it can be seen that both regions’ patients (10.4%) showed low daily ICS usage, with Riyadh patients slightly ahead of Asser patients (12.8% vs. 8.0%,  $p= 0.28$ ).

## 4.4 Disease Management

### 4.4.1 Medication used in the past 12 months

Respondents were asked if they had used asthma medication in the past 12 months.

**Table 4.7 Number of patients using medication over the past 12 months.**

Region	Use an asthma medication over the past year			p value
	Yes	No	Total	
	N (%)	N (%)	N (%)	
Asser N=113	109(96.5)	4(3.5)	113(100.0)	NS
Riyadh N=117	112(95.7)	5(4.3)	117(100.0)	
Total N=230	221(96.1)	9(3.9)	230(100.0)	

The data in Table 4.7 illustrate that the majority of patients (>95%) had used asthma-related medications in the previous 12 months. Chi Square analysis shows no statistically significant differences in responses between genders or regions (see Appendix E).

#### 4.4.2 Quick relief medication

Respondents were asked if they had used medication to relieve their symptoms.

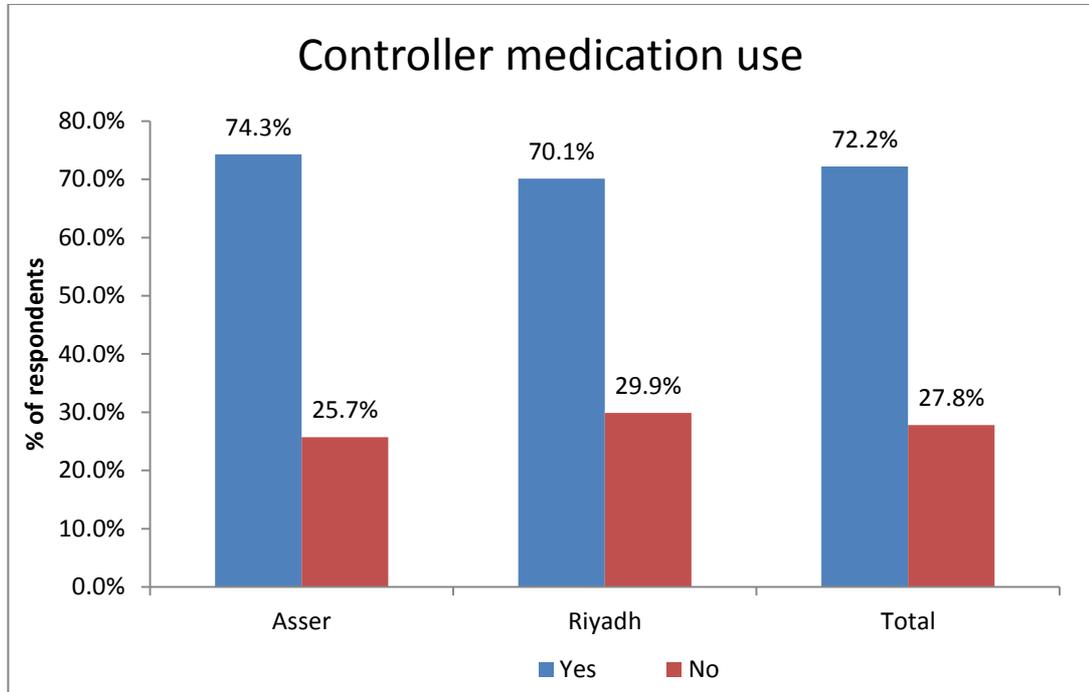
**Table 4.8 Number of patients using an inhaler or nebulizer for quick relief from asthma symptoms.**

Region	Use of an inhaler or nebulizer for <i>quick relief</i> from asthma symptoms			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser N=113	79(69.9)	31(27.4)	3(2.7)	113(100.0)
Riyadh N=117	95(81.2)	21(17.9)	1(0.9)	117(100.0)
Total N=230	174(75.70)	52(22.6)	4(1.7)	230(100.0)
Difference between Gender p value	NS			
Difference between Region p value	NS			

The data presented in Table 4.8 illustrate the use of an inhaler or nebulizer for quick relief from asthma symptoms among the study cohort. In both regions, more than two thirds (Asser 69.9%, Riyadh 81.2%) of patients were using an inhaler or nebulizer. While the patients in Riyadh were more likely to be doing this than those in Asser, the difference was not statically significant. Gender did not influence the use of quick relievers (see Appendix E).

#### 4.4.3 Control medication

Respondents were asked if they had used any control medication such as corticosteroids.



**Figure 4.3 Number of patients using control medication**

The data presented in Figure 4.3 illustrate the use of control medication. The majority of respondents (72.2%) reported they used a control medication. Response rates were not influenced by gender or region (see Appendix E).

#### 4.4.4 Classes of asthma medications used

Patients and their carers were asked to list their asthma medications. These were categorized by the investigator as shown in Table 4.9.

**Table 4.9 Classes of medication used**

Type of medication	Asser N=113 N (%)	Riyadh N=117 N (%)	Total N=230 N (%)	p value
Adrenoceptor agonist (select $\beta_2$ Agonist)	107(94.7)	110(94.0)	217(94.3)	NS
Anticholinergic	1(0.9)	4(3.40)	5(2.2)	NS
Corticosteroid	21(18.6)	47(40.2)	68(29.6)	0.000
Theophylline	6(5.3)	0(0.0)	6(2.6)	0.013
Antihistamine	3(2.7)	8(6.8)	11(4.8)	NS
Sodium cromoglycate	1(0.9)	4(3.4)	5(2.2)	NS
Antibiotics	1(0.9)	0(0.0)	1(0.4)	NS
Anti-leukotriene receptor	2(1.8)	4(3.4)	6(2.6)	NS

Table 9 indicates that in both regions at least 94% (Asser 94.7%, Riyadh 94.0%) of patients were using a  $\beta_2$  agonist. There were significant differences in the proportion of patients receiving corticosteroids and theophylline in each region: Riyadh patients were 2.2 times ( $p=0.000$ ) more likely to use corticosteroids than those in Asser. In Asser, 21 of 113 (18.6%) patients were receiving a corticosteroid, compared to 47 of 117 (40.2%) in Riyadh. In the case of theophylline, six patients in Asser received the drug (5.3%) and none in Riyadh ( $P=0.013$ ). There were no significant differences in the use of other asthma-related medications, including Anticholinergic, antihistamines, sodium cromoglycate and leukotriene receptor antagonists. There was also no difference in the use of asthma-related medications based on gender (See Appendix E).

#### 4.4.5 Treatment schedules (confirmed use by investigator)

Respondents were asked to list their asthma medications; the list was grouped and classified by the researcher and appears in in Table 4.10.

**Table 4.10 Medication usage**

Medication usage	Asser N=113	Riyadh N=117	Total N=230	P value
	N (%)	N (%)	N (%)	
$\beta_2$ agonist only	80(70.8)	60(51.3)	140(60.9)	0.003
$\beta_2$ agonist + Corticosteroid	14(12.4)	34(29.1)	48(20.9)	0.002
$\beta_2$ agonist +Corticosteroid + others	1(0.9)	8(6.8)	9(3.9)	0.036
$\beta_2$ agonist + other (Non-Corticosteroid)	12(10.6)	10(8.5)	22(9.6)	NS
Corticosteroid only	4(3.5)	5(4.3)	9(3.9)	NS
Corticosteroid + other (Non $\beta_2$ agonist)	2(1.8)	0(0.0)	2(0.9)	NS

The data in Table 4.10 indicate that less than two thirds (60.6%) of respondents used  $\beta_2$  agonist alone. There were significant differences in use of  $\beta_2$  agonists in both regions, with Asser at 70.8% compared with Riyadh at 51.3% ( $p=0.003$ ). In addition, there were significant differences between both regions in corticosteroid and  $\beta_2$  agonist use with or without other medications. Thirty-four (29.1%) Riyadh patients were receiving a corticosteroid and  $\beta_2$  agonist compared with 14 (12.4%) Asser patients,  $p=0.002$ . However, there were no significant differences between regions in the prescribing of corticosteroid, whether alone or combined with other medications (non  $\beta_2$  agonist). Further, a significant difference was seen in the combined use of  $\beta_2$  agonists and corticosteroids with or without other drugs. Riyadh patients were more likely to use a  $\beta_2$  agonist combined with a corticosteroid than Asser patients ( $p=0.036$ ). There was no significant different in the treatment schedule across genders (See Appendix E).

## 4.5 Inhaled Corticosteroid (ICS)

### 4.5.1 Self-report

Patients were asked whether or not they used an inhaled corticosteroid (ICS).

**Table 4.11 Inhaled corticosteroid (ICS)**

Regions	Inhaled steroid			
	Yes	No	I don't know	Total
	N (%)	N (%)	N (%)	N (%)
Asser N=113	22(19.5)	80(70.8)	11(9.7)	113(100.0)
Riyadh N=117	58(49.6)	41(35.0)	18(15.4)	117(100.0)
Total N=230	80(34.8)	121(52.6)	29(12.6)	230(100.0)
Difference between gender p value	NS			
Difference between region p value	0.0001			

The data presented in Table 4.11 illustrate low-level use of ICS in the two study cohorts. In both regions, fewer than 35% of the respondents reported using ICS, with use in Asser statistically significantly less than in Riyadh (19.5% vs. 49.6%;  $P=0.0001$ ). The response was not influenced by gender (see Appendix E). While the KSA Guidelines recommend the use of ICS in patients with mild persistent asthma and above, only 32.4%, 52.9% and 50.05 of patients with mild, moderate and severe asthma respectively were using an ICS.

### 4.5.2 Patients' adherence to ICS daily use

Respondents were asked about their level of adherence to ICS daily use.

**Table 4.12 Patients' adherence to ICS daily usage**

Frequency of inhaled steroid use	s	Riyadh N=58	Total N=80	p value
	N (%)	N (%)	N (%)	NS
Inhaled steroids every day	9(40.9)	15(25.9)	24(30.0)	
Inhaled steroids less often.	5(22.7)	10(17.2)	15(18.8)	
Inhaled steroids several times a week.	1(4.5)	5(8.6)	6(7.5)	
Inhaled steroids when having asthma symptoms.	7(31.8)	28(48.3)	35(43.8)	

Patients in both cohorts reported a low level of regular ICS use, as shown in Table 4.12. Only 30.0% of patients from both regions used their ICS on a regular basis (i.e. daily) while more than two-thirds (70.0%) used it intermittently. There were no significant differences in the use of ICS by region or gender, but there was a difference in the level of corticosteroid used when self-reported (according to the question 'Do you/ Does your child use inhaled steroids for his/ her asthma?') and according to the response to the question analysing drug use ('confirmed use by investigator'). This will be considered in detail later in the discussion section.

### 4.5.3 Adverse effects

Patients and their carers were asked if they had suffered from adverse effects such as weight gain, change of mood, diabetes, or slowed growth rate since they commenced their asthma treatment.

**Table 4.13 Self-reported side effects**

Adverse side effect	Response option	Asser N=112	Riyadh N=116	Total N= 228	p value
		N (%)	N (%)	N (%)	
A. Weight gain	Yes	15(13.4)	24(20.7)	39(17.1)	NS
	No	97(86.6)	92(79.30)	189(82.9)	
B. Change of mood	Yes	83(36.4)	47(40.9)	36(31.9)	NS
	No	145(63.6)	68(59.1)	77(68.1)	
C. Diabetes	Yes	1(0.9)	2(0.9)	1(0.9)	NS
	No	110(99.1)	224(99.1)	114(99.1)	
D. Slowed growth rate	Yes	46(20.2)	25(21.6)	21(18.8)	NS
	No	182(79.8)	91(78.4)	91(81.3)	

Table 4.13 summarizes the adverse effects reported. There were no significant differences between regions. Approximately 13% and 21% of the respondents in Asser and Riyadh respectively reported weight gain, while 31.9% in Asser and 40.9% in Riyadh stated their mood had change since commencing corticosteroid treatment. One patient in each region reported having diabetes. Twenty percent of patients in both regions indicated a slowed growth rate (See Appendix E).

#### 4.5.4 Hospital or emergency room visits

Respondents were asked if they had been admitted to hospital or attended the ER at the hospital during the last three months, and if so, how many times.

**Table 4.14 Number of patients admitted to hospital or attending ER.**

Region	Number of times admitted to hospital or attended the Emergency Room at the hospital in the last 3 months					p value
	1 To 2 times N (%)	3 To 4 times N (%)	5 To 6 times N (%)	over 6 N (%)	Total N (%)	
Asser	19(55.9)	11(32.4)	3(8.8)	1(2.9)	34(100.0)	NS
Riyadh	32(71.1)	7(15.6)	5(11.1)	1(2.2)	45(100.0)	
Total	51(64.6)	18(22.8)	8(10.1)	2(2.5)%	79(100.0)	

Table 4.14 presents the frequency of hospital admissions and ER attendances in the three months prior to the survey. Only 34.3% of patients were admitted to hospital or attended the ER. Riyadh patients (45: 38.5%) were more likely to be admitted to hospital or visit ER than Asser patients (34: 30.1%), but this difference is not statistically significant. Gender did not influence attendance rates (see Appendix E).

#### 4.5.5 Relationship between dependent variable (using inhaled steroids) and other independent variables (logistic regression)

**Table 4.15 Relationship between inhaled corticosteroid use and other variables**

Variable	Comparison	Odds Ratio	95% mCI	p value
Dissatisfied with current asthma treatment component.	No / unsure vs. Yes	2.29	0.93-5.63	0.072
Use of an inhaler or nebulizer as a reliever	Yes vs. No / unsure	5.06	2.17-11.81	0.000
Average number of inhaler/nebulizer daily use.	Over 6 vs. 0 to 2	6.30	1.33-29.95	0.021
Number of inhaler/nebulizer daily use over the past 12 months.	Over 6 vs. 0 to 2	11.79	2.04-68.06	0.006
Chest tightness (difficulty taking a deep breath).	Daily vs. Never	8.25	1.89-36.05	0.005
Wheezy or whistling sound in the chest.	Daily vs. Never	9.00	2.71-29.89	0.000
Wheezing or difficulty breathing when exercising.	4-7 vs. None	5.27	1.97-14.08	0.001
Wheezing during the day when not exercising.	4-7 vs. None	7.04	2.15-23.04	0.001
Waking up at night.	1-3 vs. None	2.33	1.28-4.25	0.006
Missing days of school.	1-3 vs. None	4.53	2.43-8.45	0.000
Missing any daily activities.	1-3 vs. None	2.76	1.54-4.98	0.001
Average of asthma attacks.	Once or twice a week vs. Not at all	7.03	2.81-17.57	0.000
	Three or more times a week vs. Not at all.	6.11	1.75-21.27	0.004
Asthma severity (self-reported)	Moderate vs. Very mild	10.69	2.15-53.21	0.004
	Severe vs. Very mild	9.50	1.77-50.96	0.009
Home peak flow meter accessibility	Has and used regularly vs. Does not have PFM	5.50	1.99-15.24	0.001
Spacer accessibility	Yes vs. No	2.19	1.25-3.85	0.006

Variable	Comparison	Odds Ratio	95% mCI	p value
Inhaler use demonstration	Yes vs. No	1.85	1.01-3.38	0.047
Inhaler use observation by professional	Yes vs. No	2.25	1.22-4.13	0.010
Medication adjustment	Yes, and completely understood vs. No, not at all vs. No, not at all	3.36	1.30-8.70	0.012
	Yes, and completely understood vs. Yes, and he/she (I) pretty well understood.	2.11	1.02-4.33	0.043

Table 4.15 illustrates the relationships between patients' use of an inhaled corticosteroid and other independent variables. Satisfaction with current asthma treatment was more likely to be reported amongst ICS users, and use of ICS was reported more commonly (5.06 times) amongst patients using relievers (95% CI, 2.17-11.806; p=0.000). Inhaled corticosteroid use was also more common (6.30 times) amongst patients with high inhaler/ nebulizer use (> 6 times daily) than among these with low use (0-1 times daily; p=0.02). ICS use was also 11.79 times more likely amongst these who had used quick relief inhalers six or more times daily in the past 12 months (95% CI, 2.04-68.06; p=0.006).

Patients with a high frequency of asthma symptoms reported more use of ICS than patients with a low frequency: for example, patients with daily symptoms over the past four weeks including chest tightness (difficulty taking a deep breath) and wheezy or whistling sounds in the chest were 8.25 and 9 times more likely to have used ICS than patients with no symptoms (95% CI, 1.89-36.01; p=0.005) and (95% CI, 2.71-29.89; p=0.000 respectively). Patients who experienced wheezing or difficulty breathing when exercising or without exercising, within the frequency range of four to seven, were more likely to use ICS than patients with no symptoms (OR 5.3; 95% CI, 1.97-14.08; p=0.001) and (OR 7.04; 95% CI, 2.15-23.04; p=0.001 respectively). Patients who woke up once to three times at night with wheezing or difficult breathing, and who missed days of school and daily activities as a result of

asthma, were more likely to use ICS more than other patients (OR 2.3; 95% CI, 1.28-4.25; p=0.006), (OR 4.5; 95% CI, 2.43-8.45; p=0.000), and (OR 2.8; 95% CI, 1.54-4.98; p=0.001). In addition, use of ICS amongst patients with severe asthma was higher than amongst those with less severe asthma. Patients with moderate and severe asthma were more likely to use ICS than were very mild asthma patients (OR 10.7; 95% CI, 2.15-53.21; p=0.004 and OR 9.5; 95%CI, 1.77-50.96; p=0.009 respectively), while patients who had suffered once or twice, or three or four times a week from asthma attacks over the past four weeks were more likely to use ICS than patients who did not have asthma attacks at all (OR 7.03; 95%CI, 2.81-17.57; p=0.000) and (OR 6.11; 95%CI, 1.75-21.27; p=0.004).

Possession of a peak flow meter at home was implicated in patients' use of ICS, which was reported 5.5 times more often amongst patients having peak flow meter and using it regularly (p=0.001). Further, patients who used a spacer with an inhaler were 2.2 times more likely to use ICS than patients who did not (p=0.006).

Patients who were educated and followed up were more likely to use ICS. Patients shown how to use an inhaler properly by their health providers and observed doing so were more likely to use ICS than patients who were not (OR 1.85; 95% CI, 1.01-3.38; p=0.047 and OR 2.24; 95% CI, 1.22-4.13; p=0.010 respectively). In addition, patients who were taught how to adjust their medication when their asthma grew worse, and completely understood the instructions, were 3.4 times more likely to use ICS than non-educated patients (95%CI, 1.30-8.70; p=0.012), and 2.11 times more likely to use ICS than patients who were understood 'pretty well' (95% CI, 1.02-4.33; p=0.043). However, the regression multivariate analysis only demonstrated the following to be significant: Have wheezing during the day when not exercising (OR 1.9; CI, 1.14-3.15; p=0.014), number of inhaler/ nebulizer daily uses over the 12 months (OR 2.02; CI, 1.2-3.41; p=0.008), asthma severity self- reported (OR 2.2; CI, 1.78-3.67; p=0.004), home peak flow meter accessibility (OR 3.1; CI, 1.45-6.64; p=0.004) and medication adjustment (OR 0.67; CI, 0.49-0.92; p=0.013).

## 4.6 Asthma Control

### 4.6.1 Patient response

Respondents were asked about their asthma control beliefs over the past four weeks.

**Table 4.16 Patients' asthma control beliefs**

Region/ sex	Do you believe your or your child's asthma was well controlled in the past 4 weeks				p value
	Yes N (%)	No N (%)	Unsure N (%)	Total N (%)	
Asser males	33(56.9)	12(20.7)	13(22.4)	58(100.0)	0.035
Asser females	32(58.2)	13(23.6)	10(18.2)	55(100.0)	
Asser total	65(57.5)	25(22.1)	23(20.4)	113(100.0)	
Riyadh males	25(35.2)	31(43.7)	15(21.1)	71(100.0)	
Riyadh females	26(56.5)	14(30.4)	6(13.0)	46(100.0)	
Riyadh total	51(43.6)	45(38.5)	21(17.9)	117(100.0)	
Total	116(50.5)	70(30.4)	44(19.1)	230(100.0)	

The data in Table 4.16 indicate that more than half (50.5%) of respondents from both regions believed their asthma was well controlled over the past four weeks, although self-reported control amongst Asser patients (57.5%) was slightly higher than among Riyadh patients (43.6%;  $p=0.035$ ). This result was not influenced by gender.

### 4.6.2 Relationship between the belief that the disease had been controlled in the past four weeks and other elements

**Table 4.17 Relationship between belief that asthma is well controlled and other variables**

Variable	Comparison	Odds Ratio	95% CI	p value
Dissatisfied with current asthma treatment component.	Unsure vs. Yes	2.26	1.05-4.86	0.036
Medication administration ability: patient's beliefs	Yes vs. unsure	.09	0.01-.69	0.021
Adequate asthma management information accessibility beliefs	Yes vs. No/unsure	5.67	2.90-11.09	0.000
Medication usefulness: patients beliefs	Yes vs. No/ unsure	10.63	5.34-21.13	0.000
Acting upon physician's given plan	Yes vs. No	2.31	1.18-4.53	0.014
Asthma triggers recognition and avoidance	Yes vs. No	2.16	1.06-4.39	0.034

Variable	Comparison	Odds Ratio	95% CI	p value
Ability to act with asthma attack	Yes vs. No	2.74	1.50-5.03	0.001
Asthma treatment decision involvement	Yes vs. No	4.46	2.11-9.43	0.000
Physician's attentiveness to patient's medication preference	Yes vs. No	3.62	1.25-10.42	0.017
Medication use followed up over the past 12 months	Yes vs. No	4.61	1.79-11.91	0.002
Asthma management education quality	Excellent vs. Fair	5.68	1.92-16.80	0.002
	Very good vs. Fair	8.75	3.25-23.57	0.001
AAP availability (when having asthma attack)	Yes vs. No/unsure	3.68	1.79-7.57	0.000
AAP availability (when not having asthma attack)	Yes vs. No/unsure	2.62	1.40-4.91	0.003
Level of AAP understanding on how to take asthma medicine	Yes, and completely understood vs. No, not at all	7.41	1.59-34.48	0.011
Level of AAP understanding on what to do when having a severe asthma attack	Yes, and completely understood vs. No, not at all	9.43	2.70-33.33	0.000
Chest tightness (difficulty taking a deep breath)	Never vs. 2 to 3 times a week	5.10	2.1-12.35	0.000
Wheezing or whistling sound in the chest.	Never vs. 2 to 3 times a week	3.46	1.55-7.75	0.003
Wheezing or difficulty breathing when exercising	None vs. Over 7	13.51	1.56-111.11	0.018
Missing any daily activities	None vs. Over 7	5.29	1.05-26.32	0.043
Waking up at night	Not at all vs. Once or twice a week Less than once a week	2.42	1.26-4.63	0.008
Asthma severity (self- reported).	Very mild/mild vs. Moderate	2.370	1.30-4.31	0.005
	Very mild/mild vs. Severe/very severe	5.44	2.20-13.51	0.000
Physician's attention to patient's concerns	Excellent vs. Fair	6.33	2.17-18.47	0.001
	Very good vs. Fair	2.94	1.02-8.50	0.046
Hospital admission or emergency room attendance in past three months	No vs. Yes	1.84	1.06-3.20	0.030

Table 4.17 illustrates the relation between the patients' or their families' belief that their asthma had been well controlled over the past four weeks, and other independent variables. Patients / families satisfied with their current asthma treatment were 2.3 times more likely to believe the asthma was well controlled than patients dissatisfied with any part of their current asthma treatment (95% CI, 1.05-

4.86;  $p=0.036$ ). Patients/ families believing the asthma was well controlled were more likely to be able to administer asthma medicine(s) as directed than those patients who did not believe that (OR 0.09, 95% CI, .01-.69;  $p=0.021$ ).

The effects of patients' knowledge, behaviour and attitudes were reported. Patients/ families believing they had access to sufficient information, and that the medicine(s) prescribed were useful in controlling their asthma, were more likely to believe their asthma was well controlled than who were not sure or not confident (OR 5.67, 95% CI, 2.90-11.09;  $p=0.000$ ) and (OR 10.63, 95% CI, 5.34-21.13;  $p=0.000$ ) respectively. Those patients/ families who recognized they had the ability to follow the care plan given them by a health provider, could identify things that might trigger their asthma, and knew how to deal with an asthma attack were more likely to believe their asthma was controlled than patients who did not (OR 2.3, 95% CI, 1.18-4.53;  $p=0.014$ ; OR 2.2 95% CI, 1.06-4.39;  $p=0.034$  and OR 2.7, 95% CI, 1.50-5.03;  $p=0.001$  respectively).

The involvement of patients in their own asthma treatment affected their belief in their ability to control their asthma. Patients who were engaged in decision-making about their treatment, or whose physicians knew how they wished to take their medicine, were more likely to believe their asthma was controlled than patients who were not engaged or unsure (OR 4.5, 95% CI, 2.11-9.43;  $p=0.000$  and OR 3.62, 95% CI, 1.25-10.42;  $p=0.017$  respectively).

Patients who were educated and followed up by their physician were more likely to believe their asthma was well controlled than others. Patients instructed on how to take their asthma medicine(s) by their health providers over the past 12 months were more likely to believe their asthma was well controlled than patients with no follow-up (OR 4.6, 95% CI, 1.79-11.91;  $p=0.002$ ). Patients/ families who classified the quality of the asthma education they received as excellent and very good were more likely to believe their asthma was well controlled than patients who rated their education poorly (OR 5.7, 95% CI, 1.92-16.80;  $p=0.002$  and OR 8.8, 95% CI, 3.25-23.56;  $p=0.001$  respectively).

Having an asthma action plan (AAP) and knowing how to take medications had a positive influence on patients' belief that their asthma was well controlled (OR 3.7,

95% CI, 1.79-7.57;  $p=0.000$  and OR 2.6, 95% CI, 1.40-4.91;  $p=0.003$  respectively); patients who completely understood their AAP and how to take their asthma medicine, and what to do if they had a severe asthma attack, were significantly more likely to believe their asthma was well controlled than those with no AAP (OR 7.4, 95% CI, 1.59-34.48;  $p=0.011$  and OR 9.4, 95% CI, 2.70-33.33;  $p=0.000$  respectively).

Patients with a low frequency of asthma symptoms believed their asthma was well controlled more than patients with a high frequency of symptoms. For example, patients who had had no symptoms over the past four weeks, including chest tightness (difficulty taking a deep breath) and wheezy or whistling sounds in the chest, were more likely to believe their asthma was under control than patients who had faced these symptoms two to three times (OR 5.1, 95% CI 2.10-12.35;  $p=0.000$  and OR 3.5, 95% CI, 1.55-7.75;  $p=0.003$  respectively). Patients who had never experienced wheezing or difficult breathing when exercising, and had never missed daily activities as a result of asthma in the past four weeks, were more likely to report their asthma was controlled than patients who had suffered more than seven times from these symptoms (OR 13.51, 95% CI 1.56-111.11;  $p=0.018$  and OR 5.3, 95% CI, 1.05-26.32;  $p=0.043$  respectively), while patients who had never woken up at night as a result of asthma in the past four weeks were more likely to feel their asthma was under control than other patients (OR 2.42, 95% CI, 1.26-4.63;  $p=0.008$ ).

In addition, beliefs of good control among patients with very mild asthma were higher than among patients with more severe asthma. People with very mild and mild asthma were 2.4 and 5.4 times more likely, respectively, to believe their asthma was well controlled than moderate and severe asthma patients (95% CI, 1.30-4.31;  $p=0.005$  and 95% CI, 2.20-13.51;  $p=0.000$  respectively).

Patients who felt that their health care professionals listened to their concerns were more likely to report their asthma was controlled. Those who gave an excellent or very good rating to the skills of their doctors and nurses were 6.3 (95% CI, 2.17-18.47;  $p=0.001$ ) and 2.9 (95% CI, 1.02-8.502;  $p=0.046$ ) times more likely to report good control. Patients who had neither been admitted to hospital nor attended the ER at the hospital during the past three months were 1.8 times more likely to believe their asthma was under control than other patients (95% CI, 1.06-3.20;  $p=0.030$ ).

## 4.7 Asthma Self-management

### 4.7.1 Asthma Action Plans (AAPs)

#### 4.7.1.1 Access to written asthma action plan.

Respondents were asked if they had written instructions from their health provider on what to do during an asthma attack.

**Table 4.18 Number of patients with written instructions (AAPs)**

Region	AAPs Availability, On what to do when having an asthma attack		
	Yes	No	Total
	N (%)	N (%)	N (%)
Asser*	98(93.3)	7(6.7)	105(100.0)
Riyadh**	86(77.5)	25(22.5)	111(100.0)
Total	184(85.2)	32(14.8)	216(100.0)
Difference between Gender p value	NS		
Difference between Region p value	0.014		

\*Eight sets of data missing

\*\*Six sets of data missing

Table 4.18 illustrates that 80.0% of patients from both regions had an AAP. Asser patients were 1.18 times more likely to have an AAP than Riyadh patients (86.7% vs. 73.5%) explaining what to do if they had an asthma attack (95% CI, 1.192-4.651; p=0.014). Response rates were not influenced by gender (see Appendix E).

Respondents were also asked if they had written instructions from their health provider on how to use asthma medication when not having asthma attacks.

**Table 4.19 How to take medicine(s) on days when not having an asthma attack.**

Region	AAP available on how to take medicine when not having an asthma attack			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser	91(80.5)	11(9.7)	11(9.7)	113(100.0)
Riyadh *	80(69.6)	23(20.0)	12(10.4)	115(100.0)
Total	171(75.0)	34(14.9)	23(10.1)	228(100.0)
Difference between Gender p value	NS			
Difference between Region p value	NS			

\* 2 sets of data missing

Table 4.19 illustrates that most patients in both regions (75.0%) had an AAP with regard to using medication when they were not having an asthma attack. There were no significant differences in responses based on region or gender (see Appendix E).

#### 4.7.1.2 Patient's level of understanding of AAP

##### 4.7.1.2.1 Respondents' understanding regarding AAP instructions on how to take medicine(s) on days when not having an asthma attack.

Respondents were asked if they had an AAP on how to use their medications, to estimate their level of understanding.

**Table 4.20 Respondents' understanding level of AAPs on how to use their medications when not having a severe asthma attack.**

Possession of AAP and understanding on how to take asthma medicine when not having a severe asthma attack.	Asser	Riyadh	Total	p value
	N=113	N=117	N=230	
	N (%)	N (%)	N (%)	NS
1. Yes, and completely understood	78(69.0)	84(71.8)	162(70.4)	
2. Yes, well understood	29(25.7)	19(16.2)	48(20.9)	
3. Yes, confused	3(2.7)	4(3.4)	7(3.0)	
4. No, not at all	3(2.7)	10(8.5)	13(5.7)	

The data presented in Table 4.20 illustrate that around 70% of patients in both regions had AAPs, and the majority felt they understood completely or very well how to use their medications. There were no significant differences in responses based on region or gender (see Appendix E).

4.7.1.2.2 *Patients' level of understanding of AAPs regarding what to do when having a severe asthma attack*

Respondents were asked if they had an AAP on what to do when having a severe asthma attack, to estimate their level of understanding.

**Table 4.21 Respondents' level of understanding of AAPs regarding having a severe asthma attack.**

Possession of AAP and level of understanding of what to do when having a severe asthma attack	Asser	Riyadh	Total	p value
	N=113	N=117	N=230	
	N (%)	N (%)	N (%)	
1. Yes, and completely understood	81(71.7)	76(65.0)	157(68.3)	0.009
2. Yes, well understood	26(23.0)	18(15.4)	44(19.1)	
3. Yes, confused	1(0.9)	4(3.4)	5(2.2)	
4. No, not at all	5(4.4)	19(16.2)	24(10.4)	

The data presented in Table 4.21 illustrate that the majority of patients (68.3%) in both regions who had AAPs reported completely understanding what to do if they suffered a severe asthma attack. However, there was a significant difference between regions, with a greater proportion of patients from Riyadh unclear on what to do in case of a severe asthma attack ( $p = 0.009$ ). Responses rates were not influenced by gender (see Appendix E).

4.7.1.3 *Patients' understating level of AAPs regarding how to adjust medication when asthma gets worse.*

Respondents were asked if they had an AAP on how to adjust medication when their asthma worsened; and their estimate of their understanding level.

**Table 4.22 Number of respondents on medication adjustment category.**

Possession of AAP and level of understanding regarding how to adjust medication when asthma worsens	Region	Asser N=113	Riyadh N=117	Total N=230	p value	
	Gender	No N (%)	N (%)	N (%)	region	gender
1. Yes, and completely understood	Male	26(44.8)	39(54.9)	65(50.4)	0.003	0.036
	Female	33(60.0)	31(67.4)	64(63.4)		
	Total	59(52.2)	70(59.8)	129(56.1)		
2. Yes, well understood	Male	18(31.0)	11(15.5)	29(22.5)		
	Female	17(30.9)	5(10.9)	22(21.8)		
	Total	35(31.0)	16(13.7)	51(22.2)		
3. Yes, confused	Male	7(12.1)	7(9.9)	14(10.9)		
	Female	2(3.6)	0(0.0)	2(2.0)		
	Total	9(8.0)	7(6.0)	16(7.0)		
4. No, not at all	Male	7(12.1)	14(19.7)	21(16.3)		
	Female	3(5.5)	10(21.7)	13(12.9)		
	Total	10(8.8)	24(20.5)	34(14.8)		

Table 4.22 illustrates that just over half the patients across both regions (56.1%) with an AAP reported completely understanding how to adjust their medication when their asthma got worse. There was a significant difference based on regions ( $P=0.003$ ), with more patients in Riyadh (20.5%) reporting not having received an AAP than in Asser (8.8%). Across genders there was also a significant difference. Males (50.4%) were less likely to have an AAP or to completely understand how to adjust medications than females (63.4%,  $p=0.036$ ); 14 (10.9%) and 21(16.3%) of males were confused and had no AAP, compared with 2(2.0%) and 13(12.9%) of females; see Appendix E.

#### 4.7.1.4 Relationship between AAPs and others variables

**Table 4.23 Relationship between AAPs on what to do if having an asthma attack, and other variables**

Variable	Comparison	Odds Ratio	95%CI	p value
Dissatisfied with current asthma treatment component.	Unsure vs. Yes	3.16	1.32-7.57	0.010
Medication adjustment when asthma worsens	Yes, and completely understood vs. No, not at all	12.35	5.03-30.30	0.000
Asthma triggers: recognition and avoidance	Yes, and completely understood vs. No, not at all	4.93	1.17-20.83	0.030
Acting upon physician's given plan	Yes vs. No	3.41	1.68-6.94	0.001
Ability to act with an asthma attack	Yes vs. No	.48	1.78-6.85	0.001
Patient's belief in being able to administer medication	Yes vs. Unsure	5.46	1.58-18.87	0.007
Belief that there is adequate accessible asthma management information	Yes vs. No/unsure	6.27	3.13-12.56	0.000
Patient's belief in medication's usefulness	Yes vs. No/unsure	2.73	1.40-5.32	0.003
Spacer accessibility	Yes vs. No	2.78	1.27-6.10	0.011
Involvement in decisions about asthma treatment	Yes vs. No	2.82	1.33-5.99	0.007
Physician's attentiveness to patient's medication preferences	Yes vs. No	9.43	3.44-25.64	0.000
Medication use followed up over the past 12 months	Yes vs. No	9.43	3.98-22.22	0.000
	Yes vs. Unsure	21.28	4.05-111.11	0.000
Inhaler use demonstration	Yes vs. No	2.55	1.31-4.95	0.006
Inhaler use observation	Yes vs. No	2.48	1.28-4.79	0.007
Quality of asthma management education	Very good vs. OK	5.81	2.13-15.87	0.001
Quality of health care in the past 12 months	Excellent vs. Poor	39.00	6.68-227.65	0.000
	Very good vs. Poor	17.02	5.07-57.12	0.000
Use of an inhaler or nebulizer as reliever	Yes vs. No / unsure	2.18	1.09-4.37	0.028
Use of a control medication	Yes vs. No	2.17	1.11-4.27	0.024
Change of mood	No vs. Yes	2.03	1.06-3.92	0.034
Slowed growth rate	No vs. Yes	3.09	1.51-6.34	0.002

Table 4.23 illustrates the relationship between patients with an AAP knowing what to do if they have an asthma attack, and other independent variables. The effects of

patients' knowledge, behaviours and attitudes were reported against patients and their families possessing an AAP. Patients and their families satisfied with current asthma treatment were 3.2 times more likely to have an AAP (95% CI, 1.32-7.57;  $p=0.010$ ) than others. AAPs were more often provided to patients who received education and follow-up from their health providers. Patients instructed on how to adjust their medication when their asthma got worse and who completely understood were more likely to use an AAP than non-educated patients (OR 12.35, 95% CI, 5.03-30.30;  $p=0.000$ ). Furthermore, patients who completely understood how to identify asthma triggers were 4.9 times more likely to have an AAP than other patients (95% CI, 1.17-20.83;  $p=0.03$ ). Those who had the ability to follow the care plan given to them by their health provider, and predict how to deal with an asthma attack, were more likely to use an AAP than patients who did not (OR 3.4, 95% CI, 1.68-6.94;  $p=0.001$  and OR 3.5, 95% CI, 1.78-6.85;  $p=0.001$  respectively).

Good self-efficacy was reported among patients and their families with an AAP, who were 5.5 times more likely to be able to administer asthma medicine(s) as directed than other patients (95% CI, 1.58-18.87;  $p=0.007$ ). Patients and their families who believed they had access to enough information and that the medicine(s) prescribed were useful for controlling their asthma were more likely to have an AAP than those who did not, or who were unsure (OR 6.3, 95% CI, 3.13-12.56;  $p=0.000$  and OR 2.7, 95% CI, 1.40-5.32;  $p=0.003$  respectively). Patients who usually used a spacer when they used an inhaler were 2.78 times more likely to have an AAP than non-spacer users (95% CI, 1.27-6.10;  $p=0.001$ ).

A link between good communication between patients and their families and their health provider, and possession of an AAP, were documented. Patients who were engaged in decision-making about their asthma treatment and whose physicians knew how they desired to take their medicine were more likely to have an AAP than patients who were not engaged (OR 2.8, 95% CI, 1.33-5.99;  $p=0.007$  and OR 9.4, 95% CI, 3.44-25.64;  $p=0.000$  respectively). Those patients instructed on how to take their asthma medicine(s) by their health providers in the past 12 months were 9.4 and 21.3 times more likely to have an AAP than patients with no follow-up or who were unsure (95% CI, 3.98-22.22;  $p=0.000$  and 95% CI, 4.05-111.11;  $p=0.000$  respectively). Patients shown how to use an inhaler properly by their health providers

and observed doing so were 2.55 and 2.48 times more likely to have an AAP than patients who did not (95% CI, 1.31-4.95; p=0.006 and 95% CI, 1.28-4.79; p=0.007 respectively).

Patients and their families who classified the quality of information received about their illness from their health care providers as very good were 5.8 times more likely to use an AAP than patients who rated their education poorly (95% CI, 2.13-15.87; p=0.001). Patients who had an AAP were more likely to report the level of care received as excellent (OR 39, 95% CI, 6.68-227.65; p=0.000) or very good (OR 17, 95% CI, 5.07-57.12; p=0.000) than patients without an AAP.

Use of an AAP was more common among patients using an inhaler or nebulizer for quick relief than among patients who were not using such or were unsure (OR 2.2, 95% CI, 1.09-4.37; p=0.028). In addition, patients who were prescribed a control medication were 2.2 times more likely to have AAP than patients who did not (95% CI, 1.11-4.27; p=0.024).

The use of an AAP was higher among patients not suffering from adverse effects such as change of mood and slowed growth rate than among those who were. Patients who reported that they did not suffer from changes of mood and slowed growth rate after commencing asthma medication were more likely to have an AAP than patients who experienced these adverse effects (OR 2.03, 95% CI, 1.06-3.92; p=0.034 and OR 3.1, 95% CI, 1.51-6.34; p=0.002, respectively).

## 4.7.2 Peak flow meter (PFM)

### 4.7.2.1 PFM usage

Respondents were asked if they had a PFM and how regularly they used it.

**Table 4.24 Number of patients with a peak flow meter**

PFM availability and usage frequency	Asser N= 113	Riyadh N=117	Total N=230
	N (%)	N (%)	N (%)
Does not have a home PFM	101(89.4)	83(70.9)	184(80.0)
Yes and uses it regularly.	3(2.7)	16(13.7)	19(8.3)
Yes, but almost never uses it	9(8.0)	18(15.4)	27(11.7)
Difference between region p value	0.001		
Difference between both regions' patients' adherence to PFM use p value	*0.003		

\* P value between both regions adherences with PFM use

Table 4.24 shows that the majority (80%) of respondents in both regions did not have a PFM at home. There were significant differences between both regions. More than 89% and 70% of patients in Asser and Riyadh respectively did not have a PFM. Riyadh patients were more likely to have a PFM than Asser patients,  $p= 0.001$ . Furthermore, there were low levels of regular PFM usage: 27 patients across both regions had a PFM but almost never used it. Only 8.3% of patients from both regions who had a PFM used it regularly, with patients in Riyadh more likely to do so than those in Asser (13.7% vs. 2.7%;  $p=0.0031$ ). Response rates were not influenced by gender (see Appendix E).

#### 4.7.2.2 Relationship between the dependent variable PFM and other variables

**Table 4.25 Relationship between dependent variable PFM and other variables**

Variable	Comparison	Odds ratio	95%CI	p value
Medication usage followed up over the past 12 months	Yes vs. No	7.69	1.02-58.82	0.048
Inhaler use demonstration	Yes vs. No	2.42	1.10-5.32	0.028
Patient uses a peak flow meter to monitor asthma	Yes vs. No	18.87	6.41-55.56	0.000
Uses an inhaler or nebulizer as reliever.	No/ unsure vs. Yes	5.80	1.72-19.51	0.005
Uses corticosteroid	Yes vs. No	2.45	1.26-4.79	0.009
Uses medication	$\beta_2$ Agonist +corticosteroid vs. $\beta_2$ Agonist Only	2.23	1.01-4.93	0.048
	$\beta_2$ Agonist + corticosteroid + Other vs. $\beta_2$ Agonist Only	7.50	1.85-30.34	0.005
Spacer accessibility	Yes vs. No	4.65	2.34-9.26	0.000
Chest tightness (difficulty taking a deep breath)	Daily vs. Never	14.80	2.78-78.71	0.002
Wheezy or whistling sound in the chest	Daily vs. Never	10.76	3.0-38.58	0.000
Wakes up at night.	Three or more times a week vs. Not at all	6.66	1.73-25.66	0.006
Symptom (wheezing or difficulty breathing with or without exercising, waking up at night, missing days of school and daily activities).	Moderate vs. Very mild	3.90	1.42-10.73	0.008
Asthma severity (self-reported)	Severe/very severe vs. Very mild/mild	2.87	1.06-7.78	0.038
Hospital admission or emergency room attendance in past three months	Yes vs. No	2.87	1.48-5.56	0.002

Table 4.25. illustrates the relationship between having a PFM and other independent variables. Patients who were observed and followed up by their physician were more likely to use a PFM than others. Patients instructed in how to use their asthma medicine(s) by their health providers in the past 12 months were more likely to have and use a PFM than patients who were not followed up (OR 7.7, 95% CI, 1.02-58.82;  $p=0.048$ ). In addition, patients who were shown how to use an inhaler properly by their health providers were more likely to have a PFM and use it than those who were not (OR 2.42, 1.10-5.32;  $p=0.028$ ). A high percentage of patients with a PFM were using it to monitor their asthma (OR 18.87, 95% CI, 6.41-55.56;  $p=0.000$ ).

PFM use was reported more by patients not using or unsure if they were using an inhaler or nebulizer for quick relief than by patients who were confident using it (OR 5.8, 95% CI, 1.72-19.51;  $p=0.005$ ). Patients who were prescribed a corticosteroid or  $\beta_2$  agonists plus corticosteroids, with or without other medication, were more likely to have and use a PFM than patients prescribed  $\beta_2$  agonists only (OR 2.45, 95% CI, 1.26-4.79;  $p=0.009$ , OR 2.23, 95% CI, 1.01-4.93;  $p=0.048$  and OR 7.5, 95% CI, 1.85-30.34;  $p=0.005$  respectively). In addition, patients using a spacer with an inhaler were more likely to use a PFM than patients who were not (OR 4.65, 95% CI, 2.34-9.26;  $p=0.000$ ).

Patients with a high frequency of asthma symptoms reported more use of their PFM than others. For example, patients with daily symptoms which included chest tightness and wheezy or whistling sounds in the chest were 14.8 and 10.8 times more likely to have a PFM and use it than those without symptoms (95% CI, 2.78-78.71;  $p=0.002$  and 95% CI, 3.00-38.58;  $p=0.000$ , respectively). Patients who woke up three or more times a week at night as a result of their asthma were 6.7 times more likely to use a PFM than other patients (95% CI, 1.73-25.65;  $p=0.006$ ).

Patients who had moderate symptoms including wheezing or difficulty breathing when exercising or without exercising, who woke up at night with wheezing or difficult breathing or missed days of school and daily activities, were 3.9 times more likely to use a PFM than patients with very mild symptoms (95% CI, 1.42-10.73;  $p=0.008$ ). It is clear that the use of a PFM was dependent on asthma severity. Patients with severe asthma were 2.9 times more likely to use a PFM than these with very mild asthma (95% CI, 1.06-7.78;  $p=0.038$ ), and patients who had been admitted

to hospital or had attended the ER in the last 3 months were 2.9 times more likely to use a PFM than patients who had not (95% CI, 1.48-5.56; p=0.002).

#### 4.7.2.3 Air chamber (spacer)

##### 4.7.2.3.1 Possession of spacer

Respondents were asked if they used a spacer when taking medication.

**Table 4.26 Number of patients using a spacer when taking medication**

Regions	Spacer accessibility		
	Yes	No	Total
	N (%)	N (%)	N (%)
Asser*	27(24.1)	85(75.9)	112(100.0)
Riyadh**	55(47.8)	60(52.2)	115(100.0)
Total	82(36.1)	145(63.9)	227(100.0)
Difference between gender p value	NS		
Difference between region p value	0.000		

\*One set of data missing

\*\*Two sets of data missing

As can be seen from Table 4.26, around three quarters of the Asser patients and half of the Riyadh patients did not use a spacer. There was a significant difference based on region (p= 0.000), but no difference related to gender (see Appendix E).

#### 4.7.2.4 Relationship between spacer use and age

**Table 4.27 Age category and spacer use**

Age	Spacer accessibility			p value
	Yes N (%)	No N (%)	Total N (%)	
5 - < 10 yrs.	45(19.8)	54(23.8)	99 (43.6)	0.016
10 - <15 yrs.	24(10.6)	47(20.7)	71 (31.3)	
15 - <18 yrs.	13(5.7)	44(19.4)	57 (25.1)	
Total	82(36.1)	145 (63.9)	227	

Table 4.27 demonstrates that younger patients were more likely to use a spacer, with usage falling with increasing age,  $p=0.016$ .

## 4.8 Patients' Education

### 4.8.1 Accessible information

Respondents were asked if they believed they had enough access to asthma-related information.

**Table 4.28 Level of accessible information across gender and region**

Region	Access to adequate asthma management information			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser*	88(78.6)	13(11.6)	11(9.8)	112(100.0)
Riyadh**	75(65.2)	25(21.7)	15(13.0)	115(100.0)
Total	163(71.8)	38(16.7)	26(11.5)	227(100.0)
Difference between gender p value	NS			
Difference between region p value	0.028			

\*One set of data missing

\*\*Two sets of data missing

Table 4.28 shows that more than two thirds of respondents reported they had access to enough information to help them control their asthma. However, a significant difference between regions was found, with Asser patients more likely to have access

to information than Riyadh patients (78.6% vs. 65.2%,  $p=0.028$ ). There was no statistically significant difference across gender (see Appendix E).

#### 4.8.2 Inhaler use education

Respondents were asked if they were shown the correct use of the inhaler by their health provider, to which they could respond Yes, No, or unsure (see Appendix E).

**Table 4.29 Respondents' inhaler usage education**

Region	Correct inhaler use demonstrated by health care providers		
	Yes	No	Total
	N (%)	N (%)	N (%)
Asser*	75(67.6)	36(32.4)	111(100.0)
Riyadh**	76(65.5)	40(34.5)	116(100.0)
Total	151(66.5)	76(33.5)	227(100.0)
Difference between Gender p value	NS		
Difference between Region p value	NS		

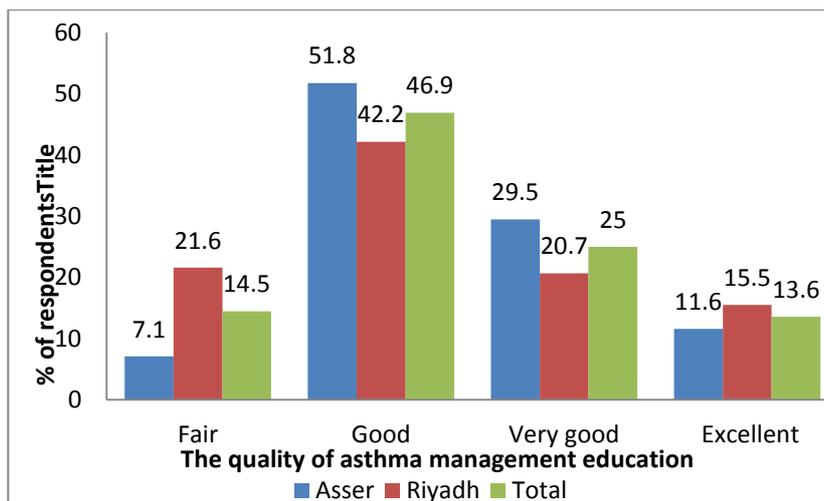
\*Two sets of data missing

\*\* One set of data missing

Table 4.29 illustrates the majority (66.5%) of patients had been educated on how to use their inhaler. There were no significant differences between region or gender.

#### 4.8.3 Quality of patients' education

Respondents were asked to evaluate the quality of education regarding their disease that they received from their health providers, to which they could respond Fair, Good, Very good, Excellent, or Unsure (see Appendix E).



**Figure 4.4 Respondents' assessment of education in asthma management**

Figure 4.4 shows that the majority of patients evaluated the quality of education they received to manage their asthma as good or better. There was a significant difference between regions: while only 7.1% of Asser patients classified the quality of education as fair, this percentage increased to 21.6% amongst Riyadh patients,  $p=0.009$ . There was no difference based on gender (see Appendix E).

## 4.9 Communication between Patients and Health Care Providers

### 4.9.1 Patients' involvement

Respondents were asked if they were involved with their health providers in making decisions about their asthma management.

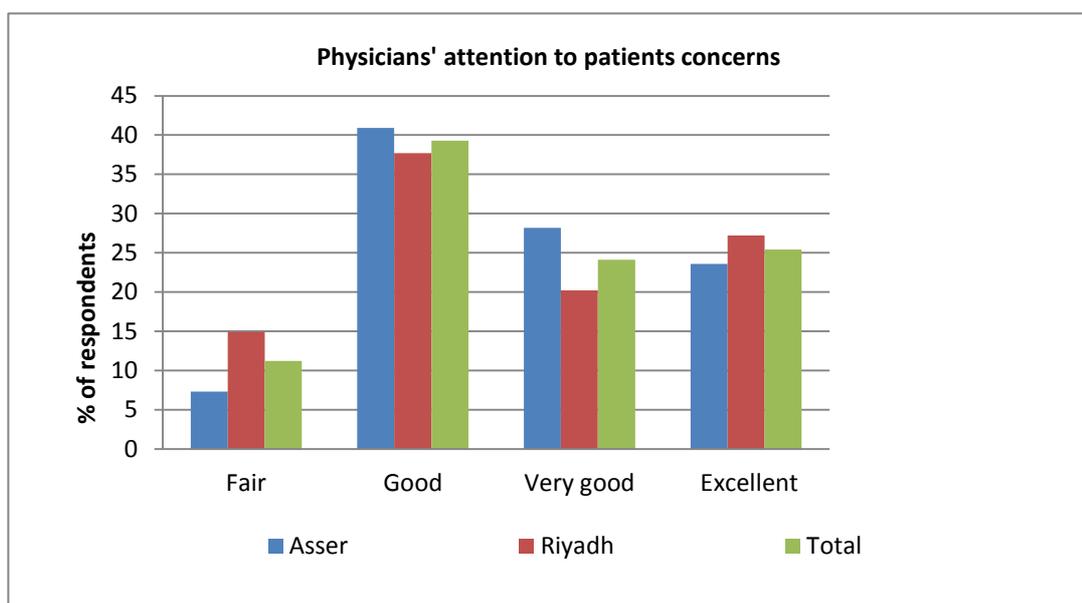
**Table 4.30 Patients' involvement**

Region	Involvement in asthma treatment decisions with medical provider.			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser	83(73.5)	16(14.2)	14(12.4)	113(100.0)
Riyadh	83(70.9)	29(24.8)	5(4.3)	117(100.0)
Total	166(72.2)	45(19.6)	19(8.3)	230(100.0)
Difference between gender p value	NS			
Difference between region p value	0.019			

Table 4.30 shows that most patients (72.2%) were involved in decision-making regarding their asthma treatment; Riyadh patients were more definite that they were not engaged in decision-making than Asser patients (24.8% vs. 14.2%,  $p=0.019$ ). No statistically significant differences were observed across gender (see Appendix E).

#### 4.9.2 Patients' assessment of their relationship with health care providers

Respondents were asked to rate the level of attention their health care providers gave to their concerns.



**Figure 4.5 Level of health care provider's attention to patients' concerns**

Figure 4.5 shows that the majority of patients (88.8%) in both regions evaluated the level of attention given by their health providers regarding their care concern issues as good or above. There were no significant differences based on region or gender (see Appendix E).

#### 4.9.3 Physicians' amenability to prescribing patients' preferred medication

Respondents were asked if their health care providers paid attention to their preferred dosage form for medications.

**Table 4.31 Patients' perception of physicians' amenability**

Region	Physician attentive to patient's medication preference			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser	96(85.0)	6(5.3)	11(9.7)	113(100.0)
Riyadh	92(78.6)	13(11.1)	12(10.3)	117(100.0)
Total	188(81.7)	19(8.3)	23(10.0)	230(100.0)
Difference between gender p value	NS			
Difference between region p value	NS			

Table 4.31 illustrates that the majority of patients (81.7%) reported that their health providers were familiar with their preferred medication. There were no significant differences based on region or gender (see Appendix E).

#### 4.9.4 Medication usage instruction

Respondents were asked whether their health provider had instructed them about their medications in the past year.

**Table 4.32 Number of respondents coached about medication in the past 12 months.**

Region	Medication use follow-up			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser	104(92.0)	6(5.3)	3(2.7)	113(100.0)
Riyadh	90(76.9)	22(18.8)	5(4.3)	117(100.0)
Total	194(84.3)	28(12.2)	8(3.5)	230(100.0)
Difference between gender p value	NS			
Difference between region p value	0.002			

Data in Table 4.32 shows that the majority of respondents (84.3%) reported they had been educated about their use of medication over the past 12 months. Not as many

Riyadh patients (76.9%) received instruction as Asser patients (92.0%): 18.8% and 4.3% of Riyadh patients were not educated or were unsure, compared with 5.3% and 2.7% of Asser patients respectively (p=0.002). There was no significant difference based on gender (see Appendix E).

#### 4.9.5 Patient follow-up

Respondents were asked if they had been observed by their health care providers when using their inhaler.

**Table 4.33 Number of respondents observed by their health care providers while using their inhaler**

Region	Inhaler observation by health care provider		
	Yes	No	Total
	N (%)	N (%)	N (%)
Asser	69(62.7)	41(37.3)	110(100.0)
Riyadh	78(67.2)	38(32.8)	116(100.0)
Total	147(65.0)	79(35.0)	227(100.0)
Difference between gender p value	NS		
Difference between region p value	NS		

Table 4.33 illustrates that the majority of patients (65.0%) had been observed by their health providers when using their inhaler. There were no significant differences based on region or gender (see Appendix E).

#### 4.10 Patients' Medication Knowledge

The questionnaire asked the patients or their family members if they (the child) used an inhaler or nebulizer reliever. To validate the responses, the primary researcher asked the respondents to list the medication, to determine if they knew what it was used for.

**Table 4.34 Difference between patients' responses for quick relief**

Region	Use of an inhaler or nebulizer as a quick reliever		$\beta_2$ agonist use listed amongst medications	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Asser N=113	79(69.9)	34(30.1)	107(94.7)	6(5.3)
Riyadh N=117	95(81.2)	22(18.8)	110(94.0)	7(6.0)
Total N=230	174(75.7)	56(24.3)	217(94.3)	13(5.7)

Table 4.34 demonstrates that the majority of patients used a  $\beta_2$  agonist; however, there was a poor understanding amongst some patients/ parents about what these were for. For example, patients who reported using an inhaler or nebulizer for quick relief were 69.9% and 81.2% in Asser and Riyadh respectively, although their responses indicated that 94.7% of Asser and 94.0% of Riyadh patients were using  $\beta_2$  agonist treatments.

The patients were asked if they used a controller medication and an inhaled corticosteroid. To validate the responses the researcher asked the respondents to list the medication to determine if they used an ICS, as can be seen in Table 4.35.

**Table 4.35 Differences in patients' responses about control medications**

Region	Control medication used		Use of an inhaled corticosteroids		Corticosteroid use based on medications list	
	Yes N (%)	No N (%)	Yes N (%)	No or unsure N (%)	Yes N (%)	No N (%)
Asser N=113	84(74.3)	29(25.7)	22(19.5)	91(80.5%)	21(18.6)	92(81.4)
Riyadh N=117	82(70.1)	35(29.9)	58(49.6)	59 (50.4)	47(40.2)	70(59.8)
Total N=230	166(72.2)	64(27.8)	80(34.8)	150(65.2)	68(29.6)	162(70.4)

Table 4.35 demonstrates that patients (and/ or their parents) had a poor understanding of what medications were controllers. Whilst the majority of respondents from both regions reported use of a controller medication (72.2%),

fewer than 35% reported the use of an ICS and fewer than 30% were actually found to use a corticosteroid. In some cases respondents reported using an ICS when according to their medication list they did not.

## 4.11 Patients’ Beliefs, Perceptions, and Self-efficacy

### 4.11.1 Respondents’ self-efficacy in medicine administration

Respondents were asked if they believed that they could administer their medication as directed by their health provider.

**Table 4.36 Number of patients able to administer medicine as directed.**

Region	Patients believe they can administer their medication as directed			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser	103(91.2)	4(3.5)	6(5.3)	113(100.0)
Riyadh	97(82.9)	15(12.8)	5(4.3)	117(100.0)
Total	200(87.0)	19(8.3)	11(4.8)	230(100.0)
Difference between gender p value	NS			
Difference between region p value	0.037			

Table 4.36 illustrates that 87.0% of patients believed they were able to administer their medicine as directed. There was a statistically significant difference based on region, with Asser patients (91.2%) feeling more able to administer their medicine than Riyadh patients (82.9,  $p=0.037$ ). Responses were not influenced by gender (see Appendix E).

#### 4.11.2 Patient perceptions about the usefulness of medication

Respondents were asked if they believed that the medications they used were useful.

**Table 4.37 Respondents' perception about medication's effectiveness.**

Region	Medicine usefulness: patients' beliefs			
	Yes	No	Unsure	Total
	N (%)	N (%)	N (%)	N (%)
Asser	81(71.7)	8(7.10)	24(21.2)	113(100.0)
Riyadh *	69(60.0)	17(14.8)	29(25.2)	115(100.0)
Total	150(65.8)	25(11.0)	53(23.2)	228(100.0)
Difference between gender p value	NS			
Difference between region p value	NS			

Two sets of data missing

Table 4.37 illustrates that more than half (65.8%) the patients believed their medications were useful in controlling their asthma. There was no significant difference based on region, although there was a greater level of uncertainty amongst Riyadh patients (40% vs. 28.2%). There was no statistically significant difference across gender (see Appendix E).

#### 4.11.3 Patients'/ relatives' self-efficacy

(See Appendix A: Scoring Instructions)

Using the Therapy Assessment Questionnaire (ATAQ), which scores patients' responses to a series of three questions, individual patients' self-efficacy was determined. Patients with a score of zero were deemed to have a high self-efficacy level whilst those with a score of three were classified as having poor self- efficacy (See Appendix A: Scoring Instructions).

**Table 4.38 Patients' and their families' self-efficacy**

Region	Patients' and their families' self-efficacy				Total N (%)	p value
	High N (%)	Good N (%)	Low N (%)	Poor N (%)		
Asser	68(60.7)	28(25.0)	11(9.8)	5(4.5)	112(100.0)	0.057
Riyadh	52(45.6)	30(26.3)	22(19.3)	10(8.8)	114(100.0)	
Total	120(53.1)	58(25.7)	33(14.6)	15(6.6)	226(100.0)	

Table 4.38 illustrates the patients ‘and their families’ self-efficacy. Most patients had high self-efficacy. Asser patients (60.7%) were more likely to have high self-efficacy than Riyadh patients (45.6%). There were no significant differences based on region or gender (see Appendix E).

#### 4.12 Patients’ Behaviours/ Attitudes

Using the Therapy Assessment Questionnaire (ATAQ), which scores patients’ responses to a series of two questions, individual patients’ behaviours/ attitudes were determined. Patients with a score of zero were deemed to have no behaviour/ attitude barriers whilst those with score of two were classified as having two barriers.

**Table 4.39 Patients’ and their families’ behaviours/ attitudes**

Region	Patients’ and their families’ behaviours/ attitudes				p value
	No barrier N (%)	One barrier N (%)	Two barriers N (%)	Total N (%)	
Asser	30(26.5)	64(56.6)	19(16.8)	113(100.0)	NS
Riyadh	27(23.1)	67(57.3)	23(19.7)	117(100.0)	
Total	57(24.8)	131(57.0)	42(18.3)	230(100.0)	

Table 4.39 illustrates that there were no significant differences between the regions regarding patients’ behaviours or attitudes. More than half the patients (57.0%) reported one barrier, and 19.7% of Riyadh patients reported two barriers, compared with 19 (16.8%) patients from Asser. These responses were not influenced by gender (see Appendix E).

#### 4.13 Patients’ Asthma Control Level

Using the Therapy Assessment Questionnaire (ATAQ), which scores patients’ responses to a series of three questions, individual patients’ control levels were determined. Patients with a score of zero were deemed well controlled, whilst those with a score of seven were classified as poorly controlled.

**Table 4.40 Patients' asthma control levels**

Asthma control level	Region		Total	p value
	Asser N (%)	Riyadh N (%)	N (%)	
Well controlled	24(21.2)	9(7.7)	33(14.3)	0.045
One control problem	19(16.8)	13(11.1)	32(13.9)	
Two control problems	25(22.1)	24(20.5)	49(21.3)	
Three control problems	16(14.2)	26(22.2)	42(18.3)	
Four control problems	16(14.2)	23(19.7)	39(17.0)	
Five control problems	6(5.3)	13(11.1)	19(8.3)	
Six control problems	6(5.3)	8(6.8)	14(6.1)	
Poor control	1(0.9)	1(0.9)	2(0.9)	
Total	113(100.0)	117(100.0)	230(100.0)	

Table 4.40 reveals that only 14.3% had well controlled asthma. In Asser the proportion of patients with well controlled asthma was 21.2%, compared with 7.7% amongst Riyadh patients ( $p=0.045$ ). In general, patients in Riyadh were more likely to have one or more control problems than those in Asser; however, in both cases fewer than 1% of patients reported poor control. These responses were not significantly influenced by gender (see Appendix E).

#### **4.14 Communication between Patients and their Health Care Providers**

Using the Therapy Assessment Questionnaire (ATAQ), which scores patients' responses to a series of three questions, the level of communication between patients and health care providers was determined. Patients with a score of zero were deemed to have a high communication level with their health care provider, whilst those with a score of five had poor communication.

**Table 4.41 Patients' and their health care providers' communication level**

Patient/ provider communication in both regions				
Communication level	Asser N (%)	Riyadh N (%)	Total N (%)	p value
Poor	65(57.5)	50(43.5)	115(50.4)	0.080
Low	24(21.2)	28(24.3)	52(22.8)	
Fair	12(10.6)	14(12.2)	26(11.4)	
Medium	7(6.2)	6(5.2)	13(5.7)	
Good	1(.9)	8(7.0)	9(3.9)	
High	4(3.5)	9(7.8)	13(5.7)	
Total	113(100.0)	115(100.0)	228(100.0)	

Table 4.41 indicates that in general there was a lack of communication, with no significant difference between regions. More than half the patients (50.5%) classified their communication with their health providers as poor. Riyadh patients tended to report a better level of communication than Asser patients (see Appendix E).

#### **4.15 Discussion of Phase One: Patients' Survey**

Asthma is one of the most common childhood diseases. Inadequate asthma management leads to an increase in both mortality and morbidity, imposing a significant burden on children and their families in addition to social and financial strains on the population. International and national guidelines have been developed to ensure optimal asthma management, but achieving the objectives of these guidelines is difficult.

This study evaluated the current practice of asthma management and adherence to the guidelines recommended for outpatients in primary health care in Saudi Arabia. It found low adherence to guideline recommendations regarding ICS use, PFM use, AAP, and patient education. It also found that there was a lack of knowledge, allied with poor attitudes, behaviours and inadequate self-efficacy in patients and their families, and a lack of communication between them and their health care providers. These were associated with poor levels of control and a lack of optimal asthma management.

Patients' self-reports underestimate the severity of their asthma and overestimate their control (52, 58, 59). Rabe et al. found that of patients who believed that their asthma was well or completely controlled, 32% to 49% had severe symptoms, while another 39% to 70% had moderate symptoms (58). The findings of this study are consistent with Rabe et al. The majority of children from both Asser and Riyadh classified their asthma as moderately severe or less: 27.1% and 52.6% of respondents in both regions classified their asthma as mild and moderate respectively, with around 50.5% believing their asthma to be well controlled. However, 60.7% and 53.5% respectively reported having woken up at night and having missed school more than once in the past four weeks. In addition, 75.7% reported using a quick relief, and of these 94.3% had used it three times daily or more in the previous four weeks. Seventy-nine of 230 had been admitted to hospital or attended an emergency department in the past three months, with 35.4% of them utilizing these services at least three times. Only 34.8% of participants reported they were using an ICS, and of these only 30% used it regularly. Based on self-reported symptoms, only 14.3% of patients had well controlled asthma, and the actual percentage of patients using corticosteroids, based on their medication list, was 29.6%. These results are in line with the findings of many studies, indicating that asthma management and control remain suboptimal (38, 52, 55, 57-60, 74, 88, 90).

Numerous factors are reported to have a positive influence on asthma control, including patient/ family satisfaction, knowledge, beliefs, behaviour, confidence, ability, education, involvement, follow-up, patients'/ carers' communication with their health care provider, and the availability of AAPs. Asthma control is correlated negatively with disease severity, symptoms, hospital admission and emergency attendance. These factors should be considered when aiming to achieve the main goals of asthma management guidelines.

As a consequence of the underestimation of asthma severity and the subsequent imposition of an inadequate level of control, patients are likely to be inappropriately treated (38, 52, 54, 56, 57, 74). In several studies such as Asthma Insights and Reality (AIR) surveys, the use of  $\beta_2$  agonists was reported to be high, ranging from 39% to 94% in different countries (57, 58). Our findings are no different, with the majority (94.3%) of participants using  $\beta_2$  agonists. This may indicate severity of

disease and/ or lack of control. Furthermore, undertreatment was identified, with 61% of patients using  $\beta_2$  agonists only, compared to 24.8% of patients using both  $\beta_2$  agonists and corticosteroids.

Based on strong evidence, international and national guidelines recommend ICS as a long-term treatment for all patients with persistent asthma. Despite this, low prescribing of ICS is reported worldwide (38, 52, 54, 57-59, 74, 88, 89, 284). Findings of this study confirm this: based on self-reports, only 34.8% of patients used ICS, with 30% of this cohort using them daily; but the proportion actually using corticosteroids was only 29.6% when estimated from a review of the list of medications used. Jentzsch et al. have found that the adherence percentage varies when different methods are used to monitor beclomethasone usage in children (for instance, self-reporting 97.9%, pharmacy records 70.0%, electronic monitoring devices [Dosers] 51.5% and canisters 46.3%); and that adherence is likely to decline over time (285). Winnick et al. reported that children's compliance with medication regimens ranged between 10% and 90% (182).

Adherence to ICS use is a concern in asthma management. A number of studies have reported poor adherence; this is most often found to be less than 50% among children and adolescents (54, 59, 74, 85, 89, 91, 204, 218). Anarella et al. found that 74.4% of respondents reported using ICSs; however, only 38.5% used them daily (85). This study also noted that adults were more likely to adhere to ICS use than children (85). Our study showed no significant difference in rates of adherence among respondents in different age groups. Many factors, relating to patients/ families, professionals, care settings, and the medication itself, have been found to contribute to low ICS adherence levels (59, 85). Although the current study did not determine reasons, a lack of knowledge about medication was observed.

Patient knowledge and understanding of asthma – both the disease and its treatment – are essential elements for better quality care. In general, it has been reported that patients do not distinguish between different medications and the role of each (85). The current study found the same, noting inconsistencies between the patients' responses to questions about control medications and ICS use and the actual medication list recorded. Similar findings were found regarding  $\beta_2$  agonists. For instance, some participants answered 'yes' to the question on current ICS use, yet

according to their medication list did not use any steroid medications; similar findings applied in the case of 'no' and 'unsure' answers. These findings were replicated in the responses to questions about control medication, even when a pictorial list of most asthma medications was attached to help patients and family identify their medication correctly.

It was also observed that many patients recognized their medication by its colour only. While it is recommended that medications be prescribed by their generic names, some professionals use the brand names; this may confuse patients, especially if they are used to a different brand. For example, some patients described salbutamol products as 'the blue inhaler' or 'Ventolin<sup>®</sup>' even when they used a different brand. This clearly suggested that patients and/ or their families were ignorant of the meaning of 'asthma control' or the role of medications – and of the medication they actually used. Language is another concern: most drugs' names are written in English, but Arabic is the mother language in Saudi Arabia. Most asthma medications available worldwide are registered in Saudi Arabia, and the vast range of medications and devices available may confuse patients and even professionals.

Correlation tests show a significant positive relationship between ICS use and the use of a reliever and the frequency of its use, disease severity, symptoms, and possession of PFM and a spacer, as well as of patient/ family behaviour, confidence, education and follow-up. It is related negatively with the level of patient/ family satisfaction and the quality of the information supplied regarding their disease.

Asthma Management Guidelines (national and international) recommend that asthma action plans to be used. In this study, 80% of respondents had an AAP, which is consistent with the findings of Dinakar et al. and Anarella et al. (85, 160), but higher than reported in other studies (38, 57, 89, 90, 149, 167). It was noted that AAPs were not routinely used even if they had been developed for individual patients (90, 168). Leffvre et al. in their review study reported that AAPs have a limited effect on outcomes, and suggested they might not be essential for every patient (154). Quite similar results were previously reported by Sunshine et al. (286). Moreover, patients may lack the confidence to use AAPs (85, 168). As an observation, some patients were under the impression that they had a written AAP while in fact they had a verbal one. A Canadian study found that 80% of physicians prefer verbal over

written AAPs (90). While participants reported a high percentage of having AAPs, the lack of adherence to them, and confusion in practice, may be reflected in this study by low rates of adherence to ICS use, the low use of PFMs, and the lack of medication knowledge among patients. This is despite findings that outcomes of asthma management can be improved with the use of educational programs, including AAPs, monitoring, and medical review.

Even when AAPs are available, how to use them may be misunderstood. In this study, 68.3% of respondents reported that they completely understood their AAPs in regard to how to use their medication when having a severe asthma attack, but only 56.1% completely understood how to adjust their medication. Riyadh patients' answers to questions regarding  $\beta_2$  agonist and ICS use were more consistent with actual medication used as listed than were Asser patients, yet their reported use of AAPs was less than that of Asser patients, which may indicate low adherence to AAPs and/ or ineffective education.

A logistic regression test indicated a significant positive correlation between having an AAP and patients' satisfaction, beliefs, involvement and communication, education, understanding level, perceptions of both information and health care quality, and their use of a spacer. On the other hand, having an AAP had a negative correlation with controller use and side effects (mood change and slow growth rate). There is no relationship between having an AAP and the severity of asthma, admissions to hospital or attendance at EDs, of PFM and ICS use, or medication listed as used.

Anarella et al. reported that 51% of participants in their study owned a PFM, yet only 63% of those used it regularly (85). In the current study, the use of a PFM was found to be very low, with only 20% of participants having a PFM and only 41.3% of these using it regularly. These findings are consistent with several other studies (38, 57, 88, 89, 118, 147, 284, 287). Brand et al. suggested that the majority of children may not need to use home peak flow monitoring (147). Bukstein et al. used PFM in their study to measure its effect on adherence to  $\beta_2$  agonists and on hospitalization among mild asthma patients, and found that the benefits of using a PFM daily was minimal and ineffective (288). In the current study, use of PFMs shows a positive correlation with the severity of asthma and its symptoms, follow-up, education, and medication

used, and a negative correlation with the use of quick reliever inhalers and ICS. Spacer use is reported only by 82 (36.1%) participants, of whom 43.6% are from the age group 5–10 years, compared with 56.4% from the other two groups ( $p=0.016$ ). As with PFM and spacer use, the figure in this study was low. This may be due to the cost of both PFM and spacers, which must be met by the patients or their carers. The discomfort of daily use may be another factor (147); as may be a lack of knowledge on the part of health professionals about the benefits, and even the proper use, of PFMs (190). This is suggested in part by the fact that very few patients had been taught how to use their PFM.

Although 71.8% of patients had access to enough information, only 38.6% rated the quality of education provided as 'very good' or 'excellent'. This suggests that the quality of education and the way information was delivered to patients was poor and/or inadequate. Of those surveyed, 65.8% of participants believed their medication to be useful, 87% reported they could administer the medication and 66.5% reported having been educated about inhaler use, yet only a low percentage were adherent with ICS use. This may indicate that patient self-reports do not reflect reality, and that patient education is not associated with any positive behaviour change.

Interestingly, no relation was found between patients self-reporting their asthma was well controlled and their use of controllers, ICS, quick relievers or the medications listed as used; this may be a result of the low level of ICS prescribing. Nor was a relationship found between the use of an AAP or PFM and ICS and the medication listed as used.

Health services tend to focus on severe asthma patients, although mild asthma is more common and can not only cause morbidity and mortality but may develop to a stage that is believed to be life-threatening (288). The findings of this study suggest that current management focuses on patients with more severe asthma. This is evident in the more frequent use of corticosteroids or other preventive medication by patients with moderate and severe asthma than by those with mild asthma, of whom 79% used  $\beta_2$  agonists only and 12.9% used corticosteroids with or without  $\beta_2$  agonists. This compared with 48.8% and 33.9% use among patients with moderate asthma. Similarly, patients with mild asthma were less likely to be provided with an AAP, or to use a PFM, than those with moderate or severe asthma.

#### **4.15.1 Comparison between other studies and this research, considering that methodologies may differ**

When comparing the findings of the current study with other studies, such as the review of AIR surveys across in 29 countries (58), it should be noted that there are differences in the methodology together with cultural variations between the countries reviewed and Saudi Arabia that may affect the results. Despite such differences, it is generally found that patients' self-reports underestimate the severity of their asthma and overestimate their level of control (58, 59). Self-classified severity in Saudi Arabia was higher than that reported in other places such as the United States, Western Europe, Asia-Pacific, Japan, and Central and Eastern Europe. For instance, 6.1%, 27% and 52.6% of Saudi respondents classified their asthma as intermittent, mild, and moderate respectively, compared with 43%, 16% and 22% in the United States (58). Hospital admissions and ER attendances, limitations of daily activity and school absences were higher in KSA. Beta agonist use is considered high in some studies, yet in KSA it was found to be higher still. Using preventive medication such as ICS and possession of a PFM, as well as adherence, in the current study was low and in the main consistent with other studies' findings. The current study's findings indicate that there are large differences between patients' symptoms and their estimates of requisite control levels.

Health care for Saudi patients is available free of charge. It is compulsory for families to register with a single PHC centre, but adherence to this regulation is poor and patients may visit more than one setting, including ED – which some patients may use as a clinic. While this may reflect a high severity of asthma, it may also indicate lack of knowledge and poor behaviours in both patients and their families – perhaps a result of inadequate care.

It is clear that the findings in this research are consistent with the third hypothesis of this study: that the current practice of asthma management in Saudi Arabia primary health care centres is not in compliance with the national protocol for asthma management. There are no significant differences discovered between gender responses, except in the possession of an AAP and the degree of understanding about how to adjust medication when asthma worsens. These findings support the second

hypothesis: current patterns of asthma management in children and adolescents in KSA are not influenced by gender.

#### **4.15.2 Differences and similarities between Asser and Riyadh regions**

Although this study was not designed to estimate prevalence, it did reveal that the prevalence of severe asthma in Riyadh patients was higher than in Asser patients (21.4% vs.7.1%;  $p=0.000$ ). Studies have found differences between rural and urban populations (289, 290); Sapan et al. have suggested that differences in asthma prevalence between cities can be explained by air pollution and environment (291). Patients from both Riyadh and Asser reported similar increases in symptoms during winter, and similar reductions in both summer and fall; however, in spring Asser patients were more likely to suffer from asthma symptoms than Riyadh patients ( $p=0.001$ ). Comparing two seasons, winter and spring, with respect to day and night symptoms, physical daily activity, and emergency attendance, Fueyo et al. found a high frequency of daytime symptoms and physical activity limitation in both seasons, although all manifestations of asthma were reported to be worse in winter. In general, it was found that asthma control among patients was slightly poorer in winter than in spring (60). In the current study, school absence and limitations on daily activities were reported to be significant during spring and summer, but there was no relationship with patients' level of control. This may indicate a climate effect.

A variation in practice in PHCs has been reported within and between countries. In both Riyadh and Asser there was lack of consistency in asthma management. Riyadh patients were users of both medication, particularly inhaler corticosteroids, and spacers and PFM's, suggesting that facilities and medication availability in Riyadh are better, and more choices are available, than in Asser. Moreover, the economic advantages of Riyadh include the availability of private health facilities. Despite this, patient education including the use of AAP was more common in Asser ( $p=0.014$ ), and they were more likely to understand what they had to do in an asthma attack ( $p=0.009$ ). Access to information and involvement in decision-making, as well as the level of attention of the health care provider, were all higher in Asser, positively affecting patient behaviour and ability. Asser patients had more confidence in adjusting their medications and high self-efficacy, with fewer control problems. Education combined with an AAP contributed positively to patients' self-efficacy,

attitude, and communication, which led to improved asthma control levels. It is likely that a lower patient load on rural physicians allows them to spend more time with each patient, developing a good relationship with patients and carers.

Riyadh patients were found to be more aware of the medications they used such as  $\beta_2$  agonists and ICSs, shown by the greater consistency between their descriptions of medications used and their actual medication list. There were significant differences in the use of  $\beta_2$  agonists between regions, with Asser at 70.8% and Riyadh at 51.3% ( $p=0.003$ ). In addition, there were significant differences between both regions in the use of corticosteroids and  $\beta_2$  agonists, with or without other medications. Thirty-four (29.1%) Riyadh patients were receiving a corticosteroid and  $\beta_2$  agonist, compared with 12.4% of Asser patients ( $p=0.002$ ). However, self-reported good asthma control amongst Asser patients (57.5%) was higher than amongst Riyadh patients ( $p=0.035$ ). Compliance with ICS use was found to be poor in both regions with no significant difference found, although of the 80 patients who reported using ICS, only 30% used their medication daily. These findings are not consistent with the study hypothesis: those current patterns of asthma management in children and adolescents in KSA are not influenced by geographical region.

Some limitations to this study should be reported. Firstly, this study is based on self-reports; it may not reflect the patients' and/ or families' actual situations, behaviours and practices. To counter this, some questions were repeated in a different style, in order to test patients' responses for consistency. The four weeks prior to the survey were chosen as the test period, on the assumption that patients and carers would likely remember them most accurately. In addition, anonymous responses were accepted, to encourage truthful answers. It was expected that responses would reflect practices accurately as anonymity meant that patients were able to record negative responses. In fact, the findings were consistent with those of other studies in most aspects, such as low adherence to asthma management.

This study was conducted in the PHCCs of two from a total of thirteen regions, so results may have limited generalizability for children and adolescent patients and families in different regions of KSA, or who may attend different kinds of clinics such as secondary clinics. However, these two regions combined share most of the characteristics of KSA, such as urban, suburban and rural populations, geography,

climate, high and low population densities and customs. Furthermore, the organization system recommends moderate and severe asthma patients may be treated at a secondary clinic than return to PHCCs for follow-up.

Patients were unlikely to have electronic medical records in the PHCCs for the researcher to confirm that the information they provided, such as asthma severity and medication, were accurate. This is especially so as medication instructions and labels are written in English, which is not the main language. For this reason a visual colour copy of medication was attached as to help patients identify and list their medications.

#### **4.16 Conclusions**

Asthma control in children and adolescents in KSA is still suboptimal. Non-adherence to guidelines in many patterns was reported. These can be clearly seen in the survey responses, in which most patients report that they continue to suffer from symptoms that limit their daily activities, affect school attendance, and require constant use of health care facilities. The majority of participants (85.7%) had at least one control problem. Furthermore, low use of controller and other self-management skills such as PFM and spacer use was reported. A significant finding of this research is that while the Saudi National Protocol for the Management of Asthma (URL: <http://www.sinagroup.org>) recommend corticosteroids as the first-line treatment in chronic asthma, their use was suboptimal: only 21 of 113 (18.6%) Asser patients used inhaled steroids and 47 of 117 (40.2%) Riyadh patients ( $p = 0.0001$ ).

Not only low use was found, but low adherence. Slightly more than one third of participants reported using ICS, and only 30% of them used it daily. One fifth of participants owned PFMs, but only 42.3% of them used them regularly even though they are particularly recommended for patients with moderate to severe asthma. Although AAP ownership was high among participants, non-adherence and misunderstanding were observed. Variations in regional practice in PHCs have been reported. Moreover, patients'/ carers' lack of knowledge, self-efficacy and behaviour, as well as limited involvement and lack of communication with health care providers, were reported. An intervention programme coupled with an asthma action plan and motivation may improve knowledge and self-efficacy, and so change

the behaviours of patients and their carers, contributing to better self-management and, ultimately, improved health outcomes.

## Chapter 5

### Phase Two: Physician Survey – Results and Discussion

#### 5.1 Administration of Physician Survey

**Table 5.1 Administration of survey**

Region		Asser	Riyadh	Total	P value
Questionnaires administered		60 N (%)	60 N (%)	120 N (%)	
Responses		52 (86.7)	54 (90)	106 (88.3)	
Usable responses	Male	30 (69.8)	26 (59.0)	56 (52.8)	
	Female	13 (30.2)	18 (41.0)	31 (29.2)	
	Total	43 (71.7)	44 (73.3)	87 (82.1)	
Nationality	Saudi	0 (0.0)	5 (11.4)	5 (5.7)	0.023
	Non-Saudi	43 (100.0)	39 (88.6)	82 (94.3)	
Working place	Government	43 (100.0)	40 (90.9)	83 (95.4)	0.043
	Private	0 (0.0)	4 (9.1)	4 (4.6)	
Age	31-39 yrs.	14 (32.6)	13 (29.5)	27 (31)	.082
	40-49 yrs.	20 (46.5)	19 (43.2)	39 (44.8)	.905
	Over 50 yrs.	9 (20.9)	10 (22.7)	19 (21.8)	.466
	Total	43 (100.0)	42 (95.5)*	85 (97.7)	

\*Data missing for Riyadh physicians

Sixty questionnaires were administered in each region (Asser and Riyadh), with 52 (86.7%) and 54 (90%) returned respectively. Of these, 19 (18.0%) were excluded as they were incomplete. The overall response rate was 72.5% (87 of 120); the majority of respondents were male (male 56, female 31). The majority (94.3%) of participating physicians were non-Saudi. Only five Riyadh physicians were Saudi; none in Asser were (p=0.023). Eighty-three (95.4%) were working in government centres and 4 (4.6%) in private centres. There was no difference in age distribution between physicians between the regions; but most respondents (44.8%) were aged 40–49 years.

## 5.1.1 Physicians' characteristics

### 5.1.1.1 Physicians' characteristics by region

**Table 5.2 Physicians' characteristics by region**

Physicians' characteristics		Asser N (%)	Riyadh N (%)	Total N (%)	P value
Physician's specialty	Family	13 (30.2)	16 (36.4)	29 (33.3)	0.22
	General	25 (58.1)	27 (61.4)	52 (59.8)	
	Other	5 (11.6)	1 (2.3)	6 (6.9)	
	Total	43	44	87	
Duration of practice	0 -10 years	17 (39.5)	15 (34.1)	32 (36.8)	0.61
	11- 20 years	17 (39.5)	22 (50.0)	39 (44.8)	
	Over 20 years	9 (20.9)	7 (15.9)	16 (18.4)	
	Total	43	44	87	
Physician's practice is predominantly	University associated	10 (23.3)	11 (25.0)	21 (24.1)	0.14
	Community-based group practice	24 (55.8)	19 (25.0)	43 (49.4)	
	Community-based solo practice	2 (4.7)	9 (20.5)	11 (12.6)	
	Other	7 (16.3)	5 (11.4)	12 (13.8)	
	Total	43	44	87	
Conference attendances	None or one every 5 years	11 (25.6)	20 (45.5)	31 (35.6)	0.02
	Once at least every 2 years	28 (65.1)	15 (34.1)	43 (49.4)	
	Once a year or more	4 (9.3)	9 (20.5)	13 (14.9)	
	Total	43	44	87	
Personally, ever experienced asthma-like symptoms?	Yes	11 (25.6)	13 (29.5)	24 (27.6)	0.68
	No	32 (74.4)	31 (70.5)	63 (72.4)	
	Total	43	44	87	

Data in Table 2 reveal no significant difference between regions regarding physicians' specialties. Family specialists numbered 16 (36.4%) and 13 (30.2%) in Riyadh and Asser respectively, and around 60% in both regions were general specialists while 7% practised in other specialties. Thirty-nine (44.8%) physicians had 11–20 years' experience, and of these 22 (50.0%) were in Riyadh and 17 (39.5%) in Asser; 9 (20.9%) and 7 (15.9%) from Asser and Riyadh had spent more than 20 years in the same practice. More than half of the Asser physicians (55.8%)

mainly worked in community-based group practices, as did 25% of Riyadh physicians. Around one quarter of both regions' physicians had a university-associated practice. Riyadh physicians (nine, or 20.5%) were more likely to have their own practice than those from Asser (two, or 4.7%). There were no statistically significant differences between regions regarding medical experience. However, there was a significant difference in the number of conferences attended ( $p=0.015$ ). Approximately half the physicians (49.4%) reported that they attended at least one conference every two years: 28 (65.1%) from Asser and 15 (34.1%) from Riyadh, while 4 (9.3%) and 9 (20.5%) attended one or more a year. More than one third of both regions' physicians (25.6% in Asser and 45.5% in Riyadh) reported attending none or less than one every 5 years (35.6%).

#### 5.1.1.2 Physicians' characteristics by gender

**Table 5.3 Physicians' characteristics by gender**

		Male N (%)	Female N (%)	Total N (%)	P value
Physician's specialties	Family	19 (33.9)	10 (32.3)	29 (33.3)	0.15
	General	31 (55.4)	21 (67.7)	52 (59.8)	
	Other	6 (10.7)	0 (0.0)	6 (6.9)	
	Total	56	31	87	
Duration of practice	0 -10 years	17 (30.4)	15 (48.4)	32 (36.8)	0.02
	11- 20 years	24 (42.9)	15 (48.4)	39 (44.8)	
	Over 20 years	15 (26.8)	1 (3.2)	16 (18.4)	
	Total	56	31	87	
Physician's practice is predominantly	University- associated	15 (26.8)	6 (19.4)	21 (24.1)	0.53
	Community-based group practice	28 (50.0)	15 (48.4)	43 (49.4)	
	Community-based solo practice	5 (8.9)	6 (19.4)	11 (12.6)	
	Other	8 (14.3)	4 (12.9)	12 (13.8)	
	Total	56	31	87	
Conference attendances	None or one every 5 years	15 (26.8)	16 (51.6)	31 (35.6)	0.07
	One at least every 2 years	32 (57.1)	11 (35.5)	43 (49.4)	
	Once a year or more	9 (16.1)	4 (12.9)	13 (14.9)	
	Total	56	31	87	
Personally, ever experienced asthma-like symptoms?	Yes	16 (28.6)	8 (25.8)	24 (27.6)	0.78
	No	40 (71.4)	23 (74.2)	63 (72.4)	
	Total	56	31	87	

There was no significant difference between genders regarding physicians' specialties. Of the family specialists, 33.9% were male and 32.3% female, and 67.7% of females were general physicians, compared with 55.4% of males. There were significant differences in the level of experience ( $p=0.019$ ), particularly evident in the category of experience >20 years. Males were more than six times more likely to have this level of experience than their female counterparts (26.8% vs. 3.3%). Female physicians were also less frequent conference attendees, with more than 50% reporting attending none or less than one every 5 years (males 26.8%).

### 5.1.2 Physicians' access to guidelines and other assistance

**Table 5.4 Regional differences in physicians' access to guidelines and other assistance**

	Answer option	Asser N (%)	Riyadh N (%)	Total N (%)	P value
A nurse or other health care professional to assist N= 87	Yes	34 (79.1)	16 (43.2)	53 (60.9)	0.001
	No	9 (20.9)	25 (56.8)	34 (39.1)	
	Total	43 (100.0)	44 (100.0)	87 (100.0)	
Have access to The National Protocol for the Management of Asthma N= 87	Yes	40 (93.0)	28 (63.6)	68 (78.2)	0.001
	No	3 (7.0)	16 (36.4)	19 (21.8)	
	Total	43 (100.0)	44 (100.0)	87 (100.0)	
Type of access to national guideline N= 68	Hard copy	27 (67.5)	24 (85.7)	51 (75.0)	0.16
	Internet access	6 (15.0)	3 (10.7)	9 (13.2)	
	Both	7 (17.5)	1 (3.6)	8 (11.8)	
	Total	40 (100.0)	28 (100.0)	68 (100.0)	
Access to other guidelines N= 87	Yes	16 (37.2)	17 (38.6)	33 (37.9)	0.89
	No	27 (62.8)	27 (61.4)	54 (62.1)	
	Total	43 (100.0)	44 (100.0)	87 (100.0)	

As can be seen from the data presented in Table 5.12, Physicians in Asser (79.1%) had greater access to the assistance of a nurse or other health care worker than these in Riyadh (43.2%;  $p=0.001$ ). Further there was a significant difference between regions regarding National Guideline access ( $p=0.001$ ). A large majority of Asser physicians (93.0%) reported they had access to the guidelines, compared with 63.6% of Riyadh physicians; the majority in both regions accessed hard copy. Only 3.6% of

Riyadh physicians had both hard copy and Internet access, compared with 17.5% in Asser. Around one third of the physicians in both regions reported having access to alternative guidelines; however, Asser physicians had better access via Internet (15.0% versus 10.7%)

## 5.2 Patient Education Strategies

Physicians were asked about their usual approach to providing education on asthma management to their patients.

### 5.2.1 General information about asthma

Physicians were asked about their usual approach to providing general information about asthma to patients with different disease severity.

**Table 5.5 Asthma: general information**

Educational matter	Region	Physicians N=87 (Asser =43; Riyadh =44)		
		Asthma Severity		
		Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Asser	1 (2.3)	0 (0.0)	1 (2.3)
	Riyadh	2 (4.5)	1 (2.3)	1 (2.3)
	Total	3 (3.4)	1 (1.1)	2 (2.3)
I provide this information only if the patient asks	Asser	10 (23.3)	5 (11.6)	1 (2.3)
	Riyadh	11 (25.0)	6 (13.6)	3 (6.8)
	Total	21 (24.1)	11 (12.6)	4 (4.6)
I provide this information without waiting for the patient to ask.	Asser	32 (74.4)	38 (88.4)	41 (95.3)
	Riyadh	31 (70.5)	37 (84.1)	40 (90.9)
	Total	63 (72.4)	75 (86.2)	81 (93.1)
Difference between regions p value	----	0.825	0.579	0.606

Note: more detailed data are presented in Appendix F

Table 5.5 illustrates the usual approach of physicians to providing general information about asthma to patients with mild, moderate, and severe asthma. There was no significant difference based on region, although a significant difference based on gender ( $P=0.004$ ) amongst Riyadh physicians was found in the case of mild asthma. Further, in Riyadh 81% of female physicians provided asthma patients with information only if they were asked, compared with 18.8% of males; 71% of male physicians took the initiative in providing information to patients without being asked, compared with 29.0% of females.

### 5.2.2 Information about prescribed asthma medication

Physicians were asked about their usual approach to providing information about prescribed asthma medication to patients with different disease severity.

**Table 5.6 Information about prescribed asthma medication**

Educational matter	Regions	Physicians N=87 (Asser =43 and Riyadh =44)		
		Asthma severity		
		Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Asser	0 (0.0)	0 (0.0)	2 (4.7)
	Riyadh	4 (9.1)	1 (2.3)	1 (2.3)
	Total	4 (4.6)	1 (1.1)	3 (3.4)
I provide this information only if the patient asks	Asser	13 (30.2)	5 (11.6)	2 (4.7)
	Riyadh	15 (34.1)	13 (29.5)	8 (18.2)
	Total	28 (32.2)	18 (20.7)	10 (11.5)
I provide this information without waiting for the patient to ask	Asser	30 (69.8)	38 (88.4)	39 (90.7)
	Riyadh	25 (56.8)	30 (68.2)	35 (79.5)
	Total	55 (63.2)	68 (78.2)	74 (85.1)
Difference between region p value	----	0.101	0.064	0.126

Note: more detailed data are presented in Appendix F

Table 5.6 reveals no significant difference based on region or gender, although Asser physicians were generally more likely to provide information than Riyadh

physicians: for example, for patients with moderate and severe asthma respectively, 29.5% and 45.5% of Riyadh physicians provided medication information only if they were asked, compared with 11.6% and 4.7% of Asser physicians; 88.4% and 90.7% of Asser physicians took the initiative in providing information without being asked, compared with 68.2% and 79.5% of Riyadh physicians for moderate and severe cases respectively.

### 5.2.3 Demonstrating the proper use of inhalational device

Physicians were asked about their usual approach to demonstrating the use of inhalational devices to patients with different disease severity.

**Table 5.7 Demonstrating the proper use of inhalational device**

Educational matter	Region	Physicians N=87 (Asser =43; Riyadh =44)		
		Asthma severity		
		Mild N (%)	Moderate N (%)	Severe N (%)
What is your usual approach to demonstrating the proper use of inhalational device (e.g. metered dose inhaler, spacer device, turbuhaler) to patient whose asthma is...	Asser	2 (4.7)	0 (0.0)	2 (4.7)
	Riyadh	2 (4.5)	1 (2.3)	1 (2.3)
	Total	4 (4.6)	1 (1.1)	3 (3.4)
I do not provide this information	Asser	5 (11.6)	3 (7.0)	3 (7.0)
	Riyadh	11 (25.0)	6 (13.6)	4 (9.1)
	Total	16 (18.4)	9 (10.3)	7 (8.0)
I provide this information only if the patient asks	Asser	36 (83.7)	40 (93.0)	38 (88.4)
	Riyadh	31 (70.5)	37 (84.1)	39 (88.6)
	Total	67 (77.0)	77 (88.5)	77 (88.5)
I provide this information without waiting for the patient to ask	Asser	36 (83.7)	40 (93.0)	38 (88.4)
	Riyadh	31 (70.5)	37 (84.1)	39 (88.6)
	Total	67 (77.0)	77 (88.5)	77 (88.5)
Difference between region p value	_ ----	0.271	0.349	0.788

Note: more detailed data are presented in Appendix F

Table 5.7 reveals no significant difference based on region or gender; however, Asser physicians were generally more likely to provide information than Riyadh physicians. For example, in mild and moderate asthma, 25.0% and 13.6% of Riyadh physicians demonstrated the inhalation device only if they were asked to, compared

with 11.6% and 7.0% of Asser physicians respectively, who were more likely to take the initiative and demonstrate the devices without being asked.

#### 5.2.4 Information about asthma triggers

Physicians were asked about their usual approach to providing information about asthma triggers to patients with different disease severity.

**Table 5.8 Information regarding asthma triggers**

Educational matter	Region	Physicians N=87 (Asser =43; Riyadh =44)		
		Asthma severity		
		Mild N (%)	Moderate N (%)	Severe N (%)
What is your usual approach to providing information on the avoidance of asthma triggers and environmental control (e.g. control of house dust mites, mould, etc.) to patients whose asthma is...	Asser	0 (0.0)	0 (0.0)	2 (4.7)
	Riyadh	0 (0.0)	0 (0.0)	0 (0.0)
	Total	0 (0.0)	0 (0.0)	2 (2.3)
I do not provide this information	Asser	3 (7.0)	2 (4.7)	0 (0.0)
	Riyadh	4 (9.1)	4 (9.1)	3 (6.8)
	Total	7 (8.0)	6 (6.9)	3 (3.4)
I provide this information only if the patient asks	Asser	40 (93.0)	41 (95.3)	41 (95.3)
	Riyadh	40 (90.9)	40 (90.9)	41 (93.2)
	Total	80 (92.0)	81 (93.1)	82 (94.3)
I provide this information without waiting for the patient to ask	Asser	0 (0.0)	0 (0.0)	0 (0.0)
	Riyadh	0 (0.0)	0 (0.0)	0 (0.0)
	Total	0 (0.0)	0 (0.0)	0 (0.0)
Difference between region p value	_ ----	0.717	0.414	0.083

Note: more detailed data are presented in Appendix F

Table 5.8 reveals no significant differences based on region or gender, with the majority of physicians in both regions providing information about the avoidance of asthma triggers and environmental control to patients without being asked.

### 5.2.5 Information about asthma warning signs

Physicians were asked about their usual approach to providing information about warning signs to patients with different disease severity.

**Table 5.9 Information about asthma warning signs**

Educational matter	Region	Physicians N=87 (Asser =43 and Riyadh =44)		
		Asthma severity		
		Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Asser	1 (2.3)	0 (0.0)	0 (0.0)
	Riyadh	9 (20.5)	6 (13.6)	5 (11.4)
	Total	10 (11.5)	6 (6.9)	5 (5.7)
I provide this information only if the patient asks	Asser	13 (30.3)	5 (11.6)	1 (2.3)
	Riyadh	10 (22.7)	4 (9.1)	2 (4.5)
	Total	23 (26.4)	9 (10.3)	3 (3.4)
I provide this information without waiting for the patient to ask	Asser	29 (67.4)	38 (88.4)	42 (97.7)
	Riyadh	25 (56.8)	34 (77.3)	37 (84.1)
	Total	54 (62.1)	72 (82.8)	79 (90.8)
Difference between region p value	----	0.029	0.042	0.060

Note: more detailed data are presented in Appendix F

Table 5.9 reveals significant differences based on region, regarding both mild and moderate asthma ( $p=0.029$  and  $0.042$  respectively). Asser physicians provided information more frequently than Riyadh physicians: for example, for mild asthma, 30.3% of physicians in Asser provided information only when asked, compared with 22.7% of physicians in Riyadh. In contrast, with moderate asthma, 13.6% of Riyadh physicians did not provide information at all, compared with 0.0% of Asser physicians, while 77.3% of Riyadh physicians provided patients with information without being asked, compared with 88.4% in Asser. While there was no regional difference in practice based on gender, there was a gender difference in the case of moderate asthma within the groups as a whole ( $p = 0.015$ ); see Appendix F. Female physicians were found to be less likely to provide information on asthma warning signs than their male counterparts.

### 5.2.6 Information about asthma action plans based upon symptoms

Physicians were asked about their usual approach to providing patients with information about an asthma action plan based upon the severity of their symptoms.

**Table 5.10 Information about asthma action plans based upon symptoms**

Educational matter	Region	Physicians N=87 (Asser =43; Riyadh =44)		
		Asthma severity		
Mild N (%)		Moderate * N (%)	Severe N (%)	
What is your usual approach to providing an asthma action plan based upon symptoms (e.g. written plan that outlines steps to control/ regain control of asthma including to increase dose of drug) to patient with...	Asser	6 (14.0)	3 (7.1)	4 (9.3)
	Riyadh	19 (43.2)	12 (27.3)	9 (20.5)
	Total	25 (28.7)	15 (17.4)	13 (14.9)
I do not provide this information	Asser	21 (48.8)	11 (26.2)	6 (14.0)
	Riyadh	9 (20.5)	12 (27.3)	8 (18.2)
	Total	30 (34.5)	23 (26.7)	14 (16.1)
I provide this information only if the patient asks	Asser	16 (37.2)	28 (66.7)	33 (76.7)
	Riyadh	16 (36.4)	20 (45.5)	27 (61.4)
	Total	32 (36.8)	48 (55.8)	60 (69.0)
I provide this information without waiting for the patient to ask	Asser	16 (37.2)	28 (66.7)	33 (76.7)
	Riyadh	16 (36.4)	20 (45.5)	27 (61.4)
	Total	32 (36.8)	48 (55.8)	60 (69.0)
Difference between region p value	----	0.003	0.034	0.247

Note: more detailed data are presented in Appendix F.

\* One set of data missing (Asser Moderate).

Table 5.10 reveals significant differences in regional practices for both mild and moderate asthma ( $p=0.003$  and  $0.034$ , respectively). Asser physicians were more likely to provide their patients with an AAP than Riyadh physicians, and more likely to provide one without being asked. A statistically significant difference was seen in the responses of male and female physicians in Riyadh concerning severe asthma cases ( $p=0.017$ ; see Appendix (F)). There was also a significant difference in the provision of an AAP between male and female physicians within the groups as a whole, particularly in the case of severe asthma ( $p=0.037$ ). Male physicians provided AAPs based upon symptoms to patients with severe asthma more than females did.

Statistically significant differences were also found between female physicians in each region in the case of mild asthma ( $p=0.024$ ).

### 5.2.7 Peak flow monitoring

Physicians were asked about their usual approach to providing information about monitoring peak flow rates (e.g. purpose, use of peak flow meters and proper recording of peak flow rates) to patients with different disease severity.

**Table 5.11 Peak flow monitoring**

Educational matter	Regions	Physicians N=87 (Asser =43 and Riyadh =44)		
		Asthma severity		
		Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Asser	9 (20.9)	5 (11.6)	4 (9.3)
	Riyadh	19 (43.2)	14 (31.8)	12 (27.3)
	Total	28 (32.2)	19 (21.8)	16 (18.4)
I provide this information only if the patient asks	Asser	15 (34.9)	6 (14.0)	7 (16.3)
	Riyadh	13 (29.5)	14 (31.8)	10 (22.7)
	Total	28 (32.2)	20 (23.0)	17 (19.5)
I provide this information without waiting for the patient to ask	Asser	19 (44.2)	32 (74.4)	32 (74.4)
	Riyadh	12 (27.3)	16 (36.4)	22 (50.0)
	Total	31 (35.6)	48 (55.2)	54 (62.1)
Difference between region p value	----	0.071	0.002	0.041

Note: more detailed data are presented in Appendix F

Table 5.11 reveals significant regional differences regarding information about peak flow monitoring to both moderate and severe asthma sufferers ( $p=0.002$  and  $0.041$  respectively). Asser physicians provided information about monitoring peak flow rates to patients more often than Riyadh physicians; for example, in the case of moderate asthma, 74.4% of physicians in Asser provided information without request, compared with 36.4% of physicians in Riyadh. Further, 31.8% of Riyadh

physicians did not provide information at all compared with 11.6% of Asser physicians; in the case of severe asthma, 27.3% of Riyadh physicians did not provide information at all, compared with 9.3% of Asser physicians, 74.4% of whom provided information without waiting for patient requests. Only 50.0% of Riyadh physicians did so. Whilst there were no significant differences based on gender within or between regions, there were significant differences in the case of moderate asthma between female physicians, with those in Riyadh less likely to discuss peak flow monitoring with their patients than their Asser counterparts ( $p=0.01$ ).

#### 5.2.7.1 Asthma action plan based upon peak expiratory flow rates in conjunction with symptoms

Physicians were asked about their usual approach to providing information about an AAP based upon peak expiratory flow rates in conjunction with symptoms to patients with different severities of disease.

**Table 5.12 Asthma action plan based upon peak expiratory flow rates in conjunction with symptoms**

Educational matter	Region	Physicians N=87 (Asser =43 and Riyadh =44)		
		Asthma severity		
		Mild N (%)	Moderate N (%)	Severe* N (%)
I do not provide this information	Asser	9 (20.9)	8 (18.6)	9 (20.9)
	Riyadh	23 (52.3)	17 (38.6)	14 (32.6)
	Total	32 (36.8)	25 (28.7)	23 (26.7)
I provide this information only if the patient asks	Asser	15 (34.9)	8 (18.6)	5 (11.6)
	Riyadh	11 (25.0)	13 (29.5)	9 (20.9)
	Total	26 (29.9)	21 (24.1)	14 (16.3)
I provide this information without waiting for the patient to ask	Asser	19 (44.2)	27 (62.8)	29 (67.4)
	Riyadh	10 (22.7)	14 (31.8)	20 (46.5)
	Total	29 (33.3)	41 (47.1)	49 (57.0)
Difference between region p value	----	0.009	0.041	0.143

Note: more detailed data are presented in Appendix F.

\* One set of data missing (Riyadh severe)

Table 5.12 reveals significant differences based on region for both mild and moderate asthma ( $P=0.009$  and  $0.041$  respectively). Asser physicians provided patients with an AAP, based upon peak expiratory flow rates in conjunction with symptoms, more often than Riyadh physicians: for example, for patients with mild asthma, 44.2% of physicians in Asser provided information without request, compared with 22.7% of physicians in Riyadh, 52.3% of whom did not provide information at all. Only 20.9% of Asser physicians provided no AAP. For patients with moderate asthma, 38.6% of Riyadh physicians provided no information at all, compared with 18.6% of Asser physicians. While 62.8% of Asser physicians provided patients with information without request, only 31.8% of physicians from Riyadh did so. Statistically significant differences are also revealed in the responses of male and female physicians in Riyadh in the cases of moderate and severe asthma ( $p=0.037$  and  $0.012$  respectively; see Appendix F). Male physicians provided an asthma action plan to patients with severe asthma more frequently than females: for example, 13.8% of male physicians provided information when the patient asked, compared with 2.3% of females; and 44.8% did so without patient request, compared with 24.1% of female physicians.

Further statistically significant differences between female physicians are shown below:

- Asser female vs. Riyadh female physicians in the case of mild asthma;  $p=0.004$ .
- Asser female vs. Riyadh female physicians in the case of moderate asthma;  $p=0.008$ .
- Asser female vs. Riyadh female physicians in the case of severe asthma;  $p=0.049$ . Asser female physicians were more likely to provide AAPs than their counterparts in Riyadh (data not shown).

## 5.2.8 Community non-profit organizations information providers

Physicians were asked about their usual practices in providing information about community non-profit organizations that offered support to asthma patients.

**Table 5.13 Information about community non-profit organizations**

Educational matter	Region	Physicians N=87 (Asser =43 and Riyadh =44)		
		Asthma severity		
		Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Asser	11 (25.6)	9 (20.9)	9 (20.9)
	Riyadh	23 (52.3)	19 (43.2)	17 (38.6)
	Total	34 (39.1)	28 (32.2)	26 (29.9)
I provide this information only if the patient asks	Asser	20 (46.5)	20 (46.5)	15 (34.9)
	Riyadh	12 (27.3)	9 (20.5)	9 (20.5)
	Total	32 (36.8)	29 (33.3)	24 (27.6)
I provide this information without waiting for the patient to ask	Asser	12 (27.9)	14 (32.6)	19 (44.2)
	Riyadh	9 (20.5)	16 (36.4)	18 (40.9)
	Total	21 (24.1)	30 (34.5)	37 (42.5)
Difference between region p value	----	0.036	0.020	0.137

Note: more detailed data are presented in Appendix F

Table 5.13 reveals significant differences in how often physicians provided information about community non-profit organizations to patients with mild and moderate asthma ( $p=0.036$  and  $0.020$  respectively). Asser physicians provided this information more often than Riyadh physicians; for example, with patients with mild asthma, 27.9% of physicians in Asser provided the information without request, compared with 20.5% of physicians in Riyadh. Further, 52.3% of Riyadh physicians provided no information at all, compared with 25.6% of Asser physicians. In contrast, for patients with moderate asthma, 43.2% of Riyadh physicians provided no information at all compared with 20.9% of Asser physicians, but 46.5% of Asser

physicians provided information when it was requested by patients, compared with 20.5% in Riyadh. There were no significant differences based on gender, except in the case of mild asthma in Asser ( $p=0.034$ ), when female physicians provided information to patients with mild asthma more frequently than males: 16.3% compared with 11.6%. In contrast, 39.5% of male physicians provided it when the patient asked, compared with 11.6% of females; and 18.6% of males did not provide the information, compared with 7.0% of female physicians.

### **5.2.9 Regional physicians' scores**

The answers to the nine questions in the educational section were given a numerical score and then summed to give a score of physicians' performances, shown in Table 5.14. Answers to each question were rated as follows: 1= 'I do not provide this information', 2= 'I provide this information only if the patient asks', and 3= 'I provide this information without waiting for the patient to ask'. The minimum total scores is nine, indicating a lack of asthma education provided by physicians; the maximum total score of 27 indicates adequate education of their patients by physicians.

**Table 5.14 Physicians' educational performances based on the severity of patients' asthma**

Score	Mild			Moderate			Severe		
	Asser N= 43	Riyadh N= 44	Total N= 87	Asser* N= 42	Riyadh N= 44	Total N= 86	Asser N= 43	Riyadh N= 43	Total N= 86
12	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.3)	0 (0.0)	1 (1.2)
13	1 (2.3)	0 (0.0)	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.3)	0 (0.0)	1 (1.2)
14	0 (0.0)	2 (4.5)	2 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
15	0 (0.0)	5 (11.4)	5 (5.7)	0 (0.0)	2 (4.5)	2 (2.3)	0 (0.0)	1 (2.3)	1 (1.2)
16	1 (2.3)	5 (11.4)	6 (6.9)	0 (0.0)	4 (9.1)	4 (4.7)	0 (0.0)	1 (2.3)	1 (1.2)
17	0 (0.0)	2 (4.5)	2 (2.3)	0 (0.0)	3 (6.8)	3 (3.5)	0 (0.0)	1 (2.3)	1 (1.2)
18	3 (7.0)	2 (4.5)	5 (5.7)	1 (2.4)	2 (4.5)	3 (3.5)	0 (0.0)	2 (4.7)	2 (2.3)
19	2 (4.7)	3 (6.8)	5 (5.7)	4 (9.5)	0 (0.0)	4 (4.7)	1 (2.3)	4 (9.3)	5 (5.8)
20	1 (2.3)	4 (9.1)	5 (5.7)	2 (4.8)	4 (9.1)	6 (7.0)	2 (4.7)	3 (7.0)	5 (5.8)
21	4 (9.3)	2 (4.5)	6 (6.9)	1 (2.4)	3 (6.8)	4 (4.7)	2 (4.7)	1 (2.3)	3 (3.5)
22	8 (18.6)	6 (13.6)	14 (16.1)	3 (7.1)	7 (15.9)	10 (11.6)	2 (4.7)	4 (9.3)	6 (7.0)
23	7 (16.3)	2 (4.5)	9 (10.3)	3 (7.1)	3 (6.8)	6 (7.0)	3 (7.0)	5 (11.6)	8 (9.3)
24	7 (16.3)	2 (4.5)	9 (10.3)	3 (7.1)	1 (2.3)	4 (4.7)	0 (0.0)	4 (9.3)	4 (4.7)
25	2 (4.7)	3 (6.8)	5 (5.7)	3 (7.1)	3 (6.8)	6 (7.0)	4 (9.3)	2 (4.7)	6 (7.0)
26	1 (2.3)	5 (11.4)	6 (6.9)	12 (28.6)	5 (11.4)	17 (19.8)	13 (30.2)	4 (9.3)	17 (19.8)
27	6 (14.0)	1 (2.3)	7 (8.0)	10 (23.8)	7 (15.9)	17 (19.8)	14 (32.6)	11 (25.6)	25 (29.1)
<b>P</b>	0.015			0.051			0.121		

\* one set of data missing in each

Table 5.14 reveals significant differences based on region with regard to education of patients with mild asthma ( $p=0.015$ ). Asser physicians are more likely to provide asthma education to mild asthma patients than Riyadh physicians: for example, 72.1% of Asser physicians scored 22 or more on a scale of 27, compared with 43.2% of Riyadh physicians, and 11.6% scored 18 or less, compared with 36.4% of Riyadh physicians. In contrast, for patients with moderate asthma, 25% of Riyadh physicians scored 18 or less, compared with only 2.4% of Asser physicians, while 81% of Asser physicians scored 22 and higher – a feat achieved by only 59.1% in Riyadh. There was no statistically significant difference found in the case of severe asthma.

### 5.2.10 Total physicians' scores

The answers to the nine questions on education were scored for each level of asthma severity, as previously outlined. These scores were then summed to give a total score for each physician for all asthma severities. In this case, a score of 27  $[(1+1+1) \times 9]$  represents no information provided by physicians and 81  $[(3+3+3) \times 9]$  represents information provided across all cases without being requested by patients. Using these scores, physicians' performance was rated as follows:

- 27–44: poor to fair;
- 45–62: fair to good;
- 63–81: good to excellent information provision.

**Table 5.15 Physicians' educational performance across all severities of asthma.**

Score	Physicians' actions in all levels of severity of asthma		
	Asser N (%)	Riyadh N (%)	Total N (%)
27 - 44	0 (0.0)	0 (0.0)	0 (0.0)
45 - 62	7 (16.3)	17 (38.6)	24 (27.6)
63 - 81	36 (83.7)	27 (61.4)	63 (72.4)
Total	43 (100.0)	44 (100.0)	87 (100.0)
P value	0.020		

Total score = sum of the scores for each question and each severity of asthma. Minimum =27, maximum = 81

Table 5.15 shows that the majority (72.4%) of physicians scored 63 or more on a scale of 81 in their provision of education to asthma patients. There were significant differences based on regions with severity ( $p=0.020$ ). Asser physicians were better at providing asthma education on a routine basis with 36 (83.7%) scoring 63 or more on a scale of 81, compared with 27 (61.4%) of Riyadh physicians. In contrast, 17 (38.6%) of Riyadh physicians scored 62 or less, while only 7 (16.3%) Asser physicians did so.

### 5.2.11 Physicians' overall asthma education performance with relation to physicians' characteristics.

**Table 5.16 Physicians' overall asthma education performance with relation to physicians' characteristics**

Physicians' characteristics		Physicians' education total scores			P value
		45 to 62	63 to 81	Total	
Gender	Male	14 (25.0%)	42 (75.0%)	56 (64.4%)	0.47
	Female	10 (32.3%)	21 (67.7%)	31 (35.6%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	
Specialization	Family medicine	5 (17.2%)	24 (82.8%)	29 (33.3%)	0.3172
	General medicine	17 (32.7%)	35 (67.3%)	52 (59.8%)	
	Other	2 (33.3%)	4 (66.7%)	6 (6.9%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	
Age*	31 to 39 years	12 (44.4%)	15 (55.6%)	27 (31.8%)	0.087
	0 to 49 years	8 (20.5%)	31 (79.5%)	39 (45.9%)	
	Over 50 years	4 (21.1%)	15 (78.9%)	19 (22.4%)	
	Total	24 (28.2%)	61 (71.8%)	85 (100.0%)	
Practice is predominantly	University associated	9 (42.9%)	12 (57.1%)	21 (24.1%)	0.31
	Community-based group	10 (23.3%)	33 (76.7%)	43 (49.4%)	
	Community-based solo	3 (27.3%)	8 (72.7%)	11 (12.6%)	
	Other	2 (16.7%)	10 (83.3%)	12 (13.8%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	
Medical practice duration	0 to 10 year	12 (37.5%)	20 (62.5%)	32 (36.8%)	0.17
	11 to 20 year	7 (17.9%)	32 (82.1%)	39 (44.8%)	
	Over than 20 year	5 (31.3%)	11 (68.8%)	16 (18.4%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	
Attendances at conferences or seminars that related to asthma management	None or less than one every 5 years	10 (32.3%)	21 (67.7%)	31 (35.6%)	0.68
	Once at least every 2 years	10 (32.3%)	33 (76.7%)	43 (49.4%)	
	Once a year or more	4 (30.8%)	9 (69.2%)	13 (14.9%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	
Experienced asthma-like symptoms	Yes	8 (33.3%)	16 (66.7%)	24 (27.6%)	0.46
	No	16 (25.4%)	47 (74.6%)	63 (72.4%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	

\*Two data missing

The physicians' performance based on the total scores shown in Table 5.16 was not influenced by gender, age, medical specialty, duration of practice or place of practice. Neither was it influenced by personal experience of asthma-like symptoms or the frequency of conference or seminar attendance.

### 5.2.12 Physicians' overall education performance with relation to access to guidelines and professional assistances.

**Table 5.17 Physicians' overall education performance with relation to access to guidelines and professional assistance**

Question	Response	Physicians' education total scores			P value
		45 to 62	63 to 81	Total	
Access to The National Protocol for the Management of Asthma	Yes	17 (25.0%)	51 (75.0%)	68 (78.2%)	0.31
	No	7 (36.8)	12 (63.2%)	19 (21.8%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	
Type of access	Hard copy	15 (29.4%)	36 (70.6%)	51 (75.0%)	0.35
	Internet access	1 (11.1%)	8 (88.9%)	9 (13.2%)	
	both	1 (12.5%)	7 (87.5%)	8 (11.8%)	
	Total	17 (25.0%)	51 (75.0%)	68 (100.0%)	
Access to other guidelines for asthma management	Yes	8 (24.2%)	2 (24.2%)	33 (37.9%)	0.59
	No	16 (29.6%)	38 (70.4%)	54 (62.1%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	
Having a nurse or other health care professional to assist with care or education of patients with asthma	Yes	12 (22.6%)	41 (77.4%)	53 (60.9%)	0.20
	No	12 (35.3%)	22 (64.7%)	34 (39.1%)	
	Total	24 (27.6%)	63 (72.4%)	87 (100.0%)	

As shown in Table 5.17, physicians' preferences based on their total scores was not significantly influenced by their access to the National Protocol for the Management of Asthma or to guidelines other than the National Protocol; nor by having a nurse or other health care provider to assist them.

## 5.3 Treating Asthma

Physicians were presented with six clinical vignettes (see Appendix B), with a number of actions to rate as either RECOMMENDED or NOT RECOMMENDED.

Physicians were deemed to agree with best practice if 75% or more of their responses matched the expected response.

In regard to the six case scenarios, the third column was designed to show the first priority action, yet the majority of respondents did not answer, while some answered with a choice of more than one action. Both these responses were discarded.

### **5.3.1 Vignette A**

‘Imagine that a patient of yours is usually free of asthma symptoms and is currently not taking any anti-asthma medication. He/ she experiences brief and infrequent episodes of asthma symptoms (about 2 times a week for less than 15 minutes). This morning the patient awoke feeling perfectly well, experiencing no symptoms. However, later in the day he/ she experienced some coughing, wheezing and shortness of breath after doing strenuous work around the house.’

**Table 5.18 Vignette A**

Potential action	Asser N= 43		Riyadh N= 44		Total N= 87		p value
	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	
Start an inhaled $\beta_2$ agonist	5 (11.6)	38 (88.4)	4 (9.1)	40 (90.9)	9 (10.3)	78 (89.7)	0.70
Start inhaled Atrovent <sup>®</sup> (ipratropium bromide)	39 (90.7)	4 (9.3)	38 (86.4)	6 (13.6)	77 (88.5)	10 (11.5)	0.53
Start an inhaled corticosteroid	37 (86)	6 (14)	36 (81.8)	8 (18.2)	73 (83.9)	14 (16.1)	0.59
Add a non- steroid anti- inflammatory	35 (81.4)	8 (18.6)	34 (77.3)	10 (22.7)	69 (79.3)	18 (20.7)	0.64
Start an oral theophylline	39 (90.7)	4 (9.3)	41 (93.2)	3 (6.8)	80 (92)	7 (8.0)	0.67
Start oral corticosteroid	41 (95.3)	2 (4.7)	42 (95.5)	2 (4.5)	83 (95.4)	4 (4.6)	0.98
Wait and see (no medication needed at this time)	32 (74.4)	11 (25.6)	36 (81.8)	8 (18.2)	68 (78.2)	19 (21.8)	0.40
Outpatient visit (e.g. same day office visit or refer to Emergency Department )	39 (90.7)	4 (9.3)	31 (70.5)	13 (29.5)	70 (80.5)	17 (19.5)	0.017

The physicians' responses in regards Vignette A are shown in Table 5.18. Nearly 90% of physicians recommended that a  $\beta_2$  agonist should be commenced (Riyadh 90.9%, Asser 88.4), while more than 75% of physicians from both regions did not recommended starting an ipratropium bromide, starting a corticosteroid, adding a non-steroid anti-inflammatory, starting an oral theophylline, or starting oral corticosteroid. Adopting an approach of wait and see was rejected by the majority of physicians in both Riyadh and Asser, as was the option to refer the patient to the Emergency Department, although significantly more physicians in Riyadh (29.5%) than in Asser supported this action (9.3%,  $p=0.017$ ). Amongst all respondents, it was agreed to recommend starting an inhaled  $\beta_2$  agonist and not to recommend any other action. There were no significant differences based on gender, except in the same day office visit or referral to the Emergency Department ( $p=0.026$ ), when female physicians recommended this action than males; see Appendix F.

### **5.3.2 Vignette B**

'Imagine that normally the patient's asthma is well controlled using an inhaled  $\beta_2$  agonist on an as-needed basis. However, over the past 2 days, the patient notices an increase in cough, wheeze, and shortness of breath and an increase in the use of the inhaled  $\beta_2$  agonist (from 1-2 times a day to every 4-6 hours.'

**Table 5.19 Vignette B**

Potential actions	Asser N= 43		Riyadh N= 44		Total N= 87		p value
	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	17 (39.5)	26 (60.5)	23 (52.3)	20 (45.5)	40 (46.0)	46 (53.0)	0.26
Start inhaled Atrovent® (ipratropium bromide)	31 (72.1)	12 (27.9)	30 (68.2)	14 (31.8)	61 (70.1)	26 (29.9)	0.69
Start an inhaled corticosteroid	10 (23.3)	32 (74.4)	11 (25.0)	33 (75.0)	21 (24.1)	65 (75.6)	0.59
Add a non- steroid anti- inflammatory	38 (88.4)	5 (11.6)	37 (84.1)	7 (15.9)	75 (86.20)	12 (13.8)	0.56
Start an oral theophylline	37 (86%)	6 (14)	41 (93.2)	3 (6.8)	78 (89.7)	9 (10.3)	0.27
Start oral corticosteroid	42 (97.7)	1 (2.3)	36 (81.8)	8 (18.2)	78 (89.7)	9 (10.3)	0.01
Wait and see (no medication needed at this time)	39 (90.7)	4 (9.3)	37 (84.1)	7 (15.9)	76 (87.4)	11 (12.6)	0.35
Outpatient visit (e.g. Same day office visit or refer to Emergency Department )	33 (76.7)	10 (23.3)	24 (54.5)	20 (45.5)	57 (65.5)	30 (34.5)	0.029

The physicians' responses to Vignette B are shown in Table 5.19. More than 75% of physicians in both regions would not add a non-steroid anti-inflammatory, start an oral theophylline, start oral corticosteroid, or recommend waiting and seeing. Seventy-five percent of Riyadh physicians and 74.4% of Asser physicians agreed with adding an inhaled corticosteroid. The proportion of Asser physicians who would not recommend an oral corticosteroid (97.7%) was significantly higher than that of Riyadh physicians (81.8%;  $p=0.015$ ). Similarly, physicians in Asser were less likely to recommend the patient have an outpatients visit (23.3% vs. 45.5%;  $p=0.029$ ).

There was agreement (75% and over) among all study respondents regarding not recommending practices such as adding a non-steroid anti-inflammatory, starting an oral theophylline, starting oral corticosteroid, or waiting and seeing, but disagreement over whether to recommend or not recommend increasing the current use of the inhaled  $\beta_2$  agonist, starting inhaled ipratropium bromide, starting an inhaled corticosteroid, or suggesting an outpatient visit. There were no significant differences based on gender, except in the same day office visit or referral to the Emergency Department ( $p=0.042$ ), where female physicians recommended this action than males; see Appendix F.

### **5.3.3 Vignette C**

'Imagine that a patient of yours, whose asthma is usually asymptomatic, has been experiencing an increase in symptoms (e.g. cough, wheeze, shortness of breath) over the past 3 days. For the past 2 nights, this patient has experienced nocturnal awakenings due to asthma symptoms, and last night awoke three times. Yesterday, the use of an inhaled  $\beta_2$  agonist controlled asthma symptoms for 3-4 hours. Today, the patient is using his/ her inhaled  $\beta_2$  agonist approximately every 1-2 hours. The patient's usual activities were limited by these symptoms.'

**Table 5.20 Vignette C**

Potential action	Assef N= 43		Riyadh N= 44		Total N= 87		p value
	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	28 (65.1)	15 (34.90)	33 (75.0)	11 (25.0)	61 (70.1)	26 (29.9)	0.31
Start inhaled Atrovent <sup>®</sup> (ipratropium bromide)	19 (44. 2)	24 (55.8)	20 (45.5)	24 (54.5)	39 (44.8)	48 (55.2)	0.91
Start an inhaled corticosteroid	2 (4.7)	41 (95.3)	8 (18.2)	36 (81.8)	10 (11.5)	77 (88.5)	0.046
Add a non- steroid anti-inflammatory	30 (69.8)	13 (30.2)	36 (81.8)	8 (18.2)	66 (75.9)	21 (24.1)	0.19
Start an oral theophylline	26 (60.5)	17 (39.5)	32 (72.7)	12 (27.3)	58 (66.7)	29 (33.3)	0.23
Start oral corticosteroid	33 (76.7)	10 (23.3)	22 (50)	22 (50)	55 (63.2)	32 (36.8)	0.01
Wait and see (no medication needed at this time)	42 (97.7)	1 (2.3)	39 (88.6)	5 (11.4)	81 (93.1)	6 (6.9)	0.10
Outpatient visit (e.g. Same day office visit or refer to Emergency Department)	16 (37.2)	27 (62.8)	19 (43.2)	25 (56.8)	35 (40.2)	52 (59.8)	0.57

The physicians' responses in regard to Vignette C are shown in Table 5.20. In this case there was strong support for increasing the patients' asthma medications and seeking additional medical attention (Outpatient or Emergency Department visit). The option of waiting and seeing was rejected by almost all physicians from both Asser and Riyadh. The recommendation that gained the greatest support was the addition of an inhaled corticosteroid (Asser 95.3% vs. Riyadh 81.8%;  $p=0.048$ ), more favoured by Asser physicians. In contrast, Riyadh physicians (50%) were more in favour of commencing an oral corticosteroid (Asser 23.3%,  $p=0.01$ ). There was far less support for starting an inhaled non-steroid anti-inflammatory (24.1%) or oral theophylline (33.3%), although the addition of inhaled ipratropium bromide was recommended by 55.2% of physicians from both regions.

There was agreement (75% and over) among all study respondents regarding recommending starting an inhaled corticosteroid, not recommending adding a non-steroid anti-inflammatory or waiting and seeing (no medication needed at this time), but disagreement over increasing use of the current inhaled  $\beta_2$  agonist, starting inhaled ipratropium bromide, starting an oral theophylline, starting oral corticosteroid, or advising outpatient visits. There were no significant differences based on gender.

#### **5.3.4 Vignette D**

'Imagine that a patient of yours felt fine yesterday. However, he/ she awoke early this morning experiencing wheezing and coughing which was incompletely relieved by an inhaled  $\beta_2$ . One hour later, the patient is experiencing difficulty speaking and can only manage to speak 2-3 words before needing to take another breath.'

**Table 5.21 Vignette D**

Potential action	Asseer N= 43		Riyadh N= 44		Total N= 87		p value
	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	18 (41.9)	25 (58.1)	20 (45.5)	24 (54.5)	38 (43.7)	49 (56.3)	0.74
Start inhaled Atrovent® (ipratropium bromide)	15 (34.9)	28 (65.1)	15 (34.1)	29 (65.9)	30 (34.5)	57 (65.5)	0.94
Start an inhaled corticosteroid	8 (18.6)	35 (81.4)	11 (25.0)	33 (75.0)	19 (21.8)	68 (78.2)	0.47
Add a non-steroid anti- inflammatory	34 (79.1)	9 (20.9)	39 (88.6)	5 (11.4)	73 (83.9)	14 (16.1)	0.23
Start an oral theophylline	29 (67.4)	14 (32.6)	32 (72.7)	12 (27.3)	61 (70.1)	26 (29.9)	0.59
Start oral corticosteroid	20 (46.5)	23 (53.5)	16 (36.4)	28 (63.6)	36 (41.4)	51 (58.6)	0.34
Wait and see (no medication needed at this time)	42 (97.7)	1 (2.3)	40 (90.9)	4 (9.1)	82 (94.3)	5 (5.7)	0.18
Outpatient visit (e.g. Same day office visit or refer to Emergency Department)	12 (27.9)	31 (72.1)	6 (13.6)	38 (86.4)	18 (20.7)	69 (79.3)	0.17

Physicians' recommendations in regard to Vignette D are shown in Table 5.21. In this instance there were no differences between regions. The majority favoured commencing an inhaled corticosteroid (78.2%). There was also strong support for commencing an oral corticosteroid (58.6%), starting ipratropium bromide (65.5%) and increasing the patient's  $\beta_2$  agonist dose (56.3%). The patient's attendance at an outpatient clinic or Emergency Department (79.3%) was also strongly favoured. 'Waiting and seeing' was rejected by 94.3% of physicians.

Agreement (75% and over) among all study respondents about starting an inhaled corticosteroid and recommending outpatient visits, but not adding a non-steroid anti-inflammatory or waiting and seeing, was demonstrated, while disagreement about increasing use of the current inhaled  $\beta_2$  agonist, starting inhaled ipratropium bromide, starting an oral theophylline, and starting oral corticosteroid was evidenced. There were no significant differences based on gender, except in the Start oral corticosteroid ( $p=0.028$ ), when male physicians recommended this action than females; see Appendix F.

### **5.3.5 Vignette E**

'Imagine that a patient of yours is experiencing asthma symptoms daily despite use of an inhaled  $\beta_2$  agonist on an as-needed basis and an inhaled corticosteroid in a dosage  $<500\mu\text{g}/\text{day}$  (e.g. 2 puffs Beclovent<sup>®</sup> QID or 1 puff Pulmicort<sup>®</sup> BID). The patient's activities are interrupted an average of 2-3 times a day due to asthma symptoms but are controlled by taking the inhaled  $\beta_2$  agonist. The patient is experiencing no nocturnal awakenings.'

**Table 5.22 Vignette E**

Potential action	Asser N= 43		Riyadh N= 44		Total N= 87		p value
	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	17 (39.5)	26 (60.5)	20 (46.5)	23 (53.5)	37 (43)	49 (57)	0.51
Start inhaled Atrovent® (ipratropium bromide)	18 (41.9)	25 (58.1)	24 (54.5)	20 (45.5)	42 (48.3)	45 (51.7)	0.24
Increase an inhaled corticosteroid	12 (27.9)	31 (72.1)	20 (45.5)	24 (54.5)	32 (36.8)	55 (63.2)	0.09
Add a non- steroid anti- inflammatory	24 (55.8)	19 (44.2)	33 (75.0)	11 (25.0)	57 (65.5)	30 (34.5)	0.06
Start an oral theophylline	26 (60.5)	17 (39.5)	34 (77.3)	10 (22.7)	60 (69.0)	27 (31.0)	0.09
Start oral corticosteroid	26 (60.5)	17 (39.5)	24 (55.8)	19 (44.2)	50 (58.1)	36 (41.9)	0.66
Wait and see (no medication needed at this time)	40 (93.0)	3 (7.0)	35 (79.5)	9 (20.5)	75 (86.2)	12 (13.8)	0.07
Outpatient visit (e.g. Same day office visit or refer to Emergency Department)	26 (60.5)	17 (39.5)	24 (54.5)	20 (45.5)	50 (57.5)	37 (42.5)	0.58

Physicians' recommendations in regard to Vignette E are shown in Table 5.22. In this case there were some differences in the recommendations made by Asser and Riyadh physicians which just failed to reach statistical significance; for example, a greater proportion of Asser physicians recommended increasing the inhaled corticosteroid than did Riyadh physicians (72.1% versus 54.5%;  $p=0.09$ ). This was also the case for an inhaled non-steroid anti-inflammatory (44.2% vs. 25.0%;  $p=0.06$ ) and starting oral theophylline (39.5% vs. 22.7%;  $p=0.09$ ). There was concordance about increasing the  $\beta_2$  agonist dose, starting inhaled ipratropium bromide, and starting an oral steroid. Physicians in Riyadh were more likely to favour the 'wait and see' approach than their Asser counterparts. Less than 50% of physicians from both regions favoured an Outpatient or Emergency Department visit.

Agreement (75% and over) was not demonstrated among the respondents regarding recommended actions. Agreement was only seen with regard to not recommending 'wait and see' of the offered management options. Disagreement was demonstrated for all other suggested actions. There were no significant differences based on gender.

### **5.3.6 Vignette F**

'Imagine a patient of yours has been experiencing flu-like symptoms for the past 2-3 days. These symptoms include a sore throat, nasal and sinus congestion and rhinorrhoea. Additionally, the patient notices an increased cough productive of whitish-yellow sputum and increased wheezing and dyspnoea to the point of disrupting his/ her normal activities. The patient's asthma is usually well controlled by using an inhaled  $\beta_2$  agonist in a dosage of 2 puffs QID and an inhaled corticosteroid at a dosage of 400  $\mu\text{g}/\text{day}$ .'

**Table 5.23 Vignette F**

Potential action	Asser N= 43		Riyadh N= 44		Total N= 87		p value
	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	Do not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	23 (53.5)	20 (46.5)	23 (52.3)	21 (47.7)	46 (52.9)	41 (47.1)	0.91
Start inhaled Atrovent® (ipratropium bromide)	26 (60.5)	17 (39.5)	29 (65.9)	15 (34.1)	55 (63.2)	32 (36.8)	0.60
Increase an inhaled corticosteroid	19 (44.2)	24 (55.8)	23 (52.3)	21 (47.7)	42 (48.3)	45 (51.7)	0.45
Add a non- steroid anti- inflammatory	26 (60.5)	17 (39.5)	32 (72.7)	12 (27.3)	58 (66.7)	29 (33.3)	0.23
Start an oral theophylline	35 (81.4)	8 (18.6)	33 (75.0)	11 (25.0)	68 (78.2)	19 (21.8)	0.47
Start oral corticosteroid	39 (90.7)	4 (9.3)	36 (81.8)	8 (18.2)	75 (86.2)	12 (13.8)	0.23
Wait and see (no medication needed at this time)	35 (81.4)	8 (18.6)	39 (88.6)	5 (11.4)	74 (85.1)	13 (14.9)	0.34
Outpatient visit (e.g. Same day office visit or refer to Emergency Department)	32 (74.4)	11 (25.6)	27 (61.4)	17 (38.6)	59 (67.8)	28 (32.2)	0.19

Physicians' recommendations in regards to Vignette F are shown in Table 5.23. In this case there were no significant regional differences in the physicians' recommendations. Increasing the inhaled corticosteroid dose was amongst the favoured recommendations, together with increasing the dose of the  $\beta_2$  agonist (47.1%) and starting ipratropium bromide (36.8%). The majority of physicians did not favour a 'wait and see' approach (85.1%) nor an Outpatient or Emergency Department visit (67.8%). In this case there was a clear focus on increasing all the patient's medications.

Agreement (75% and over) among all respondents was not demonstrated for any of the suggested actions; however, most physicians agreed about not starting an oral theophylline, starting oral corticosteroid, or waiting and seeing. There were no significant differences based on gender.

#### 5.4 Physicians' Usual Approaches to Decision-making

Physicians were asked about their usual practice in involving asthma patients in decisions about their disease management.

**Table 5.24 Physicians' usual approaches to decision-making**

Region	Asser N= 43	Riyadh N= 44	Total N= 87
Usually, in your practice, to what extent does the average patient with asthma get involved with management decisions about his/ her disease?	N (%)	N (%)	N (%)
I make the decisions, using all that is known about the treatment	15 (34.9%)	18 (40.9%)	33 (37.9%)
I make the decisions, but strongly consider the patient's opinion	23 (53.5%)	19 (43.2%)	42 (48.3%)
The patient and I make the decisions together on an equal basis	2 (4.7%)	5 (11.4%)	7 (8.0%)
The patient makes the decisions, but strongly considers my opinion	2 (4.7%)	2 (4.5%)	4 (4.6%)
The patient makes the decisions using all the information he/ she knows about the treatments	1 (2.3%)	0 (0.0%)	1 (1.1%)
Difference between region p value	0.57		

Note: more detailed data are presented in Appendix F

The data in Table 5.24 illustrate the extent to which physicians usually involve patients in decisions about their management. There were no statistically significant differences based on region and gender, with physicians in both regions tending to make the decisions. More than one third (37.9%) of physicians from both regions usually made the decisions based on their knowledge of the treatment, while nearly half (48.3%) made the decisions but strongly considered the patient’s opinion; only 8.0% shared decision-making with patients on an equal basis. Male physicians were more likely to make decisions than females in both regions: 25 (44.6%) and 26 (46.4%) male physicians reported making the decisions based on their knowledge of the treatment, or making the decisions but considering the patient’s opinion, compared with 8 (25.8%) and 16 (51.6%) females respectively.

## 5.5 Physicians’ Ideal Approaches to Decision-making

Physicians were asked about their ideal practices in involving asthma patients in making decisions about their disease management.

**Table 5.25 Physicians’ ideal approaches to decision-making**

Region	Asser N= 43	Riyadh N= 44	Total N= 87
Ideally, in your practice, to what extent does the average patient with asthma get involved with management decisions about his/ her disease?	N (%)	N (%)	N (%)
I make the decisions using all that is known about the treatment	17 (39.5%)	17 (38.6%)	34 (39.1%)
I make the decisions, but strongly consider the patient’s opinion	20 (46.5%)	20 (45.5%)	40 (46.0%)
The patient and I make the decisions together on an equal basis	5 (11.6%)	5 (11.4%)	10 (11.5%)
The patient makes the decisions, but strongly considers my opinion	1 (2.3%)	2 (4.5%)	3 (3.4%)
The patient makes the decisions using all the information he/ she knows about the treatment	0 (0.0%)	0 (0.0%)	0 (0.0%)
Difference between region p value	0.956		

Note: more detailed data are presented in Appendix F

The data presented in Table 5.25 illustrate the extent to which physicians ideally wish to involve patients in decisions about their management. There were no statistically significant differences based on region and gender, with physicians in both regions tending to make the decisions. More than one third (39.1%) of physicians from both regions usually made the decisions, based on their knowledge of the treatment, while nearly half (46.0%) of them made the decisions but strongly considered the patient's opinion; only 11.5% shared the decision-making on an equal basis. Further, male physicians were more likely to make decisions than females in both regions, with 24 (42.9%) and 26 (46.4%) reporting that they made the decisions based on their knowledge of the treatment, or made the decisions but strongly considered the patient's opinion, compared with 10 (32.2%) and 14 (45.2%) of females respectively.

## **5.6 Discussion of Physicians' Survey**

There was a gap between the physicians' current asthma management practices and the optimal situation. Even though guidelines exist to guide health care providers and improve asthma management outcomes, studies conducted in both developed and developing countries have found that implementation and compliance with guidelines is not as expected (163, 166, 172, 184, 187, 190, 195, 261, 265, 266, 268). Furthermore, there is variation in physicians' practices with both settings of care and physicians' specialties. This is evident from studies of physicians or patients/families, or both (38, 163, 186, 188, 194, 259, 264). Also contributing to suboptimal care is a lack of knowledge and understanding of some components of the guidelines (193, 195, 264). Doerschug et al. found in their study of physicians' understanding of guideline components (assessment, diagnosis, patient education, pathology, pharmacology, prevention, severity, and therapy) that there were differences in the scores depending on the components and/ or physicians' practice specialty, although the maximum mean of improved adherence by physicians was  $60 \pm 2\%$  (mean  $\pm$  SEM) (193). The degree of physicians' lack of knowledge and confidence varied in regard to the guidelines' components. Finkelstein et al. estimated that of 407 children's physicians practicing in three care organizations, most were knowledgeable and understood some of the guidelines but were not aware of others (264).

Our study investigated primary health care physicians' approaches to the practice of asthma management in three areas: providing education to patients/ family, asthma treatment, and patient-professional partnerships, in the Riyadh and Asser regions of Saudi Arabia. Overall there was a high response rate to the survey (88.3%), with no difference between Riyadh and Asser regions. A total of 87 physicians met the research criteria and were surveyed (Riyadh 44; Asser 43). The majority who responded were male (64.4%), aged less than 50 years (77.6%) and non-Saudi (94.3%). The distribution of specialties between physicians surveyed was similar in both Riyadh and Asser. Seventy-one (81.6%) had 20 years' or less experience. A study by Gharagozlou et al. has found a lack of physicians' continuing education (190), and our study revealed that more than one third (35.6%) of physicians surveyed had attended one or no conferences/ seminars in the previous five years, and only 14.9% attended at least one annually. Sixty-eight physicians (78.2%) reported having access to The National Protocol for the Management of Asthma and around one third (37.8%) had access to other guidelines. These data were consistent with Finkelstein et al., who found that 91% of their participants had the NAEPP guidelines and 75% had read them (264). However, it has been found that some physicians who have access to guidelines do not use them on a regular basis (190, 268). Although most physicians reported being 'aware' of the guidelines, there were significant differences across groups. The authors concluded that guideline recommendations were not sufficiently read by physicians, less than half of whom reported having knowledge about guideline recommendations (163).

Working in teams within health care mostly leads to better outcomes. Goeman et al. suggested that the presence of a professional educator would be an advantage, at least in circumventing the time-pressure barrier (165). In the current study, 53 (60.9%) physicians (Asser 79.1% vs. Riyadh 43.2%,  $p=0.001$ ) had access to the assistance of a nurse or other health care professional. Asser physicians were more likely to provide education than Riyadh physicians.

Primary health care (PHC) was the main setting for treating and following asthma patients, and often patients were treated by general physicians; however, it is evident that most outpatients were not treated appropriately (184, 186, 187, 194, 248, 250, 292). Lack of, or variation in, primary health care quality has been reported within

and between countries (247, 252). Specialists have been found more likely to adhere to treatment guidelines (186, 194, 195, 263). Laforest et al. found that quality of life and satisfaction among patients treated by specialists was better, and that patients were more likely to feel they had enough information regarding their disease. Diette et al. found that when patients were treated by specialists they were more likely to receive a controller medication (94% vs. 72%,  $p < .01$ ), have AAPs (69% vs. 46%,  $p < .05$ ), to be educated about their inhaler device (89% vs. 69%,  $p < .05$ ), and have pulmonary function tests (86% vs. 48%,  $p < .05$ ). These patients were more likely to adhere to daily medication use (68% vs. 36%,  $p < .01$ ) in comparison with generalist physicians' patients (186). In our study, most physicians were general medicine GPs (60%) and family physicians 33%, with the exception of one who was a specialist (pulmonologist); there was no significant difference between the two groups' practices, although family physicians scored higher in their education performance (at 82.8% versus 67.3%, without statistical significance).

### **5.6.1 Patients' education**

Low adherence to some or all guideline components amongst Outpatient clinic physicians was reported. One of these components was the education of patients and their families, who are required to play a major role in asthma self-management and to be involved in decision-making. This requires those involved to have a basic knowledge of the disease and its treatment, as this may influence their behaviour; hence, education is recommended for all patients. However, lack of patients' and their families' knowledge, detrimental behaviours, and poor adherence in addition to misunderstanding, were noted (74, 179, 183, 212, 293-296). Haby et al. have reported that a high proportion of patients (51%) and family members (38%) believe they do not have an adequate amount of information (162). Health care providers are recognized as the main resource. A lack of physicians' adherence to their duty to educate their patients in essential aspects of asthma and its management has also been stated (163, 186, 190). Gharagozlou et al. found that more than one third (42.2%) of the clinicians they surveyed reported giving no consideration to education or to providing action plans when treating their patients (190). Jin et al.'s study, conducted in Canada, found that although physicians believed they provided enough information and education to their patients regarding most aspects of the disease, in fact information about medications, triggers, signs of worsening asthma, and actions

that should be taken was deficient. Little over half (58%) of participants observed all or most of their patients demonstrating inhaler technique, and a lower proportion prepared written AAPs and referred patients to an asthma educator or an organization for asthma education. Variations were reported between physicians' levels of specialization regarding these aspects (163).

Our results were consistent with these findings. A lack of consistency in providing information and educating patients about some essential aspects of their disease and management was found. For some patients, information was not provided unless they asked for it. Physicians in this study also were likely to provide education mainly to patients with more severe asthma. Cicutto's study found that physicians provided general information about asthma (87.1%–97.6%), explained the medication prescribed (90.2%–99.4%), demonstrated the proper use of an inhalation device (85.3%–94.5%), and defined signs of worsening asthma (74.8%–96.9%) to mild, moderate and severe asthma patients: figures consistently higher than in our study (72.4%–93.1% ; 63.2%–85.1%; 77%–88.5%, and 62%–90% respectively). Reeves et al. in their study reported that most of the children in the study sample (71%) acknowledged receiving some type of asthma education, with a majority of 99%, 95% and 88.6% of respondents respectively reporting being educated about nebulizer use, medication treatment, and asthma triggers (187). Most physicians in our study reported that they demonstrated the use of an inhaler to their patients. Hussain et al. found a lack of knowledge and misconceptions by physicians about inhaler devices (184).

Similar results were found regarding provision of AAPs. Receiving AAPs based on asthma severity (mild to severe) from their physicians occurred for 36.8%–69.0% of patients in our study, compared with 38% to 73.6% in Cicutto et al.'s (297). These findings are supported by data from several other studies which report a lack of asthma action plan development amongst asthma patients (158, 162, 163, 186, 187, 264, 268). Goeman et al. found that while patient education was documented as the most important of six priorities to improve asthma care outcomes by six focus groups, including 49 GPs, written AAPs were not identified as a priority by five groups and were ranked third by the sixth group (165). In Jin et al.'s study, only 17% of physicians surveyed reported they provided an AAP for all or most of their

patients; differences were noted between physician specialties (163). Reeves et al. in their study, conducted in three Emergency Departments and including 197 patients aged between 2-17 years, found that less than half (43%) the participants had a written AAP (187). Similar findings were reported by Haby et al. in a study conducted in Melbourne involving 231 patients ranging from 2 to 5 years old. They found that only 52% of participants had an AAP (162). This may indicate the disagreement of physicians with the importance of AAPs (165); in any case, verbal plans are more likely to be used by physicians than written AAPs, and perhaps time constraints contribute to this. It has been suggested that self-management plans (SMPs) may not be appropriate to use with all patients, especially those with poorly controlled asthma (166). Physicians may believe that patients will not comply with their AAP.

It has been reported worldwide that physicians are less likely to recommend home PFMs for their patients (163, 172, 187, 190, 264, 266, 268). Diette et al. found that 58% and 83% of respondents who were treated by generalists and specialists respectively had been instructed about PFMs (186). In our study most physicians reported that they did not provide information about monitoring peak flow rate or using AAPs based on PFMs and symptoms to their patients with mild or moderate asthma. Despite this, the proportion of physicians providing their patients with this information was higher than that reported by Cicutto et al. (297) (36% vs. 10% and 33% vs. 7% respectively) but for severe asthma patients was similar (62% vs. 60% for PFMs and 57% vs. 52% for AAP, based on symptoms and PFMs). This may be due to the unavailability of peak flow meters, poor PFM usage, and lack of knowledge. It has been reported that the reason behind the low use of spacers was unavailability, and the main reason behind the low recommendation of the lung function test by physicians was both lack of knowledge about how to interpret the test, and its unavailability (165, 187, 190). Liwarisakun et al. found that chest physicians answered 57% of the PEF variability correctly, compared with general doctors who answered only 9% correctly (195).

Haby et al. reported that 83% of parents had been informed about asthma triggers, but only 49% reported they had been advised on how to avoid them – although it has been suggested that these findings may not point to a gap in management as some

triggers cannot be avoided (162). In our study, physicians were found to be to be aware of this aspect of asthma management, with the majority reporting that they usually provided patients with information about avoiding asthma triggers and controlling their environmental. Our findings are inconsistent with those reported by Cicutto et al. (297). This may be attributed to physicians believing that most triggers in Saudi patients such as weather changes, contact with animals, and smoke generated by fires can be avoided.

The results of this portion of the current study indicate a number of key points that need to be addressed. First is the variation among physicians' performance of their duty to educate patients, which may reflect a lack of awareness about, or agreement with, patients' issues, and limited application of the national guidelines. In addition, medical facilities may not always have all the educational and other equipment necessary. Morbidity and mortality have been reported among patients with mild asthma. Asthma severity is not stable, and mild forms may develop into moderate or severe asthma. This is pertinent to the second point, that physicians in the current study were more likely to give attention to severe cases than to mild cases of asthma with regard to providing education. This may be partly because it is usual practice in KSA to treat patients with mild asthma in PHCCs, while those with moderate and severe asthma are referred to secondary health care centres.

A third key point in this part of current study is the low adherence to providing information about AAPs and PFMs. It was found that the reported provision of AAPs based on symptoms was low across the board, but especially lacking for patients with mild forms of the disease. The provision of information regarding monitoring peak flow rates was also found to be very low. Provision of AAPs based on symptoms and PFMs was reported to be lower than that of AAPs based on symptoms alone. This is reflective of the low use of PFMs, which may due to physicians' lack of knowledge and familiarity with their use or to their unavailability, either of which may affect physicians' practices. In addition, education is time-consuming, and shortage of time, lack of both suitable materials and community resources, and patients being unreceptive were common factors reported by participants in Jin et al.'s study (163). Education regarding asthma triggers was reported high across all severity

classifications. This indicates that physicians were highly aware of the importance of triggers in asthma management.

Finally, in regard to community non-profit organizations, there was lack of patient guidance by providers to groups that could have offered further information. This finding is consistent with those of Robert et al. and Cicutto et al. (163, 297), and may be attributed either to providers' being unaware of such organizations, to such bodies having no presence in KSA, to problems with language as most information is available only in English, or to a lack of access to resources such as the Internet.

### **5.6.2 Physicians and treatment**

Diagnosing asthma and classifying its severity is an important issue facing physicians (266). Inaccurate assessment of the severity of asthma may contribute to inappropriate treatment (185, 189, 195, 262, 266) and may occur as a result of a lack of physician knowledge or an unawareness of asthma symptoms; from poor patient knowledge of and attitude towards asthma, or from a lack of communication between health care providers and patients and their families. Improvement in patients' education and communication may increase adherence to guideline recommendations and improve the outcomes of asthma management. Halterman et al.'s study found that most respondents (60%) were incorrectly classified by their physicians, and of these only 28% had preventive anti-inflammatory medication prescribed (189).

Physicians' disagreement regarding asthma severity has also been reported (266) and may contribute to variations in or lack of treatment. Baker et al. asked 24 specialists to classify eight cases in addition to interpreting the pulmonary function test and indicating the main factor used in classification (daytime symptom, night-time symptom, pulmonary function or all) each case. They were also asked to recommend treatment. It was found that there was poor agreement amongst physicians in classifying asthma severity. There was better agreement on the main factor used to classify asthma amongst physicians and interpret pulmonary function, except in the case of asthma revealed by bronchodilator response. Although treatment was consistent with their classifications, it was often inappropriate as a result of incorrect classification. It was noted that while the majority of physicians recommended ICS, this proportion might differ in a larger sample (185). These findings may help

explain the variations between physicians' recommendations in the six vignettes in our study. In our results, agreement with the six vignette options was considered at  $\geq 75\%$  of the sample response. A lack of or variation in prescribing practices of physicians was reported by Jepson et al. in a study conducted in six European countries of adult and child patients (259), and almost the same results were found by another study performed in five European countries to estimate physicians' knowledge, attitudes and prescribing behaviour (188). In our study, lack of physicians' adherence to guidelines, and practice variations when treating asthma, were observed across all six clinical vignettes. Cicutto et al. (298), who used the same case studies, found that physicians were more likely to recommend the use of corticosteroids, either oral or inhaled (only 9% to 15% of Cicutto et al.'s participants did not recommend the use of corticosteroids) except for vignette D than the physicians in our study. In our study, the proportion of physicians who did not recommend corticosteroid use was higher than that reported by Cicutto et al. (range: 6.9% to 43.7%) with the exception of vignette A. It has been reported that specialist physicians are more likely to prescribe controller medications than other physicians (163, 186, 195), which may explain the differences between these two results, as around half the participants in Cicutto et al.'s study were specialists, while nearly all (93%) of our participants were general and family physicians.

It is concluded that although physicians report agreeing with ICS recommendations, in actual practice prescription of ICS is less than optimal (259, 266). Several studies have found that some physicians are less likely than others to prescribe ICS to their patients, and numerous reasons for non-ICS prescription have been offered, such as disagreement, cost, and side effect patterns (172, 184, 190, 194, 195). ICS recommendations in our study tended to be a bit high in some cases, although suboptimal within the recommendations of the guidelines' recommendation usage rate from 16.1% to 88.5% among the six vignettes. This finding is consistent with data reported in the previous study (14.7%– 87.7%) (298). However, physicians' ICS recommendations in the two studies differ from vignette to vignette, with the exception of vignette A. For example, in our study 75.6%, 88.5%, 78.2%, 63.2% and 51.7% of participants were reported agreeing to start or increase ICS dosage in vignettes B, C, D, E and F, compared with 87.7%, 71.8%, 40.5%, 80.9% and 71.8%; respectively in Cicutto et al.'s study (298). These are supported by Reeves et al.'s

finding that more than one third of respondents with persistent asthma are under-treated, and that of these 51.3%, 36% and 22% had mild, moderate and severe asthma respectively  $p=0.03$  (187). The current findings may also reflect variations between physicians' practices. Gharagozlou et al. reported that a number of physicians may still disagree with the recommendation that ICS use is the cornerstone of asthma treatment, or may worry about the safety of long-term use (190). Hussain et al. in their study conducted in Pakistan found a significant lack of medication knowledge amongst physicians, combined with misconceptions about inhaler treatment, despite all respondents having participated in CME programs (184). In contrast, Finkelstein et al. reported a high awareness of the role of anti-inflammatory agents in asthma treatment among physicians, but noted that they tended to hesitate before increasing dosages (264). This may support our findings. Physicians in our study were more likely to start ICS (except in vignette A) than to increase the dose of ICS that had been given in some vignettes. Furthermore, prescription of an anti-inflammatory agent may be affected by the severity of asthma (188).

Inappropriate recommendations regarding the use of oral corticosteroids were identified amongst the physicians' responses to most of the vignettes. Oral corticosteroids were recommended in some cases where they may not have been needed, as in vignettes A and E, while in other cases they were not recommended where they were needed, as in vignettes C and D.

One of the asthma management goals is to reduce reliever use. However, it has been reported that utilizing bronchodilators is still commonly recommended by a large proportion of physicians (163, 184, 188, 190, 259). One study conducted in Canada with different specialty groups found that around 72.5% of participants almost always or often chose a trial course of inhaled  $\beta_2$  agonists as a method for diagnosing asthma in adults and children, compared with 61.9% and 60.3% who used a course of inhaled corticosteroids with adults and children respectively. Furthermore,  $\beta_2$  agonists' use as first-line medication for adults and children were indicated by 71% and 65% respectively, while around 40% and 34% of participants reported regularly using  $\beta_2$  agonists (163). In our study, although patients in some vignettes were already using a high dose of  $\beta_2$  agonist, some physicians tended to

increase the dose. Increasing the  $\beta$ 2 agonist dose was recommended by physicians more often in our study than in the Cicutto study (298): in our study, usage rate ranged from 30% to 57%, compared with 14% to 42% in the Cicutto study, again with the exception of vignette A, where similar levels were observed (90%) in both studies.

On the other hand, starting inhaled ipratropium, or recommending oral theophylline and added non-steroid anti-inflammatories, varied across the physicians' sample. Jepson et al. found that these agents were limited in their prescription (259). In our study, the recommendation to start these agents ranged from 11.5%–65.5% for inhaled ipratropium, 8%–33.3% for oral theophylline, and 13.8%–34.5% for adding a non-steroid anti-inflammatory across the six vignettes; in Cicutto's study these medications were recommended in 5.5%–34.4%, 1.2%–14.9% and 3.7%–23.6% of cases respectively. It was reported that non-steroid anti-inflammatories had limited effects (50).

In our study some physicians opted to 'wait and see', which may reflect a tendency to hesitate in prescribing medication or may be an effect of organization. Same-day office visits or referral to an ED were less likely to be recommended in our study than in Cicutto's, in most vignettes.

The lack of, or variations in, recommendations by physicians was noticeable in those vignettes that depicted more severe cases with exacerbation than in those of a lesser severity. This finding was consistent with those of other studies (188, 189). Inadequate management of worsening asthma has been reported, with wide discrepancies amongst five countries' physicians. Physicians' responses to the question, 'Does yellow-green sputum always indicate a bacterial infection?' varied widely (188). In Vignette F, for example, this variation was documented, and although antibiotics were not included in the answers option, over a third of respondents recommended adding antibiotics. Of these, 23.3% suggested adding only antibiotics. Slightly over half the respondents recommended starting or increasing corticosteroids, whether oral and/ or ICS; of these, 27.1% combined them with antibiotics. Laforest et al. found that general practitioners (GPs) and GP + specialist (SPE) groups were more likely to prescribe antibiotics for their adult patients than was a purely SPE group. The authors reported that the use of antibiotics was still

widespread in primary care (194). While adding antibiotics in this case may seem reasonable as the patient has an upper respiratory tract infection (URTI), infection signs may cause physicians concern that it could exacerbate the patient's asthma. This action was not recommended in the other vignettes. This point may prove to be controversial. Around one third of respondents recommended starting ipratropium or adding a non-steroid anti-inflammatory agent, whilst 5.7% of respondents did not recommend any medication. These differences in treatment practices may be due to knowledge differences regarding the treatment of asthma (186).

While some medications such as long-acting beta agonists (LABA), combinations of corticosteroids and LABA, and leukotriene receptor antagonists (LTRA) were not included in the vignettes' management options in our study, physicians were asked to identify additional medications or actions that would apply. Consistently, these agents were either not recommended or least recommended by physicians. LABA were recommended only in vignettes B, C, D, and E in  $\leq 4.6\%$  of cases. This result was mostly consistent with data from other studies where the use of LABA was reported in  $\leq 8\%$  of cases, although Robert et al. reported a slightly higher percentage of physicians recommending LABAs across their cases, in some instances inappropriately (163). In this study, combination formulations were recommended by 3.4% and 1.1% of physicians in Vignettes C and F respectively. Factors which may have contributed to this finding include physicians being unaware or having a lack of knowledge about asthma and its treatment, their level of agreement with recommended asthma treatments, and perceived agent unavailability or its cost. Hussain et al. in their study suggested that the low level of prescribed LABAs may be due to physicians' lack of knowledge rather than to cost (184). Prescribing these agents may also be affected by physicians' specialties: a study involving adult patients reported that respiratory physicians were more likely to prescribe LABA-ICS combinations to their patients (194).

### **5.6.3 Patients' involvement in decision-making**

Some evidence indicated that patient involvement in decision-making improved their adherence to at least some aspects of the guidelines. Sleath et al. reported that arthritis patients involved by their physicians in decisions about their treatment were more likely to provide and discuss health information and status (299). Possession of

a written action plan and adherence to daily preventer medication use has been reported to be significantly higher amongst patients who participated in decision-making (158): Diette et al. reported that 91.2% and 77.9% of respondents treated by specialists and generalists respectively were involved in their treatment decisions (186). In the current study, physicians were less likely to involve patients, and fewer than 50% of those surveyed included patients in decision-making. There is no significant difference between physicians' responses in actual and ideal cases. The severity of the disease and the level of communication between patients and professionals, in addition to patient characteristics such as age, education and income level, may affect these approaches (158). Given that nearly all the physicians were non-Saudi, a lack of relationship between physicians and their patients/ carers in this study may be involved in doctors' preferences to make unilateral decisions. In particular, the physicians usually were not fluent in Arabic, and were unaware of the subtleties of Saudi culture and customs. This point is supported by Ferguson and Candib, who found that culture and language play a role in patient–physician relationships (201).

#### **5.6.4 Regional differences between physicians' practices**

Regional differences between health care practices have been observed in other studies (87, 187, 188, 259), and our findings are consistent with these. Variations between practices in each region was reported. Asser physicians, for example, were more likely to provide education than their Riyadh counterparts. Reeves et al. have found a substantial difference between places in the possession of PFMs, with respondents from urban areas more likely to have a PFM than those elsewhere (187). In general, Asser physicians were more likely to provide all aspects of education (with the exception of recommending community non-profit organizations to moderate asthma patients) across the spectrum of asthma severity, although significant differences were still identified in the instruction of patients with mild and moderate severity in some aspects such as asthma warning signs, AAPs based on symptoms either with or without PFMs, and PFM information. For people with severe asthma, only providing information on PFMs was found to be significantly different between physicians from the two regions. This finding may indicate that Asser physicians are more likely to be compliant with the guideline recommendations related to patient education than are Riyadh physicians. Physicians

were found to give more attention to patients with severe asthma than to those with mild asthma. In addition, lack of adherence to AAPs and PFMs were reported.

This finding may be an indication of awareness of the guidelines, with Asser physicians having greater access to them. It also may be a result of work overload, lack of time, and unavailability of professional assistance. Asser physicians were more likely to have a nurse or other health professional to assist them; they were also more likely to attend conferences or seminars, which might encourage a higher level of adherence to practice guidelines. Lack of professionals' knowledge about devices such as PFMs, in addition to differences in facilities and their consequent availability, may also be factors. Furthermore, Riyadh's physicians were less likely to involve patients in decisions about their treatment. In vignettes B and C a significant difference was noted between the groups' recommendations to start oral corticosteroids, with Riyadh physicians more likely to recommend them. Asser physicians were more likely to recommend ICS than Riyadh physicians, as demonstrated in especially in Vignette C ( $P=0.048$ ). Riyadh physicians also recommended same-day office or emergency visits, especially in Vignette A. This may be because of the large number of hospitals available locally. Although not significantly different, Asser physicians were more likely to recommend increased  $\beta_2$  agonists, oral theophylline, and adding non-steroid inflammatory agents than Riyadh physicians. Results for ipratropium bromide recommendations were similar across both regions.

### **5.6.5 Gender influences**

Variations across gender were noticed in physicians' practices. Male physicians were more experienced, and had a greater tendency to attend conferences. In addition, they had more access to guidelines and were more likely to have a nurse or other health professional (69.6% versus 45.2%;  $p=0.025$ ) than their female counterparts. This finding may be why male physicians were more likely to provide education than female physicians in our study. Some statistically significant differences were noted: males were more likely to provide information about worsening asthma than female physicians to moderate/ severe patients ( $p=0.015$ ); they also tended to supply their patients with moderate/ severe asthma with information about AAPs ( $p=0.037$ ) and to discuss PFMs with moderate asthma patients ( $p=0.05$ ). There were significant

differences between genders in the Riyadh region regarding education: male physicians were providing AAPs based on symptoms to patients with severe asthma, with or without PFM information, more than their female counterparts. Interestingly, significant differences were reported between female physicians in both regions regarding AAPs and PFMs. With regard to treatment, females were more likely to recommend  $\beta$ 2 agonists and antibiotics; however, there were no significant differences in this area. They were also more likely to recommend corticosteroids in all vignettes, although the only significant difference appeared in Vignette E with their recommendation of oral corticosteroid. Female physicians were more likely to recommend 'wait and see' and same-day office visits or to refer the patient to an Emergency Department, in most of the vignettes. It was noticeable that male physicians' recommendations regarding the use of oral theophylline in all vignettes was greater than females' recommendations. The reason behind this is not clear, but it may be because males tend to recommend more than one drug.

#### **5.6.6 Barriers to adherence**

A number of barriers were reported affecting physicians' approach to the treatment of people with asthma. Cabana et al. has grouped these barriers into three: 'Knowledge (lack of awareness and familiarity), attitudes (lack of agreement and self-efficacy, outcome expectancy and motivation/ previous practice) and behaviour (external barriers) barriers' (265, p. 1460). In adult and children asthma patients, several studies have supported such findings (172, 191, 268); for instance, Robert et al. found a relationship between physician awareness and knowledge about guideline recommendations and their practice (163).

It was reported that lack of familiarity more likely affected physicians' practices than lack of awareness, and that one or more barriers may influence compliance with any recommendation in the guidelines (172, 265, 268). Cabana et al. estimated paediatrician physicians' adherence to four components of the asthma guidelines (including ICS prescription and instruction in PFM daily use) and found that 88% of respondents were aware of the guidelines, but that lack of familiarity with all components was reported. The physicians' adherence to these components ranged from 39% to 53% (172). Although our study was not designed to estimate barrier effects, some barriers can be deduced from the results. Physicians' lack of

knowledge, and their misconceptions regarding some aspects of asthma treatment and tools, have been reported (184). Moffat et al. considered that lack of adherence to guidelines and to developing AAPs may contribute to poor communication between patients and health care providers (166). Lack of self-efficacy can be behind un-prescribing medication and failing to provide information about some devices. Low use of PFMs and AAPs by physicians contributes to the lack of physician self-efficacy and unsatisfactory outcomes (172, 268). In addition to those barriers already mentioned, disagreement and cost effects have been implicated in the failure to achieve recommended PFM use by physicians (191). This may be deduced from the minimal information provided to patients regarding asthma, AAP and PFM as well as from the medication being prescribed. Physicians' disagreement with the guideline recommendations, their lack of self-efficacy, and lack of outcome expectancy have all been reported as barriers resulting in low adherence to ICS prescriptions (172, 191, 268). Lagerlov et al. found a relationship between ICS prescribed and physicians' knowledge and attitudes (188). These may join with many other elements and account for the inappropriate recommendation of corticosteroids and other variations in practice noted in our findings. In addition, patients' knowledge, beliefs, perceptions and adherence to their regimen, as well as their ease of communication with their physicians, may be considered as another set of barriers influencing physicians' practices (188, 191, 265, 268). Moffat et al. found that patients relate that such things as non-compliance and lack of concern, as well as poor communication, hinder their doctors' ability to provide appropriate education to enable them to manage their asthma, arguing that good communications skills are essential if physicians are to supply patients with useful information that can improve their asthma control (166). The effect of both patients and their families on physicians' practices that is revealed in our study is evident in physicians' admission that, unless asked, they do not supply their patients with information. It may also account for the low number of physicians who involved their patients in decision-making and explain the tendency of physicians to recommend oral corticosteroids where patients favour these over inhalers. At a pragmatic level, medication and device availability may limit physicians' adherence: for example, PFMs may not be available in all health care centres and are not supplied free of charge, so while patients receive free health services there are some expensive agents such as leukotriene receptor antagonist (LTRA) and combination drugs that must be

purchased, or may not be available at least some of the time in PHCCs. These may be reasons for physicians not recommending their use.

Most PHCC physicians are responsible about treating, following up and educating all their patients, not just their asthma patients; however, lack of time and work load pressure, combined with staff shortages, a lack of educational materials and lack of facilities were reported as working against best practice (163, 165, 166, 172, 186, 191, 265, 268).

Accessibility to and complication of guidelines can be considered barriers, especially for general physicians and professionals (191, 195, 265). Goeman et al. found that GPs' concerns to achieve good levels of asthma care were not consistent with some aspects of the guidelines (165).

The majority of respondents to our survey were non-Saudi. The differences in culture and language between physicians and patients is yet another barrier that may affect the quality of the relationship (201).

### **5.6.7 Conclusion**

Although most physicians reported having access to guidelines, poor adherence among PHCC physicians was reported at least with several guideline components. There was a failure on the part of medical practitioners to provide essential asthma education, especially to mild asthma patients. Respondents were less likely to provide information about AAPs and PFMs to this group, indicating non-compliance with guideline recommendations to at least develop AAPs and recommend home PFMs. As far as establishing an equal partnership with their patients, physicians were unlikely to involve their patients or families in decisions about their treatment. The doctors in this study were likely to recommend controllers, which fall below the optimal prescription of corticosteroids. Inappropriate treatment choices were observed in the responses to the vignettes. Further, there were variations in practices between the two regions. Gender appears to be influential in some responses to guideline recommendations. In general, current practices fell short of adherence with the guidelines. An education program would improve physicians' practices and increase compliance.

### **5.6.8 Recommendations**

The barriers affecting physicians' practices and their adherence to management guidelines in Saudi Arabia should provide useful clues to where interventions will be most useful. Intervention programs can improve physicians' understanding and change their behaviours, encouraging them to implement guideline recommendations (163, 165, 184, 187, 190, 193, 268). They go beyond medical issues, addressing non-medical factors such as communication skills, which can produce a stronger partnership between patients and their health providers (165, 166, 187, 189). Cabana et al. state that in ten regions of the United States, a change in physicians' behaviours and an improvement in patient outcomes in primary care resulted when physicians attended continuing medical education programs provided by their local peers (196). Continuing medical education was reported as one of the highest concerns by 49 Australian GPs from metropolitan and rural sites, who considered it would help improve asthma care even though they recognized lack of time and access as limitation factors (165).

It is recommended that education programs be developed to improve and update health care providers' knowledge and behaviours. Workshops and seminars are preferable, in order to improve physicians' self-efficacy by encouraging them to improve their communication approach, which will in turn assist them in developing their use of AAP and PFM with their patients. Specialist physicians are more likely to adhere to guideline components.

It is also recommended that specialist asthma clinics be established in PHCCs, with appropriate facilities, equipment and education resources, and adequate staffing. As lack of time and shortage of staff lead to overload, they have a negative effect on physicians' practices. Training educators to inform patients about the disease would be useful.

Pharmacy staff should include educating patients and following up as part of their role, and develop educational materials and provide seminars, workshops, and group meetings to other professionals regarding optimal asthma management.

Lastly, it is important to improve communication between healthcare professionals and their patients and families.

### **5.6.9 Limitations of physicians' phase**

There are some limitations to this study that must be reported. Firstly, this study was reliant on self-reporting and as such may not reflect the physicians' actual behaviour or practices. To avoid bias and limit this effect, and to gain accurate practice insight, the following actions were taken:

- In the education section, usual practice regarding some essential aspects of asthma treatment was solicited across all three severity classifications to gain accurate and specific responses rather than a general catch-all reply.
- Vignettes were used to elicit practical responses rather than knowledge; response options were unified across all vignettes to avoid any indication of which might be the 'right' answer.
- Respondents were given the option to add any actions they felt had not been included in the options.

It is believed that the surveys provide an accurate view of current practice, as physicians recorded even negative responses. Our finding is consistent with others studies' findings in most aspects such as education (AAP, PFM) and variations in treatment (38, 187, 259, 261).

Secondly, as only physicians from two regions were surveyed, generalizing the result across the other 11 regions in KSA may not be appropriate. However, these two regions reflect most of regional characteristics of the country, including urban, suburban, and rural areas, and a wide range of geographic and climactic conditions, heavy and light areas of population, and variations in customs.

Thirdly, there was a lack of specialized asthma clinics in the PHCCs when the study was conducted, as is reflected in the shortage of specialist physicians in the research; only one respondent identified him/ herself as a pulmonologist. The shortage was also reflected in physicians' lack of time and workload pressure, which resulted in responses generally being delayed, although overall the volume of responses is considered to be good.

Fourthly, the shortage of female respondents may have been due to organizational systems, as females' clinics are separate from males' clinics, which creates contact

barriers: the researcher, being male, was blocked from access to female clinics and limited in his ability to approach female practitioners.

## Chapter 6

### Phase 3: Barriers to the Optimal use of Inhaled Corticosteroids and to Patient Compliance – Results and Discussion

#### 6.1 Administration of Survey

##### 6.1.1 Survey response

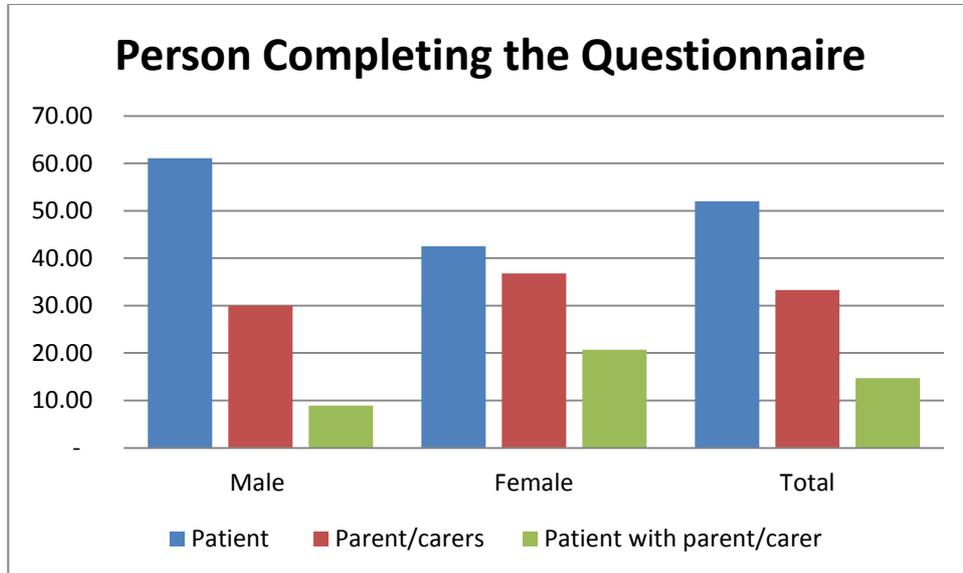
A total of 230 questionnaires were administered to primary health care centres in Riyadh, KSA; 205 (89.1%) were returned. Of these, 28 (13.7%) were excluded because of the age of the respondent (under 5 or over 18) or because they were incomplete. Of the 177 eligible responses, 90 were from males and 87 from females.

**Table 6.1 Survey response**

Riyadh primary health cares in KSA		
Questionnaires administered		230
Responses		205 (89.1%)
Usable responses	Male	90 (50.8%)
	Female	87 (49.2%)
	Total	177 (78%)

### 6.1.2 Person completing the survey

Patients were asked to complete the survey by themselves, but if they could not, their carer could assist them.

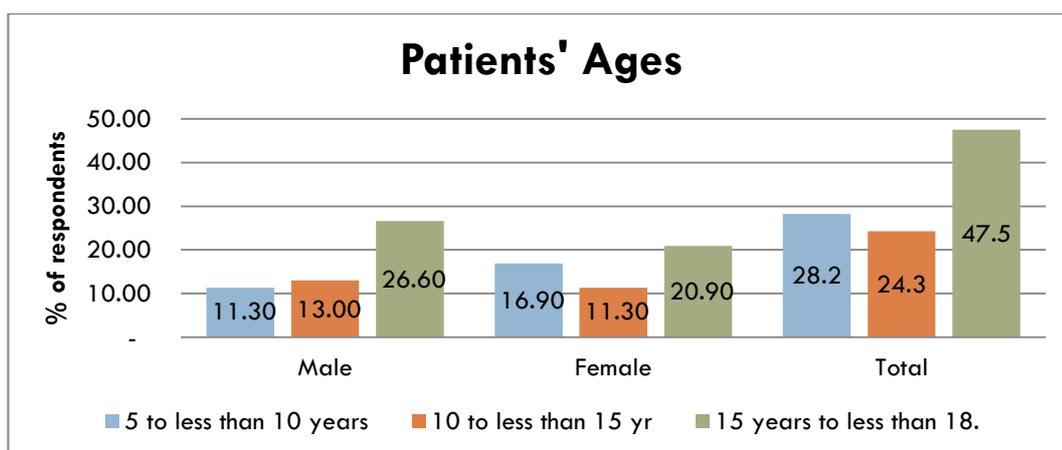


**Figure 6.1 Persons completing the survey**

As Figure 6.1 illustrates, more than half (52%) of the questionnaires were completed by the patient. A significant difference was reported between genders. Male patients were more likely to prefer to complete their survey by themselves than were females: 55 (61.1 %) male patients, compared with 37 (42.5%) females. Another 8 (8.9%) male and 18 (20.7%) female respondents had help from their parents ( $p=0.021$ ).

A significant difference was found among different age groups. Seventy-three respondents (86.9%) of the age group 15 to 18 years old completed their survey by themselves compared with 4 (4.8%) who completed the survey with their parents. In contrast, 34 (68%) of the returned surveys in the age group 'over 5 but under 10' were completed by parents, and only 4 (8%) were completed by the patient alone ( $p=0.000$ ).

### 6.1.3 Patients' ages



**Figure 6.2 Patients' ages**

Figure 6.2 illustrates that approximately half (47.5%) the participants were in the age group from 15 to 18 years; of these 56% were male. There was no significant difference based on gender.

### 6.1.4 Patients' education level

Patients were asked about their education level.

**Table 6.2 Patients' education level**

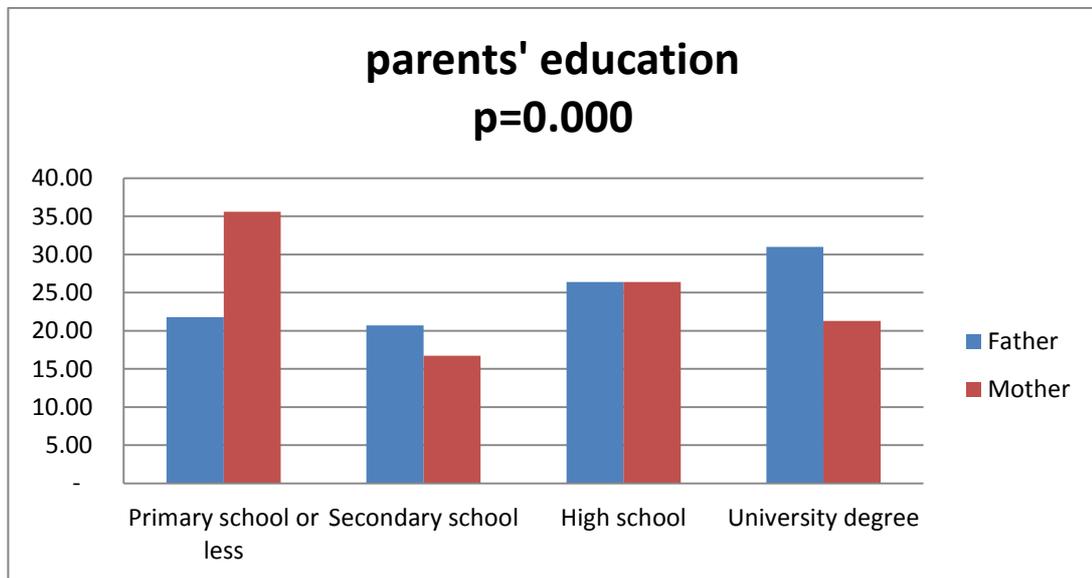
Response option	Male n=90		Female n=87		Total n=177		P vale
	N	%	N	%	N	%	
Primary school or less	24	13.6	41	23.2	65	36.7	0.046
Secondary school	31	17.5	21	11.9	52	29.4	
High school	27	19.8	25	14.1	60	33.9	
University level*	8	4.5	6	3.4	14	7.9	

Just enrolled

The data in Table 6.2 show that most of the patients (36.7%) had a primary school or less level of education. Males were more educated than females. Twenty-four (13.6%) and 35 (19.8%) of the male respondents compared with 41 (23.2%) and 25 (14.1%) of the female group had primary school or less and high school respectively (p=0.046).

### 6.1.5 Parents' education level

Respondents were asked about their parents' education level.



**Figure 6.3 Parents' education level**

Figure 6.3 illustrates that a patient's father was likely to have a higher level of education than the mother. A large proportion of mothers were primary school educated or less (35.6% females vs. 21.8% males), and fathers were more likely to have a university degree (31.0% males vs. 21.3% females,  $p=0.000$ ).

### 6.1.6 Monthly household income and health insurance

Respondents were asked about their monthly household income and if they had health insurance. (This question was answered by carers.)

**Table 6.3 Household's monthly income and health insurance**

	Response	Male		Female		Total	
		N	%	N	%	N	%
Monthly household income n=177	Less than 5000 SR	42	23.7	38	21.5	80	45.2
	5001- 10000 SR	32	18.1	22	12.4	54	30.5
	10001- 15000 SR	10	5.6	23	13.0	33	18.6
	15001-20000 SR	6	3.4	4	2.3	10	5.6
	More than 20000 SR	0	0.0	0	0.0	0	0.0
Have health insurance n=177	Yes	23	13.0	15	8.5	38	21.5
	No	67	37.9	72	40.7	139	78.5

Table 6.3 shows that in more than 45% of cases the patients' monthly household income was less than 5000 SR (Au \$1450); only 21% of respondents had health insurance. There was no significant difference regarding gender.

### **6.1.7 Severity of disease**

Patients were asked to classify their asthma severity from very mild to severe, and to indicate the frequency of symptoms over the past four weeks.

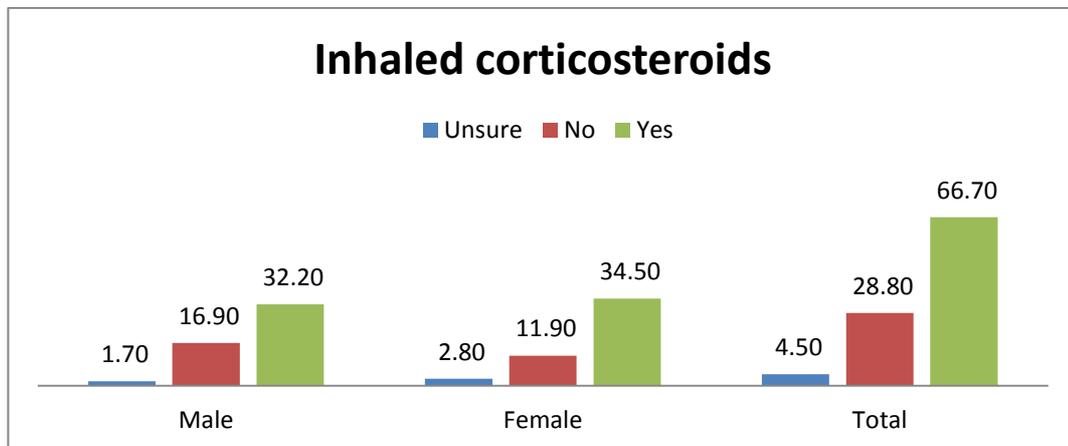
**Table 6.4 Self-reported severity of disease**

Patients' self-reported symptoms		Responses	Male		Female		Total	
			N	%	N	%	N	%
Asthma severity	Self-reported severity classified n=177	Very Mild	5	2.8	7	4.0	12	6.8
		Mild	14	7.9	19	10.7	33	18.6
		Moderate	51	28.8	42	23.7	93	52.5
		Severe	20	11.3	19	10.7	39	22.0
Asthma symptoms in last 4 weeks	(Cough, Wheeze, Difficulty Breathing) n=177	Once per month or less	35	19.8	41	23.2	76	42.9
		Once per week	30	16.9	28	15.8	58	32.8
		Twice per week	15	8.5	11	6.2	26	14.7
		Daily	10	5.6	7	4.0	17	9.6
	Awoken at night n=175	Not at all	23	13.1	28	16.0	51	29.1
		Less than once a week	30	17.1	35	20.0	65	37.1
		Once or twice a week	23	13.1	15	8.6	38	21.7
		Three or more times a week	13	7.4	8	4.6	21	12.0
	missed school or was unable to do normal daily activities n=174	Once per month or less	42	24.1	51	29.3	93	53.4
		Once per week	30	17.2	22	12.6	52	29.9
		Twice per week	11	6.3	7	4.0	18	10.3
		More than twice per week	6	3.4	5	2.9	11	6.3

From Table 4 it can be seen that the majority of respondents (74.5%) of both genders classified their asthma as moderately severe or severe, and 101 (57.1%) reported they experienced asthma symptoms at least once per week. A large proportion of patients reported being woken by their asthma symptoms at more than once a week (33.7%), having a cough, wheeze or difficulty breathing (57.1%), or having missed school or been unable to do normal activities (46.5%) in the past four weeks. A statistically significant difference between genders was not found.

### 6.1.8 Inhaled corticosteroids

Respondents were asked if they use inhaled corticosteroids (ICS).

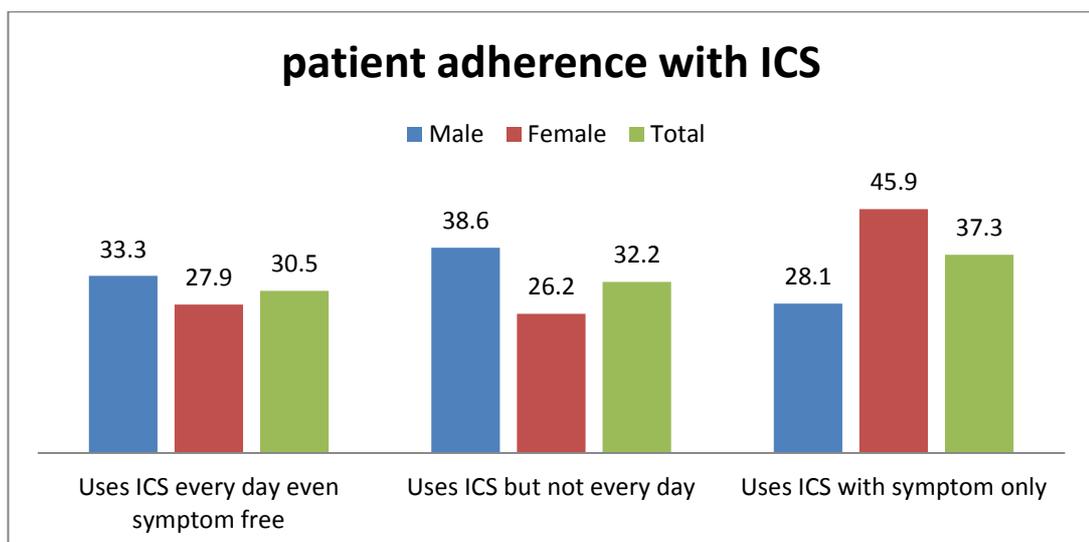


**Figure 6.4 Respondents using inhaled corticosteroids**

Figure 4 illustrates that according to patients' self-reporting, 118 (66.7%) used ICSs while 33.3% reported they did not or were unsure. There were no significant differences based on gender or age group, but females (34.5%) and those in the age group 10 to less than 15 (76.7%) reported using ICSs more than males from the same group and other age groups.

### 6.1.9 Patients' adherence to ICS use

Respondents were asked about their level of compliance with daily ICS use.



**Figure 6.5 Patients' adherence to ICS use**

Figure 5 illustrates low levels of adherence reported by both genders. Only 30.5% from both genders used ICSs daily while the majority of the sample (69.5%) used them intermittently. There were no significant differences in the use of ICS according to gender and age, although males (33.3%) were marginally more compliant with ICS use than females (27.9%).

#### 6.1.10 Asthma self-management skills

Respondents were asked if they had an Asthma Action Plan (AAP) and used a peak flow meter (PFM).

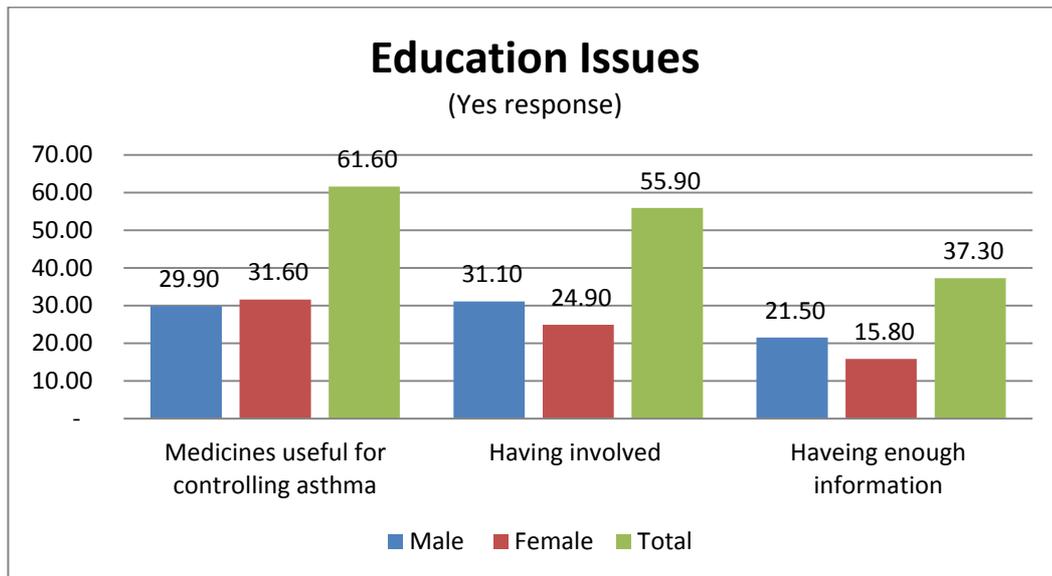
**Table 6.5 Asthma self-management skills**

Asthma management skill	Responses	Male		Female		Total	
		N	%	N	%	N	%
Asthma Action Plan (AAP) n=177	Unsure	8	4.5	8	4.5	16	9.0
	No	53	29.9	52	29.4	105	59.3
	Yes	29	16.4	27	15.3	56	31.7
Peak Flow Meter (PFM) n=175	Unsure	0	0.0	0	0.0	0	0.0
	No	78	44.1	71	40.1	149	84.2
	Yes	12	6.8	16	9.0	28	15.8

The data presented in Table 5 illustrates that the majority of respondents did not have an AAP (68.3%), nor did they use a PFM (84.2%). No significant differences were identified across gender or age.

### 6.1.11 Education issues

Respondents were asked whether they believed their medicines were useful in controlling asthma, that their doctor involved them in decision-making and that they had adequate access to information about asthma. Their responses are shown in Figure 6.6.



**Figure 6.6 Education issues**

There were no significant differences across gender and age; 38.4% and 44.1% of respondents believed their medication was unhelpful for controlling their disease and felt that their doctor did not involve them in decision-making. Fewer than 40% of respondents felt they had adequate access to asthma information.

### 6.1.12 Factors in asthma management

**Table 6.6 Factors in asthma management**

Barriers	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
	Medication issues	Doctor and other relationship	Adherences Influences	Self-efficacy	Negativity
My medications have side effects that I really don't like.	.65	.02	-.03	-.20	.03
It's hard for me to stay organized enough to keep track of medications or other things related to my illness	.62	-.06	-.05	-.15	.25
My treatment program causes changes to my body that I don't like.	.58	-.04	.09	.2	-.17
It's hard for me to plan things out carefully, so sometimes I don't get around to following my treatment program.	.52	-.03	-.05	-.09	.20
I have difficulty taking my medication when I am not at home	.52	.05	.21	.02	-.09
Following my treatment program causes me physical pain or discomfort	.46	.31	.05	.09	.04
The doctors do a good job of explaining things to me.	-.15	.72	.11	.01	-.10
I don't always trust the doctors and nurses.	.07	.62	.15	-.10	.14
My doctors are friendly and easy to talk to.	-.05	.55	-.12	.32	.10
I have difficulty understanding the information the doctor tells me about my medications	.28	.53	-.05	.18	.01
The doctors don't seem to understand how much my treatment program gets in the way of important things in my life.	.12	.50	.18	-.06	.17
My family gives me a lot of support to help me follow my treatment program.	-.18	.49	-.21	.12	.09
It feels like the doctors are too busy or rushed to talk to me about my illness and my treatment.	.30	.42	.23	-.08	.11
Sometimes I can't remember everything I'm supposed to do about my illness.	.10	.07	.65	-.12	-.07
When there are changes to my treatment program I sometimes get confused.	.20	.04	.64	.15	-.14

I try to forget that I have an illness	-.27	-.08	.56	.10	.32
I don't want my friends to know about my illness	-.11	-.05	.54	.21	.29
When I feel nervous or worried, it's hard to follow my treatment program.	.08	.18	.46	-.18	.03
My regimen takes a lot of time and work.	.34	.04	.41	-.08	-.12
I don't mind if my friends bring up my illness or ask me questions about it.	-.31	.03	.20	.65	.07
My illness is easier to take care of than a lot of other illnesses.	-.00	-.11	.02	.63	-.01
I believe that if I take care of myself and follow my treatment program, my health will improve.	.09	.23	-.31	.58	.06
I understand what I am supposed to do to care for my illness	-.06	.25	-.06	.55	.13
None of my friends have to deal with this, why do I?		.06	.00	.20	.72
Nothing bad would happen to me if I didn't follow my treatment program.	-.07	.18	-.01	-.28	.65
The doctors treat me like a little kid who can't take care of her/ himself.	.11	.04	.06	.12	.48
My family doesn't understand what it's like to live with my illness.	.32	.19	-.04	.01	.45

Table 6.6 shows the factor analysis loaded for IMS. In this study, the responses were grouped into either 'strongly agree and agree' or 'strongly disagree and disagree', after which the factor analysis for IMS was performed. The IMS items were subjected to principle components analysis (PCA) with varimax rotation using SPSS Version 17. The Kaiser-Meyer-Olkin value was .74, and, according to Bartlett's Test of Sphericity, reached statistical significance; this supports the factorability of the correlation matrix. Based on the Scree plot test and eigenvalues greater than one, it was found that four to eight factors could explain the IMS. The loading for each barrier was  $>0.41$ . Five factors were considered by the researcher to be suitable for the current study, and accounted for 54.3% of the total variance in the responses. The five factors were labelled as follows: medication issues, consisting of 6 barriers ( $\alpha=0.74$ ); doctor and other relationships, with 7 barriers ( $\alpha=0.76$ ); adherence influences, with 6 barriers ( $\alpha=0.64$ ); self-efficacy, with 4 barriers ( $\alpha=0.60$ ); and negativity, with 4 barriers ( $\alpha=0.55$ ).

#### **6.1.13 Patients'/ carers' responses: level of agreement**

Patients'/ carers' responses to IMS barriers are sequenced in Table 6.7 by strength of agreement.

**Table 6.7 Patients'/ carers' responses to IMS barriers**

Barriers	Count	%
My regimen takes a lot of time and work.	79	45.9%
I have difficulty taking my medication when I am not at home	77	44.8%
When I feel nervous or worried, it's hard to follow my treatment program.	73	42.4%
My medications have side effects that I really don't like.	72	41.9%
When there are changes to my treatment program I sometimes get confused.	69	40.1%
It's hard for me to stay organized enough to keep track of medications or other things related to my illness	69	40.1%
I try to forget that I have an illness	66	38.4%
I hate the idea of giving up the things the doctors say I have to give up.	62	36.0%
Sometimes I can't remember everything I'm supposed to do about my illness.	56	32.6%
I don't mind if my friends bring up my illness or ask me questions about it.	54	31.4%
I don't want my friends to know about my illness.	53	30.8%
My illness is easier to take care of than a lot of other illnesses.	48	27.9%
My family doesn't understand what it's like to live with my illness.	48	27.9%
I refuse to give up time with friends to take care of my illness.	44	25.6%
It's hard for me to plan things out carefully, so sometimes I don't get around to following my treatment program.	42	24.4%
My treatment program causes changes to my body that I don't like.	42	24.4%
Following my treatment program causes me physical pain or discomfort.	40	23.3%
Nothing bad would happen to me if I didn't follow my treatment program.	40	23.3%
It feels like the doctors are too busy or rushed to talk to me about my illness and my treatment.	39	22.7%
The doctors treat me like a little kid who can't take care of her/ himself.	35	20.3%
I have difficulty understanding the information the doctor tells me about my medications.	35	20.3%
My doctors are friendly and easy to talk to.	34	19.8%
My family gives me a lot of support to help me follow my treatment program.	34	19.8%
The doctors do a good job of explaining things to me.	33	19.2%
The doctors don't seem to understand how much my treatment program gets in the way of important things in my life.	31	18.0%
I believe that if I take care of myself and follow my treatment program, my health will improve.	29	16.9%
I understand what I am supposed to do to care for my illness.	29	16.9%
None of my friends have to deal with this, why do I?	26	15.1%
I don't always trust the doctors and nurses.	24	14.0%

Table 6.7 shows that more than 40% of patients or their carers reported strongly agreeing or agreeing about being affected by the following barriers: My regimen takes a lot of time and work (45.9%); I have difficulty taking my medication when I am not at home (44.8%); When I feel nervous or worried, it's hard to follow my treatment program (42.4%); My medications have side effects that I really don't like (41.9%); When there are changes to my treatment program I sometimes get confused (40.1%); and It's hard for me to stay organized enough to keep track of medications or other things related to my illness (40.1%). These barriers are related to issues with medication and compliance. The smallest barrier was 'I don't always trust the doctors and nurses', reported by 14.0% of patients/ carers.

#### 6.1.14 Number of IMS barriers affecting patients.

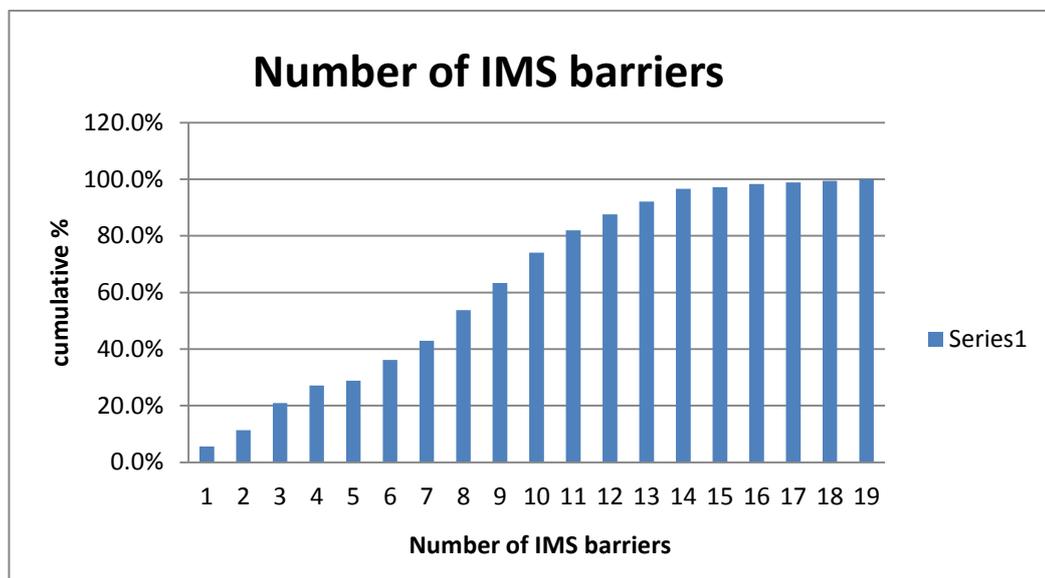


Figure 6.7 Number of IMS barriers affecting patients.

Figure 6.7 illustrates that only 5.6% of participants reported one barrier, while more than two thirds or 72.9% reported being affected by five or more. The maximum number of barriers reported was 19.

6.1.14.1 A summary of the relationship between IMS barriers and the patients'/ families' characteristics and severity of disease

**Table 6.8 Relationship between IMS barriers and patients'/ families' characteristics and disease severity**

	P value					
	Total IMS barriers scores	Medication issues factor	Doctor and other relationship factor	Adherences influences factor	Self-efficacy factor	Negativity factor
<b>PATIENT/ FAMILY CHARACTERISTICS</b>						
Gender	0.76	0.93	0.63	0.26	0.68	0.90
Age group	0.76	0.89	0.44	0.63	0.48	0.66
Health insurance	0.34	0.09	0.28	0.53	0.02*	0.30
Household's monthly income	0.85	0.40	0.91	0.93	0.31	0.33
Patient's education level	0.87	0.62	0.68	0.57	0.22	0.92
Parents' education level	0.64	0.59	0.32	0.80	0.15	0.68
<b>DISEASE SEVERITY</b>						
Asthma severity self-report	0.55	0,04*	0.49	0.43	0.49	0.47
Asthma symptoms	0.68	0.003**	0.52	0.39	0.77	0.61
Wake at night	0.30	0.03*	0.76	0.001***	0.59	0.66
Miss school or daily activity	0.10	0.001***	0.65	0.32	0.96	0.57

\* P < .05. \*\* P ≤ .01. \*\*\* P ≤ .001

Table 6. 8 shows the association between both total barriers and subclass factors for both patients’/ families’ characteristics and disease severity. There were no associations between patients’ gender, age, household income, or parents’ education level and the number of barriers or factors reported; however, significant associations were found between the self-efficacy factor and the possession of health insurance: patients who had health insurance reported higher mean scores ( $t(175) = 2.269, p < 0.05$ ). Patients who had severe asthma or asthma symptoms, who woke at night and missed school or daily activities, were more likely to be affected by the medication factor and reported higher mean scores:  $f(3,173) = 2.78, p < 0.05$ ,  $f(3,173) = 4.93, p < 0.05$ ,  $f(3,171) = 3.14, p < 0.05$  and  $f(3,170) = 5.76, p < 0.05$ , respectively. A significant association between waking at night and the adherence influences factor was found: patients who reported waking three times or more at night were likely to be affected by this factor:  $f(3,171) = 5.74, p < 0.05$ . (For more detail see Appendix G).

#### 6.1.14.2 A summary of the relationship between IMS barriers and both asthma management skill and beliefs, and ICS adherence

**Table 6.9 Relationship between IMS barriers and both asthma management skills and beliefs, and compliance with ICS usage**

P value	Total IMS barriers scores	Medication issues factor	Doctor and other relationship factor	Adherence influences factor	Self-efficacy factor	Negativity factor
<b>ASTHMA MANAGEMENT SKILL</b>						
Possession of AAP	0.93	0.8	0.02*	0.36	0.03*	0.69
Possession of PFM	0.07	0.69	0.19	0.22	0.12	0.16
Adherence to PFM use	0.12	0.971	0.24	0.20	0.65	0.01**
<b>Patient’s/ carer’s beliefs and behaviours</b>						
Medications useful	0.003**	0.000***	0.005**	0.16	0.02*	0.01**
Decision-making involvement	0.015*	0.02*	0.000***	0.15	0.60	0.03*
Adequate information	0.782	0.01*	0.002**	0.40	0.58	0.02*
<b>ICS USE AND ADHERENCE</b>						
Inhaled ICS	0.04*	0.04*	0.02*	0.87	0.59	0.83
Adherence to ICS use	0.01**	0.001***	0.02*	0.39	0.23	0.46

\*  $P < .05$ . \*\*  $P \leq .01$ . \*\*\*  $P \leq .001$

Table 6.9 shows no significant correlations between the number of barriers encountered and either possession of AAP and PFM or believing that the patient has adequate information; however, there are significant associations between patients'/carer's beliefs that their medications are useful and they are involved in making decisions about their health care, and both use of and adherence to ICS. Those who reported believing that medications were not useful and that they were not involved in decision-making were more likely to be affected by this barrier, and reported higher mean scores ( $t(175) = 2.99, p < 0.05$ ) and ( $t(175) = 2.46, p < 0.05$  respectively). These barriers were also reported to be affecting patients who did not use, or did not know if they used, inhaled ICS and did not adhere to ICS daily use ( $t(175) = 2.09, p < 0.05$ ) and ( $t(116) = 2.57, p < 0.05$ ) respectively.

Respondents who believed medications were not useful had higher mean scores with four factors: belief in the efficacy of medication and other medication issues ( $t(175) = 4.01, p < 0.05$ ), doctor and other relationships ( $t(175) = 2.85, p < 0.05$ ), self-efficacy ( $t(175) = 2.34, p < 0.05$ ), and negativity ( $t(175) = 2.47, p < 0.05$ ). These associations are significant. There were also significant associations among those who believed they were not involved in decision-making and their evaluation of other issues, giving high mean scores to medication issues ( $t(175) = 2.45, p < 0.05$ ), doctor and other relationships ( $t(175) = 2.23, p < 0.05$ ), and negativity factors ( $t(175) = 2.15, p < 0.05$ ). Those who believed they had not been given adequate information also reported high mean scores for these factors: ( $t(175) = 2.55, p < 0.05$ ), ( $t(175) = 3.08, p < 0.05$ ), and ( $t(175) = 2.138, p < 0.05$ ) respectively. There were also significant associations between both medication issues and doctor and other relationship factors, and inhaled ICS: patients who used ICS produced higher mean scores for medication issues factors ( $t(175) = 2.05, p < 0.05$ ) and lower mean scores for doctor and other relationships factors ( $t(175) = 2.37, p < 0.05$ ). Patients who reported irregular ICS use produced higher mean scores for the same factors ( $t(116) = 3.39, p < 0.05$ ) and ( $t(116) = 2.42, p < 0.05$ ) respectively. A significant association appears between doctor and other relationships and self-efficacy, and possession of AAP. Patients who did not have AAPs reported higher mean scores ( $t(175) = 2.30, p < 0.05$ ) than those who did. The self-efficacy factor also shows significant correlation with possession of an AAP: patients who had AAPs reported higher mean scores ( $t(175) = 2.17, p < 0.05$ ) than those who did not. A significant

relationship was reported between the negativity factor and adherence to PFM use. Patients who reported adherence also provided higher mean scores ( $t(26) = 2.74, p < 0.05$ ).

#### **6.1.15 ICS Adherence factors**

**Table 6.10 ICS Adherence Factors**

Barrier	Factor 1	Factor 2	Factor 3	Factor 4
	Health and medication literacy	Patient's/ family's concerns and fears	Peer influence and personal beliefs	Treatment cost, convenience and need
Lack of reliable information sources	.79	.14	.13	.09
Difficulty reading and understanding medication instruction	.68	.17	.28	.08
Medication instruction language level	.67	.06	.34	-.24
Lack of understanding of the role of medication	.63	.25	-.10	.37
Lack of understanding the correct use of inhaler device	.62	.20	.15	.36
Belief that medication is ineffective	.61	.15	.27	.08
Fear of side effects	.13	.87	.07	-.01
Worry of addiction/ dependence	.09	.81	.04	.03
Forgetfulness	.35	.60	.12	.16
Different number of medication types (control and reliever medication)	.17	.53	.41	.14
Use of traditional therapy	.08	.08	.75	-.10
My relatives' and friends' awareness (concern) regarding my illness and medication	.18	.11	.63	.10
Belief that asthma is not a serious illness that need continued treatment	.24	-.05	.60	.15
Embarrassment or discomfort using the medication.	.36	.28	.45	.24
Cost of medication and/ or health services	-.03	.04	.08	.76
The inconvenience of scheduled visiting times (appointments) and waiting for refills	.41	-.13	.34	.57
Absence of warning signs (symptoms) means no medication is needed	.34	.33	.09	.54

Table 6.10 shows the factor analysis loaded for ICS adherence barriers. The ICS items were subjected to principle components analysis (PCA) with varimax rotation using SPSS Version 17. The Kaiser-Meyer-Olkin value was .85, and according to Bartlett's Test of Sphericity reached statistical significance; this supports the factorability of the correlation matrix. Based on the Scree plot test and eigenvalues greater than one, it was found that four to seven factors explained the ICS survey. The loading for each barrier was >0.41. Four factors were considered by the researcher to be suitable for the current study, accounting for 56.1% of the total variation in responses: Health and medication literacy, consisting of 6 barriers (alpha=0.82); Patient/ family concerns and fears, with 4 barriers (alpha=0.76); Peer influence and personal beliefs, with 4 barriers (alpha=0.67); and Treatment cost, convenience and need, with 3 barriers (alpha=0.57).

#### 6.1.15.1 Patients/ carers' response agreement

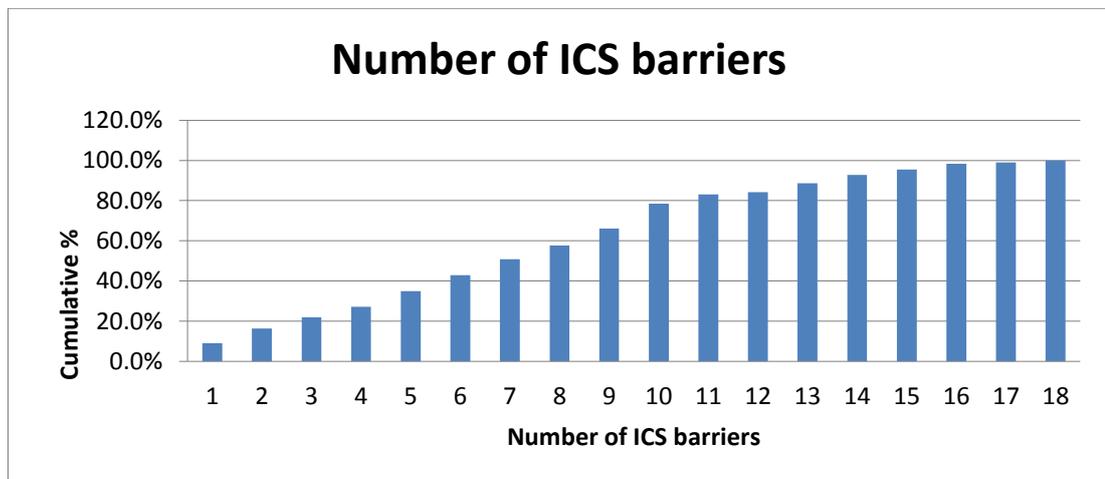
Responses to ICS barriers are sequenced in the tables by strength of agreement.

**Table 6.11 Responses to ICS barriers**

Barrier	Count	N %
Worry of addiction/ dependence	102	59.3%
Fear of side effects	99	57.6%
Absence of warning signs (symptoms) means no medication is needed	97	56.4%
Cost of medication and/ or health services	92	53.5%
Forgetfulness	88	51.2%
Lack of understanding of the role of medication	84	48.8%
Different type of inhaler device	84	48.8%
Lack of understanding of the correct use of inhaler device	75	43.6%
Lack of reliable information sources	72	41.9%
Inconvenience of scheduled visit times (appointments) and waiting for refills	72	41.9%
Different medication types (control and reliever medication)	71	41.3%
Embarrassment discomfort using the medication.	70	40.7%
Medication instruction language level	69	40.1%
Difficulty of reading and understanding medication instructions	60	34.9%
Belief that asthma is not a serious illness that need continues treatment	59	34.3%
Belief that medication is ineffective	58	33.7%
Relatives' and friends' awareness of (concern) the illness and medication	40	23.3%
Use of traditional therapy	36	20.9%

Table 6. 11 shows that more than half (51%) the patients/ carers reported being affected or strongly affected by the following factors: worry about addiction/ dependence, fear of side effects, absence of warning signs (symptoms), cost of medication and/ or health services, and forgetfulness. These barriers are related to the patient's/ family's concerns and fears regarding medication and treatment costs, and to convenience factors. The barriers least reported were nominated by 21.0% of patients/ carers.

#### 6.1.15.2 Number of ICS barriers affecting patients.



**Figure 6.8 Number of ICS barriers affecting patients.**

Figure 6.8 illustrates that more than two thirds (72.9%) of respondents reported being affected by five or more ICS barriers.

6.1.15.3 A summary of the relationship between ICS barriers and both patient/ family characteristics and severity of disease

**Table 6.12 Relationship between ICS barriers and both patients/ family characteristic and disease severity**

Barrier	P value				
	Total ICS barriers score	Factor1 Health and medication literacy	Factor 2 Patients'/ family's concerns and fears	Factor 3 Peer influence and personal beliefs	Factor 4 Treatment cost, convenience and need
<b>PATIENT/ FAMILY CHARACTERISTICS</b>					
Gender	0.19	0.97	0.25	0.51	0.77
Age group	0.18	0.29	0.98	0.91	0.08
Health insurance	0.25	0.66	0.06	0.94	0.16
Household income	0.60	0.57	0.81	0.49	0.67
Patient's education level	0.08	0.03*	0.24	0.40	0.78
Parents' education level	0.22	0.24	0.04*	0.03*	0.80
<b>DISEASE SEVERITY</b>					
Asthma severity self-report	0.80	0.42	0.90	0.63	0.40
Asthma symptoms	0.70	0.18	0.43	0.91	0.96
Wake at night	0.61	0.88	0.48	0.17	0.56
Miss school or daily activity	0.55	0.04*	0.32	0.54	0.04*

P < .05. \*\* P ≤ .01. \*\*\* P ≤ .001

Table 6.12 shows the associations between total ICS barrier scores and subclass factors with both patients' family characteristics and severity of disease. There were no significant correlations between total barriers and patient/ family characteristics and disease severity, nor between patients' gender, age group, possession of health insurance, household income, severity of asthma, asthma symptoms, waking at night, their or their parents' education level and reported subclass factors. However, an association between the health and medication literacy factor and patients' education level can be discerned. Patients at the primary school or less level were more likely to be affected, and to return a higher mean score, than respondents with higher

education levels:  $f(2,174) = 3.509, p < .05$ . Significant association is also evident between parents' education levels and two factors of patient/ family concerns and fears, and peer influence and personal beliefs. Parents with secondary school qualifications were more likely to return high mean scores for these factors than others:  $f(2,171) = 3.174, p < .05$ , and  $f(2,171) = 3.433, p < .05$  respectively. Significant associations between health and medication literacy, treatment cost, convenience factors, and missing school or daily activities are revealed. Patients who reported missing school or daily activity more than twice a week were more likely to be affected by the factors of health, medication literacy, treatment cost, and convenience, and to return higher mean scores:  $f(3,170) = 2.696, p < .05$  and  $f(3,170) = 2.725, p < .05$  respectively (for more details see Appendix G).

#### 6.1.15.4 A summary of the relationship between ICS barriers and both asthma management skills and beliefs and ICS adherence

**Table 6.13 Relationship between ICS barriers and both asthma management skills and beliefs and ICS adherence**

Barriers and factors	P value				
	Total ICS barriers scores	Factor 1 Health and medication literacy	Factor 2 Patients/ family concerns and fears	Factor 3 Peer influence and personal beliefs	Factor 4 Treatment cost, convenience and need
<b>ASTHMA MANAGEMENT SKILL</b>					
Possession of AAP	0.25	0.021*	0.12	0.29	0.03*
Possession of PFM	0.92	0.31	0.18	0.82	0.51
Adherence to PFM use	0.84	0.40	0.27	0.75	0.94
<b>PATIENTS'/ CARERS' BELIEFS AND BEHAVIOURS</b>					
Medications useful	0.015*	0.32	0.007**	0.003**	0.18
Decision-making involvement	0.42	0.29	0.036*	0.033*	0.18
Adequate information	0.004**	0.094	0.038*	0.040*	0.036*
<b>ICS USE AND ADHERENCE</b>					
Inhaled ICS	0.98	0.69	0.19	0.57	0.28
Adherence to ICS use	0.89	0.038*	0.17	0.78	0.30

\*  $P < .05$ . \*\*  $P \leq .01$ . \*\*\*  $P \leq .001$

Table 6.13 shows the relationship between ICS barriers and both asthma management skill, beliefs and ICS adherence. There were significant associations between total barriers and respondents' beliefs about both the usefulness of medications and having adequate information. Those who reported believing that medications were not useful and they did not have adequate information returned higher mean scores than who did not:  $t(175) = 2.467, p < 0.05$ ,  $t(175) = 2.913, p < 0.05$  respectively. Significant associations are evident between the factors of both health and medication literacy and treatment cost and convenience, and the possession of an AAP, with patients who did not have an AAP returning higher mean scores:  $t(175) = 2.347, p < 0.05$  and  $t(175) = 2.330, p < 0.05$  respectively. Significant associations were also found between the factor of patient/ family concerns and fears, and the responses regarding belief in the usefulness of the medication, being involved in making decisions, and having adequate information. Those who reported believing that medications were not useful, who felt they were not involved in decision-making and had inadequate information, were more likely to be affected by this factor, as indicated by the higher mean scores:  $t(175) = 2.785, p < 0.05$ ,  $t(175) = 2.115, p < 0.05$  and  $t(175) = 2.095, p < 0.05$  respectively. There were also significant associations between the factor of peer influence and personal beliefs and these same issues, which returned scores of  $t(175) = 2.988, p < 0.05$ ,  $t(175) = -2.157, p < 0.05$  and  $t(175) = 2.087, p < 0.05$  respectively. Another significant association was found between the responses regarding adequate information and the factor of treatment cost and convenience, with those who believed they did not have adequate information returning higher mean scores than others: ( $t(175) = 2.119, p < 0.05$ ). There was a further significant association between the factor of health and medication literacy and adherence to ICS. Patients with irregular ICS use returned lower mean scores for this factor:  $t(116) = 2.030, p < 0.05$  (for more detail see Appendix G).

## **6.2 Discussion**

Non-adherence to asthma management regimens became the most common factor influencing optimal management outcomes. The low adherence to asthma management amongst children and adolescents and/ or their families who attended primary health care centres (PHCC) in two regions of Saudi Arabia was reported in Phase One of this study, a finding consistent with those of several other studies

worldwide (74, 91, 183, 209, 300, 301). A number of studies have identified barriers that may influence adherence (204, 206-210, 218, 301). Some relate to the disease and its treatment, some to health care providers and some to patients and their families (34, 218). Barriers to compliance differ from one patient to another and across practice sites. Bender et al. found that there were differences both in the barriers reported and the emphasis placed on them, between adults and children (and/or their parents) and between income groups. Concern about medication side effects was reported among all groups and was one of the most common barriers (204).

The current phase of this study was conducted to identify the barriers affecting asthma management amongst child and adolescent asthma patients and/ or their families in Riyadh, KSA. In particular, the barriers affecting usage of and adherence to ICS was examined, and correlations between these barriers and participants' characteristics, severity of disease, possession of an AAP and PFM, beliefs and behaviours were evaluated. One hundred and seventy seven respondents took part in the survey, 50.8% males, nearly half aged 15–18 years, and 36.7% having completed primary education or less. Male patients and older age groups were more likely to complete the survey themselves. Patients' fathers were likely to have a higher level of education than their mothers. Most participants reported a monthly income of less than 5000 SR (Au \$1450). One hundred and thirty two (74.5%) participants classified their asthma as moderate or severe. A large proportion reported having a cough, wheeze or breathing difficulty (57.1 %), 33.7% reported being woken by their asthma symptoms, 46.5% had missed school or been unable to undertake normal daily activities at least once a week in the four weeks prior to the survey. Undertreatment and low adherence to regimens were observed. In this third phase, 66.7% of participants reported using an ICS, but of these only 30.5% used it daily; these figures were 49.6% and 25.9% respectively in Phase One of this study among Riyadh patients. The majority of respondents did not have AAPs (59.3%) or PFMs (84.2%). The rate of possession of AAPs in Phase Three was reported as less than in Phase One for the same region. These anomalies support our suggestion that patients may be confused about verbal instructions and written AAPs.

Around 40% of participants believed their medications were unhelpful and claimed their doctor did not involve them in making decisions about their treatment. Fewer

than 40% felt they had adequate access to asthma information. Chambers et al. found a relationship between patients' beliefs about their health and the seriousness of their asthma, and their adherence to treatment (177). The current study's findings are consistent with this.

Patients may be affected by more than one barrier to compliance (93, 207, 208). In the current study, the IMS scale revealed a range of barriers affecting self-management. Rhee et al. found 46% of participants reporting five or more barriers on the IMS scale (207). Our findings were consistent with this, with 73% of the sample reporting five or more barriers. McQuaid et al. found that older children were less likely to be compliant with medication regimens, but that adherence was not affected by gender, asthma severity or socioeconomic status (91). Logan et al. found a correlation between IMS total scores and age, with older adolescents reporting more barriers (206). This was not established in our study, which found no significant difference across age groups; results similar to ours were found by Rhee et al. (207). Male patients in Rhee et al.'s study returned higher mean scores in the total IMS barriers and with some factors; however, significant differences were found only with denial factors (207). In this study, with the exception of factor four (adherence influence), male participants returned higher mean scores than females, but there were no significant correlations between gender and either IMS total scores or factors: a finding consistent with Logan et al. and Rhee et al. (206, 207). It should be noted that both those studies and this one used the same instrument, although the age range differed. Negative significant correlations between both parents' education, household income and IMS total scores were reported by Rhee et al. (207). Responses in this current study are not consistent with this finding: whilst respondents with high income and parents with high levels of education reported more barriers, there are no significant differences. This may be due to health care being provided free of charge in KSA at present, so that participants did not think about cost and it did not affect their responses. It may also be due to the uneven distribution of groups, as a large minority of participants had low incomes (45.2%) and the majority of parents had attended high school or higher (61.5%). Blais et al. found that socioeconomic status did not impact on adolescents' adherence, but did have a small effect in younger children (213).

Logan et al. and Rhee et al. in their studies found significant correlations between severity and IMS scale scores (206, 207). In the current study, patients with severe asthma and those who suffered from asthma symptoms, such as being woken at night and missing school or normal activities, returned high IMS mean scores. However, there were no significant correlations observed between asthma symptoms and severity, and IMS total scores. On the other hand, there were significant correlations between both asthma symptoms and severity and the factor of medication issues. There were no significant correlations detected between IMS total mean scores and possession of both AAPs and PFMs, but significant correlations with participants' beliefs, behaviours, and ICS use. As predicted, patients and their families who believed that the medicine(s) prescribed were useful for controlling asthma, and/ or who had been involved in making treatment decisions, were more likely to return lower mean scores. The same was found with patients who reported daily adherence with ICS use. Modi et al. found that there was a lack of knowledge among children and parents regarding their disease and its treatment. They did not observe any relationship between participants' knowledge and their adherence, although they noted that their sample size was small (208). Our findings are not consistent with this, as effects of respondents' knowledge, attitudes, behaviours, and self-efficacy on adherence was observed, in line with Rhee et al.'s findings (207).

### **6.2.1 The five factors of the IMS scale**

#### **6.2.1.1 IMS Factor 1: Medication issues**

This relates to patients' and/ or their carers' beliefs in, fears about, concerns with, confidence in, and perceptions of the treatment regimen, and their adherence to it. Adherence with medication use over a long time may not be easy. This may be due to misunderstanding the need and function of asthma medication –a common finding in several studies (175, 179, 212, 218). It may also be due to patients' misconceptions and concerns about medication side effects. Boulet found that 43% of participants did not know the role of corticosteroid and 59% were worried about side effects; interestingly, 75% of the sample did not discuss their concerns with their health provider (179). It is not surprising that misconceptions, lack of confidence and fear of side effects lead to lack of adherence and poor management outcomes. The factor of medication issues has positive correlation with asthma severity and

symptoms. Patients who had severe asthma ( $p < 0.05$ ), a high frequency of symptoms ( $p \leq 0.01$ ), who woke at night ( $p < 0.05$ ) and missed school or daily activities ( $p \leq 0.001$ ) were more likely to be affected by this factor and return higher mean scores. This is supported by the negative correlation between this factor and respondents' belief that their medication is useful in controlling the disease ( $p \leq 0.001$ ), that they are involved in decision-making ( $p < 0.05$ ), and that they have adequate information ( $p \leq 0.01$ ). This factor has positive correlations with the responses concerning ICS use ( $p < 0.05$ ), but a strong negative correlation with responses about daily use ( $p \leq 0.001$ ). This may be because patients who use ICS and/or their families are most concerned about the medication, which may affect adherence.

#### 6.2.1.2 IMS Factor 2: Doctor and other relationships

The second factor relates to the barriers perceived by respondents to affect their relationship with their health care provider in areas such as communication, relationship, faith, ability of the patient to understand the provided information, patient motivation, and social support. Bender reported that patients' motivation is one of the most common barriers to adherence to medical regimens (218); others have noted that the nature of the relationship between patients/ carers and health professionals, and the clearness of communications, affected adherence (34, 93, 132, 208, 209, 218, 302, 303). Buston and Wood found that patients who failed to comply with their medication believed that their health provider's awareness of their disease was limited (209). Lack of a good working relationship and poor communication, in addition to lack of social support, contributed to their having inadequate knowledge, insufficient confidence to undertake behaviour changes, and little motivation to adhere to self-management plans. It was also found that a relationship of trust between diabetes patients and physicians reduced costs related to the patients' failure to adhere to medication routines (302). In the current study, this can be explained by the negative correlation between this factor and the possession of an AAP, belief in the value of the medication, participation in decision-making, and having adequate information. Patients with AAPs returned lower mean scores than those who did not; and those who used ICS on a regular, daily basis were less likely to report problems with their medical advisors. This finding may indicate that poor communication and lack of support affects ICS use and adherence. Cultural differences and language

may also influence the relationship, as trouble with communication between patients and their health care provider may affect asthma management outcomes (132). In this study, both the lack of a satisfactory relationship and poor communication were linked with problems about trust as well as with language and cultural differences between respondents and health professionals. Phase Two of this study showed that the majority of physicians were non-Saudi, with different languages and cultures.

#### 6.2.1.3 IMS Factor 3: Adherence influences,

Factor three relates to barriers that influence adherence to medication routines, whether intentional or unintentional cognitive barriers, such as memory failure, confusion, psychological issues, trying to forget, and stigmatization. Bender et al. found stigma to be the barrier most emphasized in child patients, who did not report forgetfulness; nor did their parents (204). A number of studies have reported forgetfulness as a common barrier (208, 209); Piette et.al. found that symptoms were likely to be twice as influential as costs on adherence (302).

There was a significant correlation between adherence and participants' responses to being woken at night by symptoms. Patients who reported waking at least once a week were more likely to be affected by adherence issues than those who did not: for unclear reasons, they returned higher mean scores than those who were woken once or more a week. This may be because patients with severe asthma are more educated than patients with mild symptoms, so that they feel more confident and succumb less to stress or worry.

#### 6.2.1.4 IMS Factor 4: Self-efficacy

Factor four relates to perceptions of being in control, such as believing that asthma is not serious and understanding how to deal with it. If patients have appropriate knowledge, good care, and a comfortable relationship with their doctor, these may encourage behaviour changes and improve self-efficacy. This assertion is supported by the following results: this factor had a significant correlation with the possession of health insurance: patients who have private health insurance have more choices in their health care, such as access to private clinics. Possession of AAPs also seems to improve communication between patients and health professionals, and so may lead to behaviour changes and improved self-efficacy. In this study, patients who did not

have AAPs returned higher mean scores for this factor; it also had a negative correlation with patients' beliefs that their medication was useful for controlling asthma.

#### 6.2.1.5 IMS Factor 5: Negativity

The last factor relates to beliefs, behaviours and emotional barriers, such as finding one's situation uncomfortable, showing unconcern about management outcomes, being dissatisfied with the health care provider's attitude, and lacking motivation and support. The negativity factor had significant correlation with PFM adherence, indicating that patients who used PFMs were more affected by this factor. However, it had a negative correlation with patients' beliefs about the degree of their involvement and the availability of suitable information about their asthma.

Bender and Bender in their review found differences in the barriers reported and emphasized by adults and children (and/ or their parents), as well as by those in low income groups (204).

In Phase One of this study, differences in responses appeared when controller or preventer expressions were used and when 'ICS' was used in the questions. In this phase, using IMS and ICS surveys, different responses were found, as were differences in the sequences of some barriers. The IMS survey, which evaluated asthma management in general, revealed that the five most common barriers, reported by at least 40% of participants (Table 6.7), were unpremeditated: psychological and social issues, and time pressures. The ICS survey revealed the five most common barriers, reported by at least 51% of participants (Table 6.11), were premeditated attitudes: worry, fears, and beliefs.

While ICSs are considered the cornerstone of asthma treatment, patients' use of them and adherence to daily use remains suboptimal. These medications may raise more argument than other medications: Modi et al. found that parents and their children with asthma documented more barriers to ICS use than they did to other medications (208). Farber et al. in their study of parents of children with asthma, which evaluated their understanding of the role of medications, found a significant level of misunderstanding: 23% of 571 parents misunderstood role of ICS, while the same was true for only 7% of 1432 of participants regarding quick reliever medication

(212). Barriers to adherence to ICS were estimated in the current study using the ICS scale. As mentioned previously, patients may be affected by more than one barrier, and in the current phase of the study, the ICS scale revealed that participants indeed reported a range of barriers affecting their adherence to ICS regimens: more than 72% of participants identified five or more barriers. There were negative correlations between total ICS scale scores and beliefs about the usefulness of the medication and the adequacy of information about it. Patients and their families who believed they had access to adequate information and that the medicine(s) prescribed were useful on controlling their asthma returned lower mean scores than those who did not, or who were unsure.

## **6.2.2 The four factors of the ICS scale**

The ICS scale in this study revealed four subclasses relating to patients' and/ or their carers' beliefs, knowledge, behaviour, concerns, attitudes, and self-efficacy regarding ICS use and adherence.

### **6.2.2.1 ICS Factor 1: Health and medication literacy**

The first factor indicates the reliability of information, the understanding of instruction in medication, and the awareness of the role and use of inhaler devices, in addition to the value of medication, amongst patients and carers. It has been reported that not understanding the role of medication is one of the common barriers to ICS adherence (179, 212). Suboptimal use and inadequate technique in using the inhaler have been reported in many studies, even amongst patients who had been educated in its use (116, 120, 121, 124, 304). As previously mentioned, Farber et al. found nearly a quarter of parents whose children had persistent asthma misunderstood the function of their child's medication, with only 24% of these parents reporting that their child complied with daily medication use; this compared with 64% of 442 parents who did understand the role of the medication (212). In this study, the effect of medication literacy on adherence to ICS can be observed in the significant negative correlation between this factor and the participants' daily adherence to ICS use ( $p < 0.05$ ). Patients with primary school education level or less were more likely to be affected by this factor than patients with higher education levels. This factor also correlated with missing school or daily activities, indicating that this group and their carers lacked either knowledge or willingness, or had not been provided with good health

care. Boulet found that 75% of participants did not discuss their concerns about ICS with their health care providers. Good communication and relationships with health professionals, as well as education and follow-up, may reduce the effect of this factor, as can be seen in the negative correlation between it and the possession of an AAP. Patients who had AAPs returned lower mean scores for this factor ( $p < 0.05$ ).

#### 6.2.2.2 ICS Factor 2: Patient/ family concerns and fears

The second factor relates to corticosteroid phobia, forgetfulness, and the number of medications prescribed. Several studies have reported that steroid phobia is the most common barrier behind the lack of adherence (34, 177, 179, 303, 305, 306). This affects not only the patient's attitude, but also that of their family or carers. Mothers who believe or fear that corticosteroids have dangerous side effects are less likely to let their children use ICS and more likely to reduce the dose (215). Two recent studies have found that patients were more likely to be tolerant of a single inhaler for combination drug use (ICS and LABA) than of separate inhalers (129, 131): Janson et al. found that about half the patients who used two medications were adherent with only one of them (210), while Farber et al. found that misunderstanding the role of medication was higher amongst parents with low levels of education and whose child did not visit a specialist (212). In the current study, this factor had strong correlation with parents' education level. Parents with secondary school level education were more likely to return higher mean scores with this factor. Forgetfulness has also been reported as an adherence barrier. Culture and social beliefs can play major role in the use of traditional therapy (93, 307).

It has been found that negative patient/ carer beliefs about medication affect adherence, even if it is believed that the medication is necessary for asthma treatment (34, 183, 300, 301, 308). Availability of adequate information, appropriate patient education, and improved patient/ carer–health care provider relationships may prove helpful in changing these beliefs and behaviours, contributing to a decrease in the effect of the fear factor. This is supported by the negative correlation seen between this factor and participants' responses regarding the usefulness of medication, involvement, and access to information about their asthma.

#### 6.2.2.3 ICS Factor 3: Peer influence and personal beliefs

The third factor relates to peer influence, misconceptions, unease with having a disease and/ or its management, believing asthma is not a serious disease, and the use of traditional therapy. Bender and Bender found that the belief that asthma is not serious is low amongst adult patients and absent among children and their parents (204). More important for the cohort in this current study are peer influence and personal beliefs, which are found to have a significant correlation with parents' education level. Parents with secondary school education returned higher mean scores than other groups. This factor had negative correlation with patients' beliefs in the usefulness of their medication, the suitability of the information they had received, and satisfaction with their involvement in decision-making. This finding indicates that intervention should be provided to all patients, carers, and peers/ relatives, for example through school intervention programs. Improving social support may be effective in minimizing the effect of this factor.

#### 6.2.2.4 ICS Factor 4: Treatment cost, convenience, and need

The last factor relates to treatment costs, visit schedules and time wasted, and lack of adherence caused by misunderstanding and lack of knowledge. The cost of health services and medication may negatively influence adherence, especially amongst those on low incomes or without health insurance (34, 132, 303). This factor correlated with missing school or daily activities. Improving health care and adherence to asthma management protocols instituted by the professionals, in addition to building good communication and relationships with patients/ carers, may reduce costs and so reduce the effect of this factor. This can be predicted from the negative correlation between this factor and both possession of AAPs and access to adequate information. Patients who had AAPs returned lower mean scores with this factor ( $p < 0.05$ ) than those without. A similar finding was observed regarding access to information.

It is interesting that although health services and medication are provided free in Saudi Arabia, the cost of medication and/ or health services was still reported as a barrier by 53.5% of participants. This may indicate that the more effective medications are not readily available in the PHCCs, or the respondents were

dissatisfied with the quality of the services provided by PHCCs, inclining them to use private health care services.

There were no correlations found between possession of PFMs and all factors of both surveys. This may be due to the low number of patients reporting the use of PFMs (15.8%); it may equally be due to the low prescription of PFMs and lack of motivation to increase PFM use.

A limitation of this study was the lack of a database where one could double-check patient medication use patterns to assess levels of adherence. To overcome this, patients were asked to list their medications and a visual list was produced to make it easier for them to identify their medication.

### **6.2.3 Conclusion**

Low use of both AAPs and PFMs, combined with inappropriate treatment, were observed among participants in this study. Adherence to ICS use in this phase was low, consistent with Phase One findings of patients from the same region. Participants reported a number of factors affecting their adherence to asthma management in general and ICS use in particular, with a majority reporting more than five barriers. Chapman et al. have argued that most patients are affected by more than one barrier and that this makes it impossible to find one solution that can be generalized to enhance compliance amongst all patients (93). Furthermore, there were differences between the barriers revealed in the IMS and ICS scales, although most barriers in both scales were related to asthma medication. Information availability and access, beliefs about medication usefulness, involvement in decision-making, and possession of AAPs and use of ICS correlated with a number of these factors. Lack of knowledge, negative behaviours, erroneous attitudes, poor self-efficacy, misconceptions, misunderstanding by patients/ carers, poor communication with health care providers, lack of motivation, and inadequate social support contributed to problems with medication.

Effective interventions should embrace all components of asthma management, with emphasis on the use of terminology such as controlling expression. Interventions should encourage partnerships between patients/ carers and health care providers and

be provided to all affected parties, whether patients, relatives, carers, or health professionals.

#### **6.2.4 Recommendations**

Prepared intervention programs should be delivered in clinics, schools and community centres and cover asthma disease and its management; however, the barriers discussed above should be considered.

Physicians should be motivated to develop and prescribe AAPs, as they play an important positive role in compliance.

There should be stronger focus on improving patient knowledge, promoting behaviour changes, and correcting misconceptions such as steroid phobia.

Pharmacy departments should play a larger role in reducing the effect of barriers, which mostly relate to medication.

Future research should include more locations and a larger sample.

## Chapter 7

### Phase 4: Impact of an Education Program and Provision of Asthma Action Plans on the Knowledge and Health Outcomes of Asthmatic Patients – Results and Discussion

#### 7.1 Results

##### 7.1.1 Group A (Education and asthma action plan)

In this portion of the study, patients and/ or their carers were given asthma education and an asthma action plan (AAP) as intervention. They were surveyed pre- and post-individual intervention to identify any changes in a wide range of issues, including knowledge, beliefs, perceptions, behaviours, adherence, self-efficacy, and asthma control. The results of the intervention are shown below.

##### 7.1.2 Survey response

Table 7.1 shows that 135 questionnaires were administered to group A. The participants in this study were made up of 90 males and 45 females. Of these, 105 (78.7%) completed the study (69 males and 36 females). Most respondents were aged 15 to less than 18 years in both stages of this phase: 40.7% pre-intervention and 40.0% post-intervention respectively.

**Table 7.1 Survey response**

Intervention stages	Gender Age group	Male		Female		Total	
		N	%	N	%	N	%
pre-intervention N=135	5 - < 10 yrs.	30	22.2	15	11.1	45	33.3
	10 - <15 yrs.	22	16.2	13	9.6	35	25.9
	15 - <18 yrs.	38	28.1	17	12.6	55	40.7
	Total	90	66.7	45	33.3	135	100.0
Post-intervention N=105	5 - < 10 yrs.	24	22.9	11	10.5	35	33.3
	10 - <15 yrs.	16	15.2	12	11.4	28	26.7
	15 - <18 yrs.	29	27.6	13	12.4	42	40.0
	Total	69	65.7	36	34.3	105	100.0

### 7.1.3 Patients' seasonal asthma symptoms

Respondents were asked if their asthma symptoms differed across seasons.

**Table 7.2 Patients' seasonal asthma symptoms**

Stage	Response option	Winter		Spring		Summer		Fall	
		N	%	N	%	N	%	N	%
pre-intervention N=135	none	5	3.7	16	11.9	11	8.1	46	34.1
	A little	50	37.0	65	48.1	67	49.6	73	54.1
	A lot	80	59.3	54	40.0	57	42.2	16	11.9
	Total	135	100.0	135	100.0	135	100.0	135	100.0
Post-intervention N=105	none	2	1.9	8	7.6	9	8.6	33	31.4
	A little	39	37.1	54	51.4	51	48.6	59	56.2
	A lot	64	61.0	43	41.0	45	42.9	13	12.4
	Total	105	100.0	105	100.0	105	100.0	105	100.0
p value		0.000		0.000		0.001		0.000	

The data in Table 2 illustrate that participants in both stages of the study reported increased symptoms during the winter season and reduced symptoms in the fall. No statistically significant differences were observed across gender or age in either stage.

## 7.1.4 Severity of disease

### 7.1.4.1 Self-assessment of severity of asthma

Respondents were asked to classify their or their child's severity of asthma in a range from very mild to severe.

**Table 7.3 Self-assessment of severity of asthma**

	Asthma severity	Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
Patient self-assessment	Very mild	2	1.5	3	2.9	0.000
	Mild	39	28.9	69	65.7	
	Moderate	70	51.9	31	29.5	
	Severe	24	17.8	2	1.9	

The majority (82.2% and 98.1%) of respondents from both stages, pre- and post-, classified their asthma as moderately severe or less. Of these, 41 (30.4%) and 72 (68.6%) reported their asthma as very mild or mild in both stages, while 70 (51.9%) and 31 (29.5%) reported their asthma severity as moderate. There was a significant difference reported between both stages ( $p=0.000$ ). Pre-intervention patients' asthma severity was more likely to be classified as severe than post-intervention patients'. Thirty-nine (28.9%) and 24 (17.8%) pre-intervention patients classified their asthma severity as mild and severe compared, with 69 (65.7%) and 2 (1.9%) post-intervention patients. There were no statistically significant differences observed based on gender or age.

### 7.1.4.2 Self-reported asthma symptoms

Respondents were asked about the frequency of asthma symptoms over the past four weeks.

**Table 7.4 Self-reported asthma symptoms**

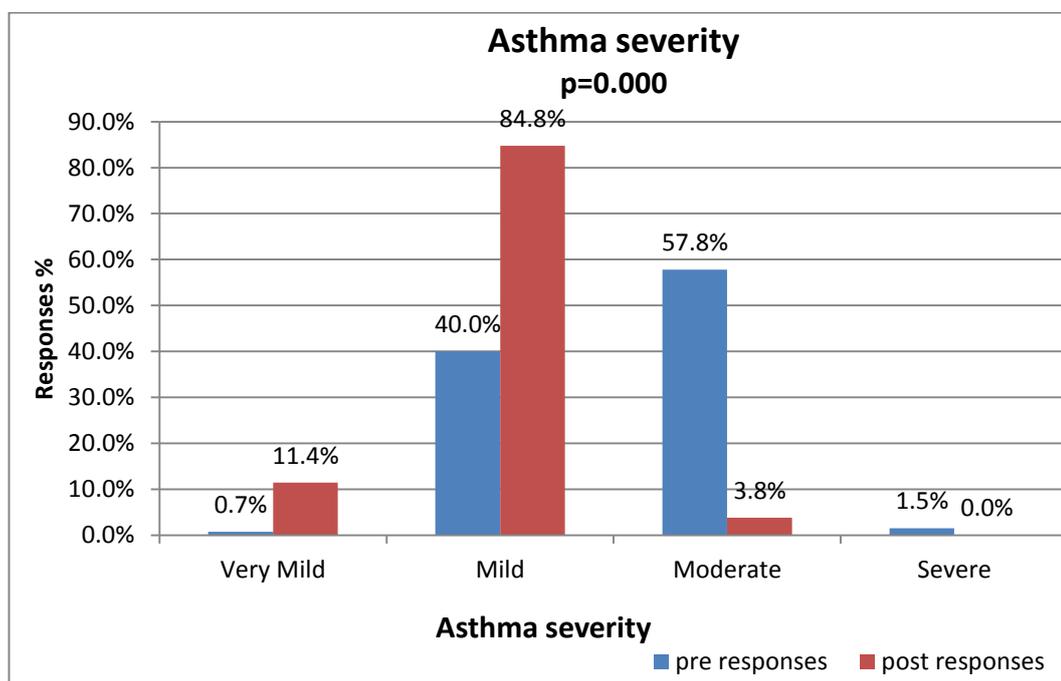
Stage	Response	Asthma symptoms									
		Wheezing or difficulty breathing when exercising		Wheezing during the day when not exercising		Waking up at night with wheezing or difficult breathing		Missing days of school		Missing any daily activities	
		N	%	N	%	N	%	N	%	N	%
Pre-intervention N=135	None	9	6.7	19	14.1	16	11.9	32	23.7	21	15.6
	1 to 3	57	42.2	97	71.9	82	60.7	76	56.3	68	50.4
	4 to 7	61	45.2	14	10.4	36	26.7	25	18.5	35	25.9
	over 7	8	5.9	5	3.7	1	.7	2	1.5	11	8.1
	Total	135	100.0	135	100.0	135	100.0	135	100.0	135	100.0
Post-intervention N=105	None	33	31.4	83	79.0	50	47.6	75	71.4	51	48.6
	1 to 3	64	61.0	21	20.0	54	51.4	29	27.6	51	48.6
	4 to 7	8	7.6	1	1.0	1	1.0	1	1.0	3	2.9
	over 7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Total	105	100.0	105	100.0	105	100.0	105	100.0	105	100.0
p value		0.000		0.000		0.000		0.000		0.000	

Table 7.4 shows the patients' asthma symptoms in the four weeks previous to the survey, for both pre- and post-intervention stages. Significant differences between all pre- and post-intervention stage symptoms were noted. Pre-intervention patients were more likely to be suffering from asthma symptoms than post-intervention patients. Across all the symptoms listed there was a dramatic increase in the proportion of patients who were symptom-free post-intervention; for example, the proportion increased from 4.6% to 31.5% in the case of wheezing or difficulty breathing when exercising ( $p=0.000$ ) and from 14.1% to 79.0% for wheezing during the day when not exercising ( $p=0.000$ ). Response rates in both stages were

influenced neither by age nor by gender, except in pre-intervention patients with wheezing during the day when not exercising. Pre-intervention female patients were more likely to suffer from this symptom than males ( $p=0.034$ ); see Appendix H.

#### 7.1.4.3 Self-reported asthma severity classification according to patient answers to symptoms question (at least one symptom)

Based on the respondents' replies to a series of five questions, the patients' asthma severity score was calculated. The score ranged from 3 to 18, where a score of 3 represented very mild, 8 mild, 13 moderate, and 18 severe, asthma.



**Figure 7.1 Self-reported asthma severity**

Figure 7.1 illustrates asthma severity based on symptom scores. A significant difference between both stages was found. Pre-intervention patients' asthma severity was more likely to be severe than post-intervention patients'. Fifty-five (40.7%) pre-intervention respondents classified their asthma severity as very mild or mild, compared with 111 (96.2%) post-intervention respondents, while 78 (57.8%) and 4 (3.8 %) respondents from the pre- and post-intervention stages respectively reported their asthma severity as 'moderate' ( $p=0.000$ ). There were no significant differences by gender or age.

### 7.1.5 Patient beliefs, perceptions, behaviours, attitudes, involvement and self-confidence (self-report)

Respondents were asked about their beliefs, perception, behaviour, attitude, practices, self-confidence, and involvement in decisions regarding asthma management issues.

**Table 7.5 Patients' beliefs, perceptions, behaviours, attitudes, practices, involvement, and self-confidence**

Questions	Pre-intervention N=135			Post-intervention N=105			p value
	Unsure N (%)	No N (%)	Yes N (%)	Unsure N (%)	No N (%)	Yes N (%)	
Belief asthma is controlled	45 (33.3)	51 (37.8)	39 (28.9)	23 (21.9)	5 (4.8)	77 (73.3)	0.000
Beliefs about usefulness of medication	50 (37.0)	20 (14.8)	65 (48.1)	12 (11.4)	0 (0.0)	93 (88.6)	0.000
Involvement in asthma treatment decisions	31 (23.0)	33 (24.4)	71 (52.6)	0 (0.0)	0 (0.0)	105 (100.0)	0.000
Physician's attentiveness to patient's medication preferences	28 (20.7)	37 (27.4)	70 (51.9)	1 (1.0)	0 (0.0)	104 (99.0)	0.000
Ability to respond to asthma attacks	54 (40.0)	24 (17.8)	57 (42.2)	9 (8.9)	0 (0.0)	96 (91.4)	0.000
Belief in ability to administer medication	36 (26.7)	51 (37.8)	48 (35.6)	21 (20)	9 (8.6)	75 (71.4)	0.000

From the data presented in Table 7.5 it can be seen that there were statistically significant differences between respondents' beliefs in both stages. Only 28.9% of respondents pre-intervention believed their asthma had been well controlled over the previous four weeks, compared with 73.3% of post-intervention respondents ( $p=0.000$ ), and were more likely to believe their medications were useful for controlling their asthma than post-intervention respondents (48.1% vs. 88.6%,  $p=0.000$ ). Post-intervention respondents felt they were involved in decision-making, and their belief that they had had a say in their medication choices regarding asthma treatment was nearly twice that of pre-intervention respondents (100.0% and 99.0% vs. 52.6% and 51.9%;  $p=0.000$  respectively). A significant difference between each stage's self-confidence was found in pre-intervention respondents feeling less able to

manage changes in their asthma (57.8%) and administer their asthma medication by themselves (64.5%) than those in the post-intervention stage (8.9% and 28.6%, p=0.000).

### 7.1.6 Disease management

#### 7.1.6.1 Medication used in past 12 months

Respondents were asked if they had used an asthma medication over the past 12 months, and all responded yes.

#### 7.1.6.2 Quick relief medication

Respondents were asked if they had used medication as a reliever for their disease symptoms.

All patients in both stages reported they had used a quick reliever. The highest number of times in one day that patients used a quick reliever, in the previous four weeks and 12 months during both stages, can be seen in Table 7.5.

**Table 7.6 Maximum frequency of quick reliever use in previous four weeks and 12 months**

	Maximum daily use (times in one day)	Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
In the previous four weeks	None	2	1.5	38	36.2	0.000
	1 to 2	84	62.2	65	61.9	
	3 to 4	46	34.1	2	1.9	
	5 to 6	2	1.5	0	00	
	over 6	1	.7	0	00	
In the past 12 months	None	7	5.2	3	2.9	NS
	1 to 2	45	33.3	26	24.8	
	3 to 4	57	42.2	49	46.7	
	5 to 6	20	14.8	23	21.9	
	over 6	6	4.4	4	3.8	

Data in Table 6 illustrate the frequency of reliever use in the 4 weeks before the survey declined post-intervention. Thirty-eight (36.2%) post-intervention patients

reported no use of a reliever, compared with 2 (1.5%) pre-intervention patients, while 46 (34.1%) from the pre-intervention stage reported the use of a reliever three to four times daily compared with 2 (1.9%) in post-intervention ( $p=0.000$ ). No significant differences were observed based on age in either stage; however, a significant post-intervention difference was seen with gender, where male patients were less likely to have used a reliever than females. Of the 69 males, 32 (46.4%) reported no use of a reliever inhaler in the past four weeks compared to 6 of 36 females (16.7%), while 53.6% of males had used a reliever 1 to 2, or 2 to 3 times, compared with 83.4% of females ( $p=0.011$ ); see Appendix H. No significant differences were observed based on gender or age in the use of quick relievers in the past 12 months, in either stage.

### 7.1.6.3 Control medication (self-report)

Respondents were asked if they had used any control medication, for example corticosteroids.

**Table 7.7 Number of patients using control medication**

Question	Response	Stage N (%)	
		Pre-intervention N=135	Post-intervention N=105
Use of control medication	Unsure	35 (25.9)	0 (0.00)
	No	8 (5.9)	0 (0.00)
	Yes	92 (68.1)	105 (100.0)
Difference between stage p value		0.000	

Table 7 shows self-reported use of controller medications. There was a significant difference between stages: 92 (68.1%) of pre-intervention stage chose ‘Yes’ compared with 105 (100%) of post-intervention ( $p=0.000$ ). A significant difference was seen between genders in the pre-intervention stage, with male patients more likely to use control medications than females: 65 (n=90; 72.2%) of males reported they used a controller compared to 27 (45; 60%) of females  $p=0.004$ . There was no significant difference between gender in the post-intervention stage, and no significant differences associated with age in either stage

#### 7.1.6.4 Self-assessment of adherence to control medications

Respondents were asked about their level adherence to daily control medication use.

**Table 7.8 Patients' self-assessments of adherence to control medications**

Self-reported use of controller medication	Pre-intervention N=92		Post-intervention N=105		p value
	N	%	N	%	
Takes it every day	28	30.4	72	68.6	0.000
Takes it some days, but not other days	22	23.9	25	23.8	
Used to take it, but now does not	12	13	2	1.9	
Only takes it when having symptoms	28	30.4	6	5.7	
Never took it	2	2.2	0	0.00	
Total	92	68.1	105	100	

Table 8 shows patients' self-reported adherence to the use of their control medications. Post-intervention patients were more likely to use their medication. More than two thirds (68.6%) of patients post-intervention who used a control medication reported taking it daily, compared with less than one third (30.4%) of pre-intervention respondents, while 69.6% pre-intervention used it intermittently compared with 31.4% post-intervention ( $p=0.000$ ). No significant differences were seen in gender or age in either stage.

#### 7.1.6.5 Inhaled corticosteroid (ICS) (self-report)

Patients were asked if they used an inhaled corticosteroid (ICS).

**Table 7.9 Inhaled corticosteroid (ICS)**

	Response	Stage				p value
		Pre-intervention N=135		Post-intervention N=105		
		N	%	N	%	
Use of an inhaled corticosteroid	Don't know	56	41.5	4	3.8	0.000
	No	31	23.0	3	2.9	
	Yes	48	35.6	98	93.3	

Table 9 shows a significant difference across stages. Patients pre-intervention reported they used ICS 2.6 times less often than post-intervention. Forty eight (35.6%) and 87 (63.5%) pre-intervention chose ‘Yes’ and ‘No/ Don’t know’, compared with 98 (93.3%) and 7 (6.7%) post-intervention, respectively (p=0.000). There were no significant differences observed based on gender or age.

#### 7.1.6.6 Patients’ adherence to ICS daily use

Respondents were asked about their level of adherence to recommended ICS use.

**Table 7.10 Patients’ adherence to inhaled corticosteroid**

Inhaled corticosteroid frequency	Pre-intervention N=48		Post-intervention N=98		p value
	N	%	N	%	
Every day	15	31.3	71	72.4	0.000
Less often	11	22.9	13	13.3	
Several times a week	7	14.5	11	11.2	
When having asthma symptoms	15	31.3	3	3.1	

Table 10 presents patients’ self-reported adherence to ICS use. Post-intervention patients were 2.3 times more likely to be adhering to their medical regimen than pre-intervention. No significant differences were observed across gender or age.

### 7.1.6.7 Medication use

Respondents were asked to list their asthma medications. This list was grouped and classified by the researcher as shown in Table 7.11.

**Table 7.11 Medication use**

Medication group	Response option	Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
$\beta_2$ agonist	No	4	3.0	0	0.00	NS
	Yes	131	97.0	105	100.0	
Inhaler corticosteroid	No	0	0.00	0	0.00	0.068
	ICS alone	70	51.9	42	40.0	
	ICS Combination	65	48.1	63	60.0	
Oral corticosteroid	No	124	91.9	103	97.1	NS
	Yes	11	8.1	3	2.9	
LABA	No	117	86.7	88	83.8	NS
	Yes	18	13.3	17	16.2	
Montelukast (Singular)	No	131	97.0	104	99	NS
	Yes	4	3.0	1	1.0	
Other medications	No	127	94.1	105	100.0	NS
	Yes	8	5.9	0	0.00	

The data presented in Table 11 illustrate the use of asthma-related medications in both pre- and post-intervention stages of the study. Almost all participants in both stages were using a  $\beta_2$  agonist, and all patients were using ICS; however, post-intervention participants were more likely to use an ICS combination (60%) than pre-intervention participants (48.1%). Use of oral corticosteroids was reduced amongst post-intervention patients. However, there were no significant differences, and the responses were not influenced by age or gender.

### 7.1.6.8 Comparison of self-reported control medication use and investigator assessment

The questionnaire asked the patients or their family member if they (or their child) used a control medication and an inhaled corticosteroid. To validate their responses

the primary researcher asked the respondents to list their medications, to determine if they used an ICS.

**Table 7.12 Comparison of patients' versus investigator's assessment of controller use.**

Stage	Self-reported				Investigator assessment				
	Control medication		Inhaled corticosteroids		Use of corticosteroids			LABA	Singular
	Yes N (%)	No or unsure N (%)	Yes N (%)	No or unsure N (%)	ICS only N (%)	ICS combination N (%)	Oral corticosteroids N (%)	N (%)	N (%)
Pre N=135	92 (68.1)	43 (31.8)	48 (35.6)	87 (64.5)	70 (51.9)	65 (48.1)	11 (8.1)	18 (13.3)	4 (3.0)
Post N=105	105 (100)	0 (0.00)	98 (93.3)	7 (6.7)	42 (40.0)	63 (60.0)	3 (2.9)	17 (16.2)	1 (1.0)

Data in Table 7.12 illustrate how differences appear in patients' responses to similar actions or questions. Patients in the post-intervention stage were more likely to choose similar answers for such questions, and to more accurately report their medications, than pre-intervention respondents. However, based on the medication list provided, all patients used either an ICS alone or in combination in both stages.

#### 7.1.6.9 Peak flow meter (PFM) and spacer use

Respondents were asked if they had used a PFM and spacer.

**Table 7.13 Peak flow meter (PFM) and spacer use**

Questions	Pre-intervention N=135			Post-intervention N=105			p value
	Unsure N (%)	No N (%)	Yes N (%)	Unsure N (%)	No N (%)	Yes N (%)	
Uses a peak flow meter to monitor asthma	2 (1.5)	126 (93.3)	7 (5.2)	37 (35.2)	13 (12.4)	55 (52.4)	0.000
Uses a spacer when using an inhaler	10 (7.4)	102 (75.6)	23 (17.0)	15 (14.3)	58 (55.2)	32 (30.5)	0.004

Table 13 shows the use of PFM for monitoring asthma and the use of spacers. Patients in the post-intervention stage were more familiar with PFM and spacer use

than in the pre-intervention stage. The majority (93.3%) of respondents pre-intervention did not use a PFM to monitor their asthma, compared with just over half (52.4%) post-intervention ( $p=0.000$ ). There were no significant differences reported across gender or age.

In general there was a low level of spacer use in both stages. Around one third (30.5%) of post-intervention patients chose 'Yes' for spacer use, compared with 17.0% pre-intervention ( $p=0.004$ ). There were no significant differences across gender; but a significant difference was observed between different groups. In the pre-intervention stage, patients aged 10 and under 15 were more likely to use a spacer than other age groups. Ten of 45 (22.2%), patients aged 5 to under 10, 11 of 35 (31.4%) of those 10 to under 15, and 2 of 55 (3.6%) of those 15 to under 18 years chose 'Yes' to using a spacer, compared with 35 (77.8%), 24 (68.6%) and 53 (96.4%) who answered 'No/ Unsure' ( $p=0.005$ ). In the post-intervention stage, the same was observed: the 10 and under 15 age group was more likely to use a spacer than the older age group. However, an increase in the use of spacers was seen in the youngest age group: 16 out of 35 patients aged 5 to less than 10 (45.7%), 13 out of 28 aged 10 to under 15 (46.4%), and 3 out of 42 aged 15 to under 18 (7.1%) answered 'Yes' to using a spacer, compared with 19 (54.3%), 15 (53.6%), and 39 (92.9%) who answered 'No/ Unsure' ( $p=0.000$ ; see Appendix H).

#### **7.1.7 Patient education and follow-up**

Respondents were asked if they had access to adequate information and if their health carers followed up about how to use asthma medications. In addition, respondents were asked if they had been taught how to use their PFMs.

**Table 7.14 Accessible information, education, and follow-up**

Question	Pre-intervention N=135			Post-intervention N=105			p value
	Unsure N (%)	No N (%)	Yes N (%)	Unsure N (%)	No N (%)	Yes N (%)	
Adequate asthma management information accessibility	41 (30.4)	60 (44.4)	34 (25.2)	9 (8.6)	2 (1.9)	94 (89.5)	0.000
Medication usage follow-up over the past 12 months	18 (13.3)	39 (28.9)	78 (57.8)	0	00	105 (100.0)	0.000
Peak flow meter usage education	0	118 (87.4)	17 (12.6)	5 (4.8)	1 (1.00)	99 (94.3)	0.000

The data in Table 14 show that patients in the post-intervention stage were 3.6 times more likely to believe they had access to enough information to help them control their asthma than they had been in the pre-intervention stage (89.5% vs. 25.2%;  $p=0.000$ ). There was no significant difference observed across gender in either stage, but pre-intervention data show significant differences based on age. Younger patients were more satisfied with the information available than older age groups. Eighteen of 45 aged 5 to under 10 (40.0%), 9 of 35 aged 10 to under 15 (25.7%), and 7 of 55 aged 15 to under 18 (12.7%) answered ‘Yes’ to having access to enough information, compared with 27 (60.0%), 26 (74.3%) and 48 (87.3%) who replied ‘No/ unsure’ ( $p=0.035$ ). No significant difference was seen between age groups in the post-intervention stage; see Appendix H.

Patient follow-up also increased in the post-intervention stage, where all patients reported they had received follow-up regarding their medication use, compared with 57.8% in the pre-intervention stage ( $p=0.000$ ). No significant differences were seen based on gender or age in either stage.

Pre-intervention patients were less educated about PFM use. Only 12.6% reported they were educated about PFM use, compared with a majority of 99 post-intervention respondents (94.3%); 118 (87.4%) and six (6%) pre-and post-intervention patients

were not educated or unsure ( $p=0.000$ ). There were no significant differences observed across age groups in either stage, but post-intervention patients showed significant differences by gender, with male patients more likely to have been educated about PFM use than females: 68 (98.6%) males and 31 (86.1%) females reported they had been educated ( $p=0.031$ ); see Appendix H.

#### 7.1.7.1 Rating the quality of information (self-report)

Respondents were asked to evaluate the quality of information regarding their disease received from their health providers.

**Table 7.15 Ratings of the quality of information**

Question	Responses	Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
Rate the quality of the information provided	None	3	2.2	0	0.00	0.000
	Bad	29	21.5	0	0.00	
	OK	43	31.9	2	1.9	
	Good	46	34.1	45	42.9	
	Very good	14	10.4	58	55.2	

The data in Table 15 show that the information quality improved in the post-intervention stage. The majority of patients post-intervention (98.1%) evaluated the quality of information they received from their health care provider about asthma as ‘very good’ or ‘good’, compared with 44.5% and 55.5% of patients pre-intervention, who classified the quality of information as good or higher and ‘OK’, ‘bad’ or ‘none’ ( $p =0.000$ ). No statistically significant differences were observed across gender or age.

#### 7.1.8 Quality of life

Respondents were asked to evaluate the quality of their life over the previous four weeks.

**Table 7.16 Patients' quality of life**

During the last four weeks, did you feel...	Pre-intervention N=135								Post-intervention N=105								p value
	Never		Some of the time		Often		Always (Daily)		Never		Some of the time		Often		Always (Daily)		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
in trouble	69	51.1	56	41.5	9	6.7	1	.7	90	85.7	15	14.3	0	00	0	00	0.000
worried, anxious or afraid	39	28.9	59	43.7	33	24.4	4	3.0	69	65.7	36	34.3	0	00	0	00	0.000
annoyed or angry	37	27.4	57	42.2	36	26.7	5	3.7	66	62.9	38	36.2	1	1.0	0	00	0.000
normal	17	12.6	42	31.1	57	42.2	19	14.1	32	30.5	68	64.8	5	4.8	0	00	0.000

The data in Table 7.16 illustrate the quality of life elements for both stages. The quality of patients' life improved in the post-intervention stage. Significant differences were reported between both QOL elements ( $p=0.000$ ). Ninety (85.7%), 69 (65.7%), and 66 (62.9%) patients post-intervention were not in trouble, worried or anxious, afraid or annoyed or angry because of their disease, compared with 69 (51.1%), 39 (28.9%), and 37 (27.4%) of pre-intervention patients ( $p=0.000$ ). Further, post-intervention participant's regular activities increased by 18% ( $p=0.000$ ). No statistically significant differences were observed across gender or age.

#### 7.1.8.1 Patients bothered by asthma symptoms

Respondents were asked if they suffered from asthma symptoms including coughing, chest tightness, and wheezing over the previous four weeks.

**Table 7.17 Frequency of asthma symptoms in the previous four weeks**

Question	Response options	Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
Patient bothered by the following symptoms: coughing, chest tightness, wheezing, in the previous four weeks	Never	1	0.7	42	40.0	0.000
	Once a week or less	67	49.6	59	56.2	
	2 to 3 times a week	50	37.0	4	3.8	
	4 to 5 times a week	15	11.1	0	00	
	Daily	2	1.5	0	00	

Table 7.17 shows the frequency of patients' symptom intervention over the previous four weeks. According to self-reporting, the majority of respondents in the post-intervention stage reported either no symptoms (40.0%) or symptoms only once weekly (56.2%), whereas of pre-intervention patients only 0.7% and 49.6% reported the same ( $p=0.000$ ). Response rates were not influenced by gender or age.

#### 7.1.8.2 Avoiding severe asthma attacks

Respondents were asked to evaluate their ability to avoid an asthma attack.

**Table 7.18 Ability to avoid severe asthma attack**

Question		Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
Ability to avoid having severe asthma attacks	Easy	10	7.4	0	0	0.000
	Moderate	68	50.4	21	20.0	
	Difficult	52	38.5	79	75.2	
	Very difficult	5	3.7	5	4.8	

Data in Table 18 show patients' ability, based on self-evaluation, to avoid having a severe asthma attack. More than half (57.8%) the patients in the pre-intervention stage reported their ability to avoid asthma attacks to be 'easy to moderate', compared with 21 (20%) of those post-intervention, 80% of whom described their ability as difficult or very difficult (compared to 42.2% pre-intervention  $p=0.000$ ). There were no significant differences observed across age groups in either stage, but post-intervention responses revealed significant differences based on gender, with male patients feeling more likely to be able to avoid an asthma attack than females. Nineteen (27.5%) and 47 (68.1%) of 69 males reported their ability to avoid an asthma attack as 'easy' or 'moderate', compared with two (2.6%) and 32 (88.9%) female patients respectively; ( $p=0.028$ ). No significant differences across age in either stage were discerned see Appendix H.

#### 7.1.8.3 Hospital or emergency room visiting

Respondents were asked if they had been admitted to hospital or attended an Emergency Room at the hospital in the previous three months; and if so, how many times.

**Table 7.19 Number of patients admitted to hospital or attending ER**

Question	Responses	Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
Hospital & ER visits	No	58	43.0	74	70.5	0.000
	Yes	77	57.0	31	29.5	

The data presented in Table 19 illustrate patients' hospital admissions and Emergency Room attendances in the previous three months. Admissions to hospital or attendances at ERs decreased among post-intervention patients, with 29.5% admitted to hospital or attending the ER compared with 57% during the pre-intervention stage (p=0.000). There were no statistically significant differences across gender or age in either stage.

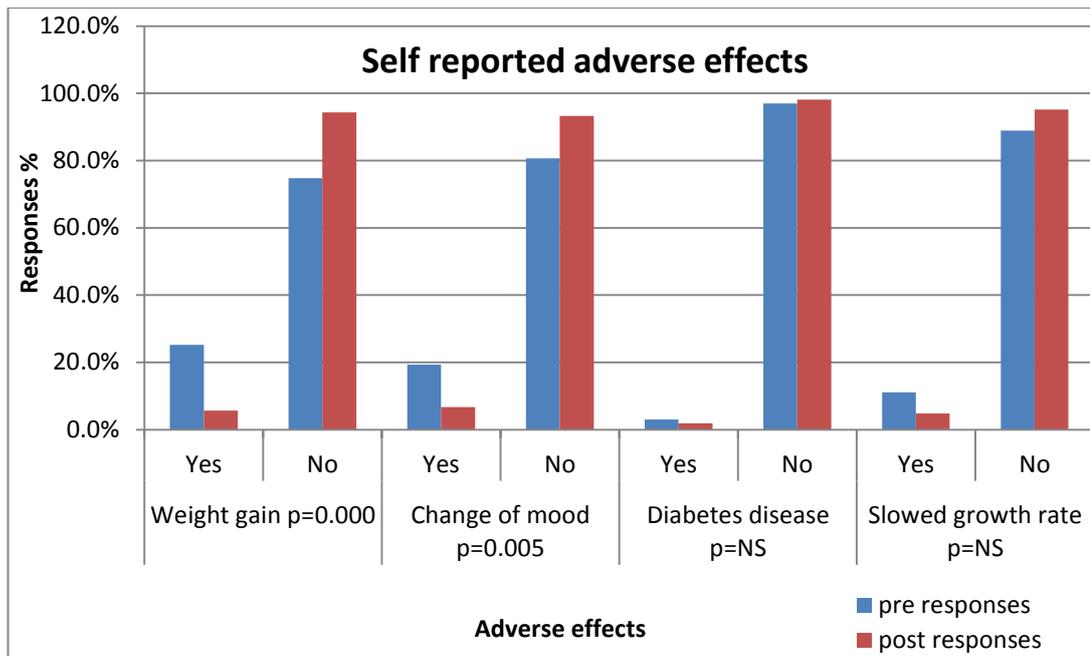
**Table 7.20 Times patients were admitted to hospital or attended ER**

Number of admissions or attendances	Pre-intervention N=77		Post-intervention N=31		p value
	N	%	N	%	
1 to 3 times	59	76.6	30	96.8	0.044
4 to 6 times	15	19.5	1	3.2	
7 to 9 times	3	3.9	00	00	

Data in Table 20 illustrate the number of times patients were admitted to hospital or attended ER. The number of visits to hospital or ER decreased in the post-intervention stage. Fifty-nine post-intervention (76.6%) and 30 (96.8%) post-intervention patients visited hospital or ER one to three times, compared with 15 (19.5%) and one (3.2%) who visited four to six times (p=0.044). There were no statistically significant differences across gender or age in either stage.

## **7.2 Adverse Effects**

Patients and their carers were asked if they or their child had suffered from any adverse effects such as weight gain, change of mood, diabetes, or slowed growth rate since they commenced their asthma treatment.



**Figure 7.2 self-reported adverse effects**

As shown in Figure 2, adverse effects were reported in both stages. Significant differences were reported in both stages in weight gain and change of mood. Thirty-four (25.2%) pre-intervention patients reported weight gain and 26 (19.3%) reported change of mood, compared with 6 (5.7%) and 7 (6.7%) post-intervention patients. No significant differences in diabetes or slowed growth rate were discerned.

### 7.2.1 Asthma medication management (clinical category)

Respondents were asked about their asthma management, in particular their use of reliever and controller medication: ‘Does your child use an inhaler or nebulizer for quick relief from asthma symptoms?’ and ‘Has your child ever had a prescription for asthma medicine that is NOT used for quick relief, but is used to control your child’s asthma?’ The responses are shown in Table 7.21. Reported levels of use of the controller medication (if one was used) are shown in Table 7.22 (see Appendix A: Scoring Instructions).

**Table 7.21 Clinical classification of patients based on reliever and controller medication use**

Question	Answer option Yes- No- Unsure	Clinical category	Stage N (%)	
			Pre-intervention N=135	Post-intervention N=105
Use of an inhaler or nebulizer for quick relief from asthma symptoms Use of a control medication.	No AND No	No asthma medication	0 (0.00)	0 (0.00)
	Yes AND No	Use of quick reliever only	8 (5.9)	0 (0.00)
	Yes AND Yes	Use of a quick reliever and has a controller	92 (68.1)	105 (100.0)

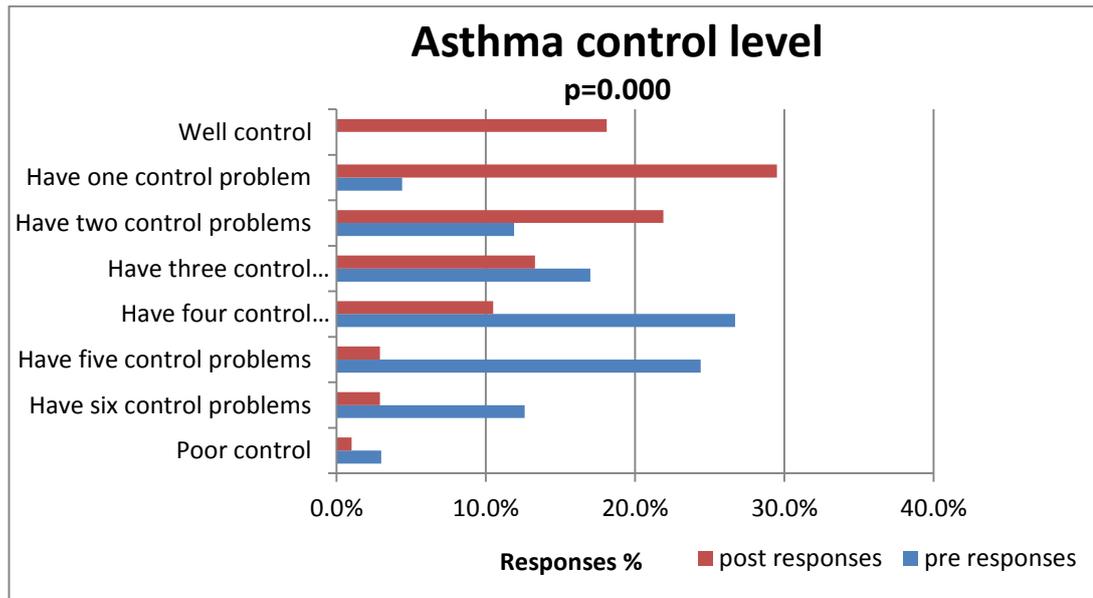
**Table 7.22 Patients' adherence to controller medication**

Question	Answer option Yes- No- Unsure	Clinical category	Stage N (%)	
			Pre-intervention N=92	Post-intervention N=105
Use of a control medication. Regularity of use	Yes AND Irregular use	Controller use is intermittent (not daily)	62 (67.3)	33 (31.4)
	Yes AND Never take it	Controller prescribed but never taken	2 (2.2)	0 (0.00)
	Yes AND Take it every day	Controller used daily	28 (30.4)	72 (68.2)

All patients were on asthma medications, with eight pre-intervention patients (5.9%) reporting using only a reliever and 92 (68.1%) using reliever with control medication; all patients in post-intervention stage reported both using a quick reliever and having a controller medication. These patients were more likely to use their controller medication on a daily basis than those in the pre-intervention stage (68.2% vs. 30.4%;  $p=0.0001$ ).

### 7.2.2 Patients' asthma control levels

Using the Therapy Assessment Questionnaire (ATAQ), which scores patients' responses to a series of three questions, individual patient's control levels were determined. Patient with a score of zero were deemed well controlled whilst those with a score of seven were classified as poorly controlled (see Appendix A: Scoring Instructions).



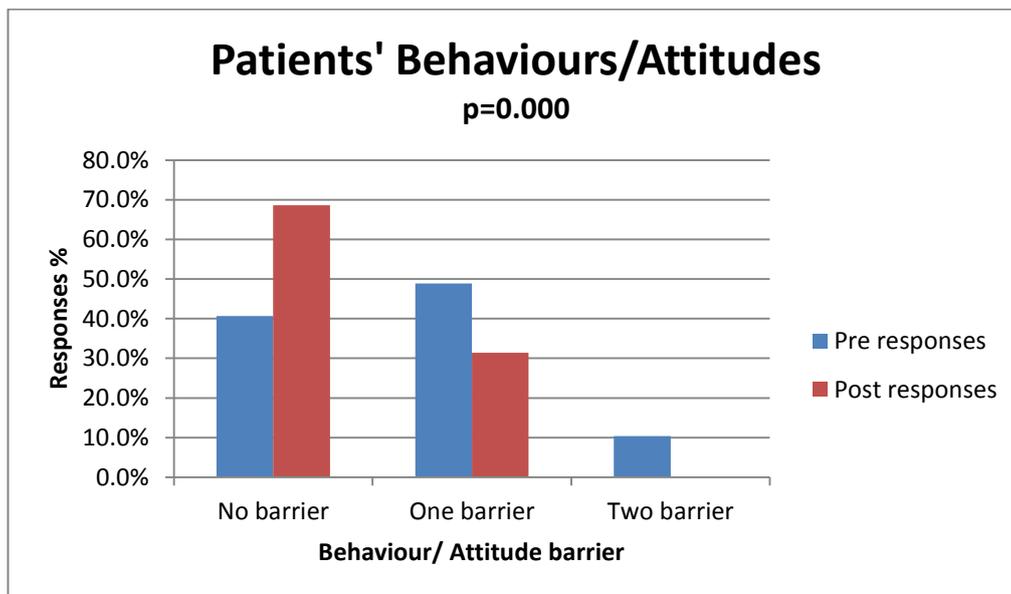
**Figure 7.3 Patients' asthma control level**

As illustrated in Figure 3, post-intervention patients had significantly better asthma control than pre-intervention: for example, 18.1% of the post-intervention cohort reported well controlled asthma compared with zero in the pre-intervention stage ( $p=0.000$ ).

No significant differences across age in either stage were observed; however, there was a significant difference based on gender in the post-intervention stage with female patients less likely to report good asthma control than males. More than half the 69 males (58.0%) reported their asthma was well controlled or that they had mostly one control problem, while 10 (27.8%) of 36 female patients ( $p=0.012$ ) did so. No significant difference across gender in the pre-intervention stage was observed (see Appendix H).

### 7.2.3 Patients' behaviours/ attitudes

Using the ATAQ and a series of two questions, individual patients' behaviours/ attitudes were determined. Patient with a score of zero were deemed to have no behaviour/ attitude barriers whilst those with score of two were classified as having two barriers (see Appendix A: Scoring Instructions)..

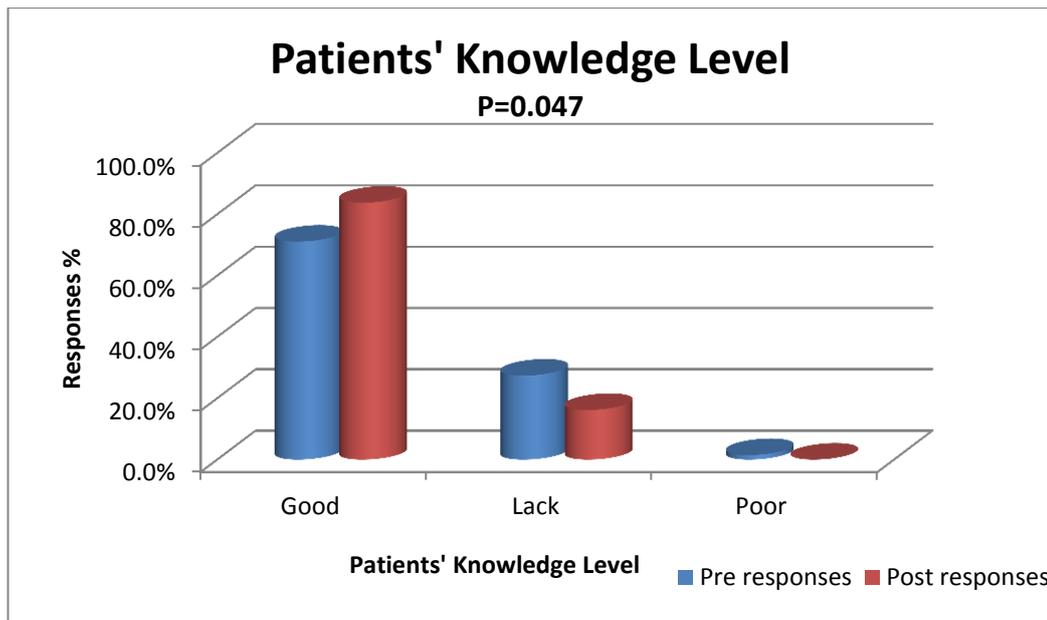


**Figure 7.4 Patients' behaviour/ attitude (Domain)**

Significant differences between stages were revealed, with 40.7% pre-intervention patients reporting no behaviour barriers compared with 72 (68.6%) post-intervention. More than half (59.3%) the pre-intervention patients reported one or two barriers, compared with 31.4% post-intervention ( $p=0.000$ ). No statistically significant differences were observed across gender or age in either stage.

### 7.2.4 Patients' knowledge (Domain)

Using ATAQ and a series of three questions, individual patients' knowledge about their disease and medication was determined. Patients with a score of zero were deemed to have good knowledge, whilst those with a score of three were classified as having poor knowledge (see Appendix A: Scoring Instructions).

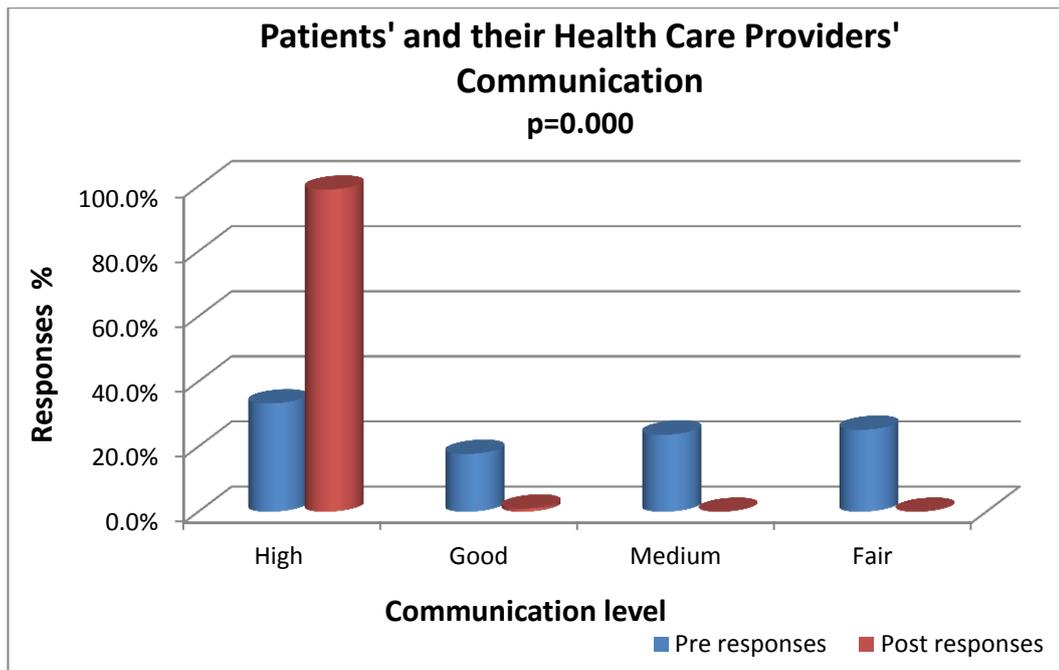


**Figure 7.5 Patients' knowledge (Domain)**

The data presented in Figure 7.5 illustrate patients' knowledge levels in both stages. Patients' knowledge increased in the post-intervention stage: pre-intervention, 71.1% reported they had good knowledge, compared with 83.8% post-intervention, while 28.9% pre-intervention reported a lack of or poor knowledge, compared with 16.2% (p=0.047) post-intervention. Responses in neither stage were influenced by gender. No significant differences were based on age in the pre-intervention group, but there was a significant difference noted between age groups post-intervention, where the middle group was more likely to claim good knowledge: 30 of 35 (85.7%) patients aged 5 to under 10, 19 of 28 (67.9%) aged 10 to under 15, and 39 of 42 (92.9%) of those aged 15 to under 18 believed they had a good knowledge level, compared with 5 (14.3%), 9 (32.1%), and 3 (7.1%), who felt they lacked knowledge (p=0.019; see Appendix H).

### **7.2.5 Communication (Domain)**

Using ATAQ and a series of five questions, the level of communication between individual patients and their health providers was determined. Patients with a score of zero were deemed to have high communication levels, whilst those with a score of five had poor communication (see Appendix A: Scoring Instructions).

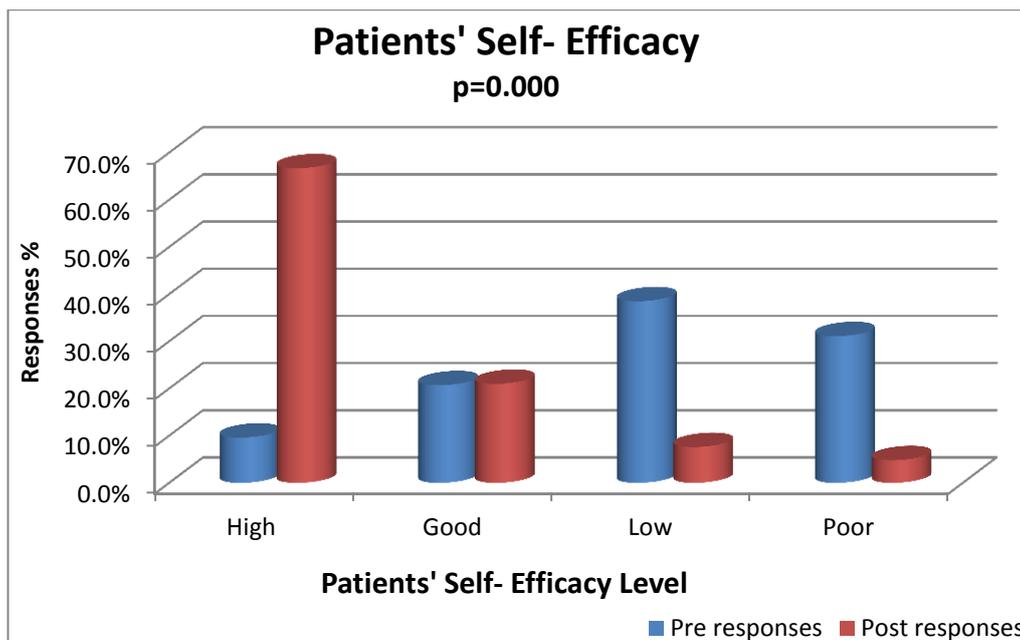


**Figure 7.6 Communication (Domain)**

The data presented in 7.6 illustrate the level of communication between patients and their health care providers in both intervention stages. In the pre-intervention stage, there was lack of communication, with around half (48.9%) classifying communication with their health providers as medium or fair. Post-intervention patients tended to report a higher level of communication (99.0% vs. 33.3%,  $p=0.000$ ). There were no significant differences observed based on gender or age.

### **7.2.6 Self-efficacy (Domain)**

Using ATAQ and a series of three questions, patients' self-efficacy was determined. Patients with a score of zero were deemed to have high self-efficacy, whilst those with a score of three were had poor self-efficacy (see Appendix A: Scoring Instructions).



**Figure 7.7 Self-efficacy (Domain)**

Figure 7.7 shows the differences in self-efficacy in pre- and post-intervention responses. Patients in the post-intervention stage (66.7%) were more likely to have high self-efficacy than in the pre-intervention (9.6%). Furthermore, patients in the pre-intervention stage reported poor self-efficacy 6.5 times more often than patients in the post-intervention stage (31.1% vs. 4.8%,  $p=0.000$ ). There were no significant differences observed based on age or gender.

### **7.3 Group B (Education Only) Result**

In group B, patients and/ or their carers were given asthma education as an intervention. They were surveyed pre- and post-intervention to identify any changes in a wide range of issues including knowledge, beliefs, perceptions, behaviour, adherence, self-efficacy, and asthma control. The results appear below.

#### **7.3.1 Survey response**

One hundred and thirty-five questionnaires were administered in group B, to 82 males and 53 females. Of these, 99 (73.3%) completed the study (62 males and 37 females). Most were aged 15 and under 18: 44.4% pre-response and 41.4% post-response.

**Table 7.23 Survey response**

Intervention stage	Gender Age group	Male		Female		Total	
		N	%	N	%	N	%
Pre-intervention N=135	5 - < 10 yrs.	21	15.6	17	12.6	38	28.1
	10 - <15 yrs.	21	15.6	16	11.9	37	27.4
	15 - <18 yrs.	40	29.6	20	14.8	60	44.4
	Total	82	60.7	53	39.3	135	100.0
Post-intervention N=99	5 - < 10 yrs.	18	18.2	12	12.1	30	30.3
	10 - <15 yrs.	16	16.2	12	12.1	28	28.3
	15 - <18 yrs.	28	28.3	13	13.1	41	41.4
	Total	62	62.6	37	37.4	99	100

**7.3.2 Patients' seasonal asthma symptoms**

Respondents were asked if their asthma symptoms differed across seasons.

**Table 7.24 Patients' seasonal asthma symptoms**

Intervention stage	Response option	Winter		Spring		Summer		Autumn	
		N	%	N	%	N	%	N	%
Pre-intervention N=135	none	4	3.0	26	19.3	18	13.3	54	40.0
	A little	44	32.6	66	48.9	63	46.7	64	47.4
	A lot	87	64.4	43	31.9	54	40.0	17	12.6
	Total	135	100.0	135	100.0	135	100.0	135	100.0
Post-intervention N=99	none	2	2.0	18	18.2	11	11.1	38	38.4
	A little	31	31.3	48	48.5	46	46.5	45	45.5
	A lot	66	66.7	33	33.3	42	42.4	16	16.2
	Total	99	100.0	99	100.0	99	100.0	99	100.0
p value		0.000		0.000		0.000		0.000	

The data presented in Table 2 illustrate that the participants reported increased symptoms during the winter season in both stages of the study, with reduced symptoms in autumn. No statistically significant differences were observed across gender or age groups in either stage.

### 7.3.3 Severity of disease

#### 7.3.3.1 Self-assessment of the severity of asthma

Respondents were asked to classify their or their child's asthma in a range from very mild to severe.

**Table 7.25 Self-assessment of the severity of asthma**

	Asthma severity	Pre-intervention N=135		Post-intervention N=99		p value
		No	%	No	%	
Patient self-assessment	Very Mild	7	5.2	5	5.1	0.001
	Mild	44	32.6	54	54.5	
	Moderate	64	47.4	37	37.4	
	Severe	20	14.8	3	3.0	

Table 7.25 shows that the majority of respondents from both stages (85.2% pre- and 97% post-intervention) classified their asthma as moderately severe or less. Of these, 51 (37.8%) and 59 (59.6%) reported their asthma as very mild or mild, compared with 64 (47.4%) pre-intervention and 37 (37.4%) post-intervention who reported their asthma as moderate. There was a significant difference between the two stages ( $p=0.001$ ): Pre-intervention patients' asthma was more likely to be considered severe than post-intervention patients'. Forty-four (32.6%) and 20 (14.8%) pre-intervention patients classified their asthma as mild or severe, compared with 55 (54.5%) and 3 (3.0%) post-intervention. There were no statistically significant differences across gender or age.

### 7.3.3.2 Self-reported asthma symptoms

Respondents were asked about the frequency of asthma symptoms in the previous four weeks.

**Table 7.26 Self-reported asthma symptoms**

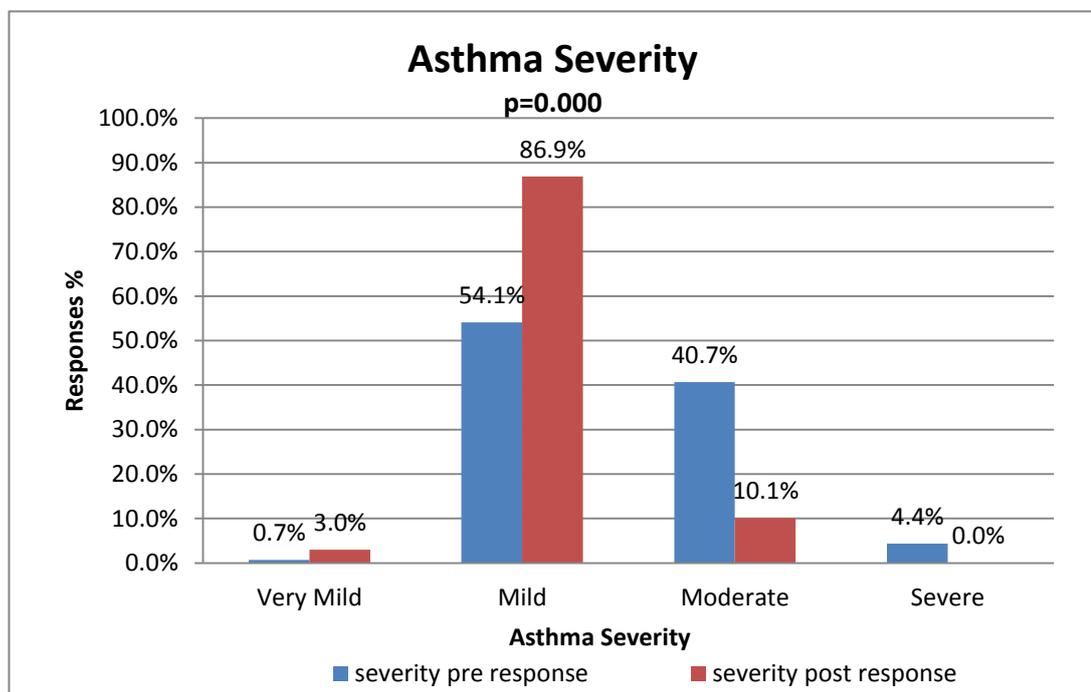
Stage	Response option	Asthma symptoms									
		Wheezing or difficulty breathing when exercising		Wheezing during the day when not exercising		Waking up at night with wheezing or difficult breathing		Missing days of school		Missing any daily activities	
		N	%	N	%	N	%	N	%	N	%
Pre-intervention N=135	None	12	8.9	23	17.0	21	15.6	34	25.2	25	18.5
	1 to 3	67	49.6	93	68.9	81	60.0	79	58.5	80	59.3
	4 to 7	44	32.6	17	12.6	30	22.2	18	13.3	23	17.0
	over 7	12	8.9	2	1.5	3	2.2	4	3.0	7	5.2
	Total	135	100.0	135	100.0	135	100.0	135	100.0	135	100.0
Post-intervention N=105	None	25	25.3	62	62.6	38	38.4	55	55.6	34	34.3
	1 to 3	65	65.7	35	35.4	58	58.6	41	41.4	59	59.6
	4 to 7	9	9.1	2	2.0	3	3.0	3	3.0	6	6.1
	over 7	0	0	0	0	0	0	0	0	0	0
	Total	99	100.0	99	100.0	99	100.0	99	100.0	99	100.0
p value		0.000		0.000		0.000		0.000		0.000	

Table 7.4 shows both pre-intervention and post-intervention patients' asthma symptoms in the previous four weeks. Significant differences between all pre-intervention and post-intervention symptoms were reported ( $p=0.000$ ). Pre-intervention patients were more likely to suffer asthma symptoms than post-intervention patients. Across all the symptoms listed there was a dramatic increase in the proportion of patients who were symptom-free in the post-intervention segment: for example, the symptom-free proportion increased from 8.9% to 25.3% in the case of wheezing or difficulty breathing when exercising ( $p=0.000$ ), and from 17.0% to 62.6% for wheezing during the day when not exercising ( $p=0.000$ ). Response rates

were not influenced by age and gender in either stage, with the exception of wheezing during the day when exercising. Pre-intervention female patients were more likely to suffer from this symptom than their male counterparts ( $p=0.034$ ).

### 7.3.3.3 Self-reported asthma severity classification regarding symptoms (at least one symptom)

Based on responses to a series of five questions, each patient's asthma severity score was calculated. The score ranged from 3 to 18, where a score of 3 represented very mild, 8 mild, 13 moderate and 18 severe asthma.



**Figure 7.8 Self-reported asthma severity**

Figure 7.8 illustrates asthma severity scores based on symptoms. A significant difference between stages was observed. Pre-intervention patients were more likely to report their asthma severe than post-intervention patients. Seventy-four (54.8%) respondents pre-intervention classified their asthma as very mild or mild, compared with 89 (89.9%) post-intervention, while 55 (40.7%) pre-and 10 (10.1 %) post-intervention respondents considered their asthma moderate ( $p=0.000$ ). There were no significant differences across gender or age.

### 7.3.4 Patients' beliefs, perceptions, behaviours, attitudes, involvement, and self-confidence

Respondents were asked about their beliefs, perceptions, behaviours, attitudes, practices, self-confidence, and involvement in making decisions about asthma management issues.

**Table 7.27 Patients' beliefs, perceptions, behaviours, attitudes, involvement, and self-confidence**

Questions	Pre-intervention N=135			Post-intervention N=105			p value
	Unsure N (%)	No N (%)	Yes N (%)	Unsure N (%)	No N (%)	Yes N (%)	
Asthma control: patients'/carers' beliefs	41 (30.4)	49 (36.3)	45 (33.3)	18 (18.2)	14 (14.1)	67 (67.7)	0.000
Medication usefulness: patients'/carers' beliefs	47 (34.8)	18 (13.3)	70 (51.9)	15 (15.2)	11 (11.1)	73 (73.7)	0.001
Asthma treatment: involvement in decisions	33 (24.4)	44 (32.6)	58 (43.0)	10 (10.1)	26 (26.3)	63 (63.6)	0.003
Physicians' attentiveness to patients' medication preferences	42 (31.1)	40 (29.6)	53 (39.3)	11 (11.1)	27 (27.3)	61 (61.6)	0.000
Ability to act with asthma attacks	42 (31.1)	32 (23.7)	61 (45.2)	16 (16.2)	4 (4.0)	79 (79.8)	0.000
Ability to administer medication: patients'/carers' beliefs	34 (25.2)	43 (31.9)	58 (43.0)	21 (21.2)	15 (15.1)	63 (63.6)	0.003

The data presented in Table 7.27 indicate statistically significant differences between respondents' beliefs in each stage. Only 33.3% of pre-intervention respondents believed their asthma had been well controlled in the past four weeks, compared with 67.7% of post-intervention respondents ( $p=0.000$ ). Post-intervention respondents were more likely to believe their medications were useful for controlling their asthma than pre-intervention (51.9% vs. 73.7%,  $p=0.001$ ). They felt involved in decision-making more than pre-intervention respondents (63.6% vs. 43.0%,  $p=0.003$ ) and that their choice of medication was taken into consideration (61.6% vs. 39.3%;  $p=0.000$ ). Another significant difference in self-confidence was that pre-intervention

respondents felt less able to manage changes in their asthma (54.8%) or administer their medication themselves (57.1%) (20.2%,  $p=0.000$  and 36.3%,  $p=0.003$ ).

### 7.3.5 Disease management

#### 7.3.5.1 Medication used in the previous 12 months

Respondents were asked if they had used an asthma medication over the past 12 months.

**Table 7.28 Medication used in the previous 12 months**

Asthma medication use over the past 12 months	Answer options	STAGE				p value
		Pre-intervention N=135		Post-intervention N=99		
		N	%	N	%	
		Yes	132	97.8	99	
No	3	2.2	0	0		

The data presented in Table 7.28 illustrate that the majority of patients (>97%) in both stages had used asthma related medications in the past 12 months. There were no significant differences in medication use between genders or across age groups.

#### 7.3.5.2 Quick relief medication

Respondents were asked if they had used medication as a reliever for their symptoms.

**Table 7.29 Quick relief medication use**

Question	Answer options	STAGE				p value
		Pre-intervention N=135		Post-intervention N=99		
		N	%	N	%	
		Use of an inhaler or nebulizer for quick relief from asthma symptoms	Yes	124	91.9	
No	6		4.4	0	0	
Unsure	5		3.7	0	0	

Table 7.29 shows the respondents' responses to quick reliever use. There was a high level of use of an inhaler or nebulizer as a quick reliever in both stages. All patients

post-intervention and 124 (91.9%) pre-intervention had used inhalers for quick relief ( $p=0.015$ ). There was no significant difference in the use of an inhaler or nebulizer based on age in either stage, but there was a significant difference across gender in the pre-intervention stage. Pre-intervention males were more likely to use relievers than females. Seventy-nine (96.3%) and 3 (3.7%) out of 82 pre-intervention males chose ‘Yes’ or ‘No/ unsure’ about using quick relief inhalers, compared with 45 (84.9%) and 8 (15.1%) of 53 female patients ( $p=0.014$ ; see Appendix H).

### 7.3.5.3 Frequency of quick reliever use in the previous four weeks and 12 months.

The highest number of times in one day a patient used a quick reliever for asthma symptoms in both stages of study can be seen in Table 7.30

**Table 7.30 Frequency of quick reliever use in the previous four weeks and 12 months.**

	Maximum daily use (time/ day)	Pre-intervention N=135		Post-intervention N=99		p value
		N	%	N	%	
In the previous four weeks	None	10	7.4	20	20.2	0.000
	1 to 2	75	55.6	73	73.7	
	3 to 4	43	31.9	6	6.1	
	5 to 6	5	3.7	0	0.00	
	over 6	2	1.5	0	0.00	
In the past 12 months	None	9	6.7	1	1.0	0.028
	1 to 2	55	40.7	27	27.3	
	3 to 4	50	37.0	52	52.5	
	5 to 6	16	11.9	14	14.1	
	over 6	5	3.7	5	5.1	

The maximum daily use of reliever medication fell post-intervention: 20 (20.2%) of post-intervention patients reported no use of relievers in the previous four weeks, compared with 10 (7.4%) pre-intervention patients; but 43 (31.9%) pre-intervention respondents reported the use of relievers three or four times daily, compared with 6 (6.1%) post-intervention ( $p=0.000$ ). No significant differences were observed across gender or age.

#### 7.3.5.4 Control medication (self-reported)

Respondents were asked if they had used any control medication, such as corticosteroids.

**Table 7.31 Number of patients using control medication**

Question	Answer option	Stage				p value
		Pre-intervention N=135		Post-intervention N=99		
		N	%	N	%	
Use of control medication	Unsure	50	37	11	11.1	0.000
	No	36	26.7	12	12.1	
	Yes	49	36.3	76	76.8	

There was a significant difference between both stages: 76 (76.8%) post-intervention respondents chose 'Yes' compared with 49 (36.3%) pre-intervention, and 23 (23.2%) chose 'No/ Unsure' compared with 86 (63.7%) pre-intervention ( $p=0.000$ ).

The response rate was not influenced by gender in either stage, although significant differences by age were noted in both stages. Pre-intervention, older patients (those 15 to under 18) were more likely to use controllers than other groups. Twenty-eight of 60 (46.7%) patients aged 15 to under 18, 8 of 37 (21.6%) aged 10 to under 15, and 13 of 38 (34.2%) aged 5 to under 10 years said 'Yes' to using controllers, compared with 32 (53.3%), 29 (78.4%) and 25 (65.8%) who replied 'No/ Unsure' respectively ( $p=0.042$ ). Amongst post-intervention patients, these aged 10 to under 15 years were more likely to use controller medication than other groups. Twenty-four of 28 (85.7%) patients aged 10 to under 15, 24 of 30 (80.0%), aged 5 to under 10, and 28 of 41 (68.3%) aged 15 to under 18 chose 'Yes' for using controllers, compared with 4 (14.3%), 6 (20.0%) and 13 (31.7%) in each group who answered 'No/ unsure' ( $p=0.006$ ; see Appendix H).

#### 7.3.5.5 Self-assessment of adherence to control medications

Respondents were asked about their adherence to daily use of control medications.

**Table 7.32 Self-assessment of adherence to control medications**

Self-reported use of controller medication	Pre-intervention N=49		Post-intervention N=76		p value
	N	%	N	%	
Takes it every day	7	14.3	39	51.3	0.000
Takes it some days, but not other days	21	42.9	22	28.9	
Used to take it, but now does not	2	4	4	5.3	
Only takes it when having symptoms	19	38.8	11	14.5	
Never takes it	0	0.00	0	0.00	

Low adherence in both stages was reported, but post-intervention patients were more likely to use their medication. Just over half (51.3%) patients post-intervention who used controller medication reported taking it daily, compared with 7 (14.3%) pre-intervention, while 85.7% pre-intervention used it intermittently compared with 48.7% post-intervention ( $p=0.000$ ). There were no significant differences based on gender or age in either stage.

#### 7.3.5.6 Inhaled corticosteroid (ICS) (self reported)

Patients were asked if they used an inhaled corticosteroid (ICS).

**Table 7.33 Inhaled corticosteroid (ICS)**

Use of an inhaled corticosteroid	Response	Response by stage				p value
		Pre-intervention N=135		Post-intervention N=99		
		N	%	N	%	
Don't know	65	48.1	16	16.2	0.000	
No	38	28.1	11	11.1		
Yes	32	23.7	72	72.7		

There was a significant difference in the use of inhaled corticosteroids between each stage. Patients post-intervention reported they used ICSs 3.1 times more than those pre-intervention. Seventy-two (72.7%) and 27 (27.3%) post-intervention respondents chose 'Yes' and 'No/ Don't know' compared with 32 (23.7%) and 103 pre-intervention (76.3%) ( $p=0.000$ ).

Amongst pre-intervention patients no significant differences across gender or age were observed. In post-intervention there was no significant difference based on gender but a significant difference by age: the middle age group (10 to under 15) were more likely to use an ICS than the other groups. Twenty-three of 28 (82.1%) patients aged 10 years to under 15 years, 24 of 30 (80.0%) aged 5 to under 10, and 25 of 41 (61.0%) aged 15 to under 18 answered ‘Yes’ to using a controller, compared with 5 (17.9%), 6 (20.0%) and 16 (39.0%) who answered No/ Unsure’ respectively (p=0.003; see Appendix H).

#### 7.3.5.7 Patients’ adherence to inhaled corticosteroid use

Respondents were asked about their level of adherence to daily ICS use.

**Table 7.34 Patients’ adherence to daily use of inhaled corticosteroid**

Frequency of inhaled corticosteroid use	Pre-intervention N=32		Post-intervention N=72		p value
	N	%	N	%	
Every day	5	15.6	37	51.4	0.003
Less than every day	8	25	15	20.8	
Several times a week	4	12.5	7	9.7	
When having asthma symptoms	15	46.9	13	18.1	

Post-intervention respondents were more likely to adhere to their medication than pre-intervention. Post-intervention, 72 of 105 reported they had used ICS, and of these more than half (51.4%) reported they had used ICS daily, compared with 5 (15.6%) of 32 pre-intervention respondents who answered ‘Yes’ to using ICS (p=0.003). Responses were not influenced by gender or age.

#### 7.3.5.8 Medication usage

Respondents were asked to list their asthma medications. This list was grouped and classified by the researcher as shown in Table 7.35.

**Table 7.35 Medication usage**

Medication group	Response option	Pre-intervention N=135		Post-intervention N=105		p value
		N	%	N	%	
$\beta_2$ agonist	No	4	3.0	6	6.1	NS
	Yes	131	97.0	93	93.9	
Inhaler corticosteroid	No	39	28.9	12	12.1	0.009
	ICS alone	50	37.0	47	47.5	
	ICS Combination	46	34.1	40	40.4	
Oral corticosteroid	No	126	93.3	91	91.9	NS
	Yes	9	6.7	8	8.1	
LABA	No	125	92.6	82	82.8	0.021
	Yes	10	7.4	17	17.2	
Montelukast (Singular)	No	133	98.5	99	1.00	NS
	Yes	2	1.5	0	0	
Other medications	No	127	94.1	96	97.0	NS
	Yes	8	5.9	3	3.0	

The data presented in Table 7.35 illustrates the use of asthma-related medications in both stages of this phase. The majority (>93%) of participants in both stages were using a  $\beta_2$  agonist, and most were using ICS; however, a significant difference was reported between stages regarding ICS use. Participants post-intervention were more likely to use ICS (87.9%) than pre-intervention (71.1%): only 12 (12.1%) post-intervention respondents answered 'No' to this option, compared with 39 (28.9%) pre-intervention (p=0.009). Use of LABA increased from 7.4% pre-intervention to 17.2% post-intervention (p=0.021). Use of oral corticosteroids was similar in both stages. There were no significant differences across gender or age in either stage.

#### 7.3.5.9 Patients' vs. investigator's assessment of use of control medication

The questionnaire asked the patients or their carers if they (the child) used a control medication and an inhaled corticosteroid. To validate their responses the primary researcher asked the respondents to list the medication used, to determine if they used an ICS.

**Table 7.36 Patients' vs. investigator's assessment of use of control medication**

Stage	Self-reported responses				Investigator assessment			
	Control medication		Inhaled corticosteroids		Using corticosteroids			LABA
	Yes N (%)	No or unsure N (%)	Yes N (%)	No or unsure N (%)	ICS only N (%)	ICS combination N (%)	Oral corticosteroids N (%)	N (%)
Pre-intervention N=135	49 (36.3)	86 (63.7)	32 (23.7)	103 (76.1)	50 (37.0)	46 (34.1)	9 (6.7)	10 (7.4)
Post-intervention N =99	76 (76.8)	23 (23.2)	72 (72.7)	27 (27.3)	47 (47.5)	40 (40.4)	8 (8.1)	17 (17.7)

Post- intervention patients proved more knowledgeable about their intervention and more able to answer correctly if they were on an ICS.

#### 7.3.5.10 Peak flow meter (PFM) and spacer use

Respondents were asked if they (their child) used a PFM and/ or a spacer.

**Table 7.37 Peak flow meter (PFM) and/ or spacer use**

Questions	Pre-intervention N=135			Post-intervention N=99			p value
	Unsure N (%)	No N (%)	Yes N (%)	Unsure N (%)	No N (%)	Yes N (%)	
Uses a peak flow meter to monitor asthma	4 (3.0)	128 (94.8)	3 (2.2)	3 (3.0)	82 (82.8)	14 (14.1)	p=0.002
Uses a spacer when using an inhaler	5 (3.7)	111 (82.2)	19 (14.1)	3 (3.0)	75 (75.8)	21 (21.2)	NS

There was low use of PFMs pre- and post-intervention, but a significant difference was observed post-intervention, where patients were more familiar with PFM use than pre-intervention. Only three (2.2%) of the pre-intervention respondents used a PFM to monitor their asthma, compared with 14 (14.1%) post-intervention (p=0.002). No significant differences were seen across gender or age groups.

In general there was a low level of spacer usage in both stages. Only 19 (14.1%) pre-intervention respondents said they used a spacer, and 21 (21.2%) post-intervention. There were no significant differences across stages, but a significant gender difference was observed pre-intervention, with male patients slightly more likely to use a spacer than females: 7 (13.2%), 41 (77.4%) and 5 (9.4%) of 53 pre-intervention females answered ‘Yes’, ‘No’ and ‘Unsure’ to using spacers, compared with 12 (14.6%) and 70 (85.4%) of 82 males ( $p=0.018$ ; see Appendix H).

Significant differences across age were also noted both pre- and post-intervention. Pre-intervention young patients (5 to under 10) were more likely to use spacers than older respondents. Twelve of 38 (31.6%) aged 5 to under 10, 4 of 37 (10.8%) aged 10 to under 15, and 3 of 60 (5.0%) aged 15 to under 18 answered ‘Yes’ to using spacers, compared with 26 (68.4%), 33 (89.2%) and 57 (95%) who said ‘No/ Unsure’ ( $p=0.006$ ). The same was observed post-intervention, with younger patients more likely to use spacers than their older counterparts. However, an increase in the percentage of patients using spacers especially was noticeable in the middle age group. Eleven of 30 (36.7%) aged 5 to under 10, 7 of 28 (25.0%) aged 10 to under 15, and 3 of 41 (7.3%) aged 15 to under 18 answered ‘Yes’ to using spacers, compared with 19 (63.3%), 21 (75.0%) and 38 (92.6%) who answered ‘No/ Unsure’ ( $p=0.017$ ; see Appendix H).

### 7.3.6 Patient education and follow-up

#### 7.3.6.1 Patient education and follow-up

**Table 7.38 Satisfaction with access to information, follow-up, and education**

Question	Pre-intervention N=135			Post-intervention N=99			p value
	Unsure N (%)	No N (%)	Yes N (%)	Unsure N (%)	No N (%)	Yes N (%)	
Adequate asthma management information accessibility.	43 (31.9)	53 (39.3)	39 (28.9)	19 (19.2)	4 (4.0)	76 (76.8)	0.000
Medication usage follows up over the past 12 months	21 (15.6)	55 (40.7)	59 (43.7)	10 (10.1)	0 (0.00)	89 (89.9)	0.000
Peak flow meter usage education	6 (4.4)	116 (85.9)	13 (9.6)	9 (9.1)	5 (5.1)	85 (85.9)	0.000

Patients' satisfaction with their access to adequate information about asthma grew significantly post-intervention (28.9% vs. 76.8%;  $p=0.000$ ). There was no significant difference observed by gender in either stage, but post-intervention patients demonstrated differences by age, with patients in the middle age group more satisfied than others. Twenty-six of 30 (86.7%) aged 5 to under 10, 25 of 28 (89.3%) aged 10 to under 15, and 25 of 41 (61.0%) aged 15 to under 18 answered 'Yes' to having access to enough information, while 4 (13.3%), 3 (10.7%) and 16 (39.0%) answered 'No/ Unsure' ( $p=0.036$ ). No significant differences based on age were seen in the pre-intervention stage (see Appendix H).

Patient follow-up increased. The majority (89.9%) post-intervention reported they had received follow-up regarding their medication use, compared with 59 (43.7%) pre-intervention ( $p=0.000$ ). Pre-intervention patients felt less educated about PFM use than post-intervention patients. There was no significant difference observed across gender in either stage; but in pre-intervention there were differences based on age: patients in the group 5 to less than 10 were more likely to be followed up than other age groups. Twenty-one of 38 (55.3%) aged 5 to under 10, 17 of 37 (45.9%) aged 10 to under 15, and 21 of 60 (35.0%) aged 15 to under 18 answered 'Yes' to having had follow-up, compared with 17 (44.7%), 20 (10.7%) and 39 (65.0%) who replied 'No/ Unsure' ( $p=0.033$ ; see Appendix H). Moreover, the majority of post-intervention respondents (85.9%) reported they were educated about PFM use, compared with 13 (9.6) pre-intervention, while 122 (90.4%) and 11 (15.1%) of pre- and post-intervention patients felt they were not educated or were unsure ( $p=0.000$ ). No significant differences across gender and age were observed.

### 7.3.6.2 Rating the quality of information

Respondents were asked to evaluate the quality of the information they received from their health providers about their disease.

**Table 7.39 Rating of the quality of information (self-reported)**

Question	Responses	Pre-intervention N=135		Post-intervention N=99		p value
		N	%	N	%	
		Rate the quality of the information provided	None	4	3.0	
Bad	22		16.3	0	0.00	
OK	42		31.1	10	10.1	
Good	51		37.8	57	57.6	
Very good	16		11.9	32	32.3	

Post-intervention participants rated the provided information highly. The majority (89.9% and 10.1%) evaluated the quality of information as ‘very good or good’ and ‘OK’, compared with 49.7% and 31.1% of patients pre-intervention (p =0.000). The responses were not influenced by gender or age.

### 7.3.7 Quality of life

#### 7.3.7.1 Patients' quality of life

Respondents were asked to evaluate the quality of their life over the past four weeks.

**Table 7.40 Patients' quality of life**

Question	Pre-intervention N=135								Post-intervention N=99								p value
	Never		Some of the time		Often		Always (Daily)		Never		Some of the time		Often		Always (Daily)		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
In the past four weeks have you felt...																	
Troubled	55	40.7	68	50.4	8	5.9	4	3.0	79	79.8	20	20.2	0	00	0	00	0.000
Worried, anxious or afraid	43	31.9	58	43.0	25	18.5	9	6.7	54	54.5	42	42.4	3	3.0	0	00	0.000
Annoyed or angry	47	34.8	56	41.5	25	18.5	7	5.2	63	63.6	36	36.4	0	00	0	00	0.000
Normal	26	19.3	59	43.7	32	23.7	18	13.3	34	34.3	58	58.6	7	7.1	0	00	0.000

The quality of patients' life improved in the post-intervention stage. Significant differences were reported between both stages' QOL elements ( $p=0.000$ ). Seventy-nine (79.8%), 54 (54.5%) and 63 (63.6%) post-intervention stage were not troubled, worried or anxious, afraid, annoyed, or angry because of their disease, compared with 55 (40.7%), 43 (31.9%) and 47 (34.8%) pre-intervention. Post-intervention participants' regular activities increased 1.8 times over pre-intervention ( $p=0.000$ ). No statistically significant differences were observed across gender or age.

### 7.3.7.2 Patients experiencing asthma symptoms

Respondents were asked if they had suffered from asthma symptoms including coughing, chest tightness, or wheezing in the previous four weeks.

**Table 7.41 Frequency of asthma symptoms in the previous four weeks**

Question		Pre-intervention N=135		Post-intervention N=99		p value
		N	%	N	%	
Patient bothered by the following symptoms: coughing, chest tightness, wheezing, in the past four weeks.	Never	4	3.0	29	29.3	0.000
	Once a week or less	70	51.9	61	61.6	
	2 to 3 times a week	46	34.1	9	9.1	
	4 to 5 times a week	9	6.7	00	00	
	Daily	6	4.4	00	00	

The majority of post-intervention respondents reported either no symptoms (29.3%) or once-weekly symptoms (61.6%), whereas only 3.0% and 51.9% of pre-intervention respondents did so ( $p=0.000$ ). Response rates were not influenced by gender or age.

### 7.3.7.3 Avoiding severe asthma attacks

Respondents were asked to rate their ability to avoid an asthma attack.

**Table 7.42 Avoiding a severe asthma attack**

Question	Response	Pre-intervention N=135		Post-intervention N=99		p value
		N	%	N	%	
Ability to avoid having severe asthma attacks	Easy	29	21.5	11	11.1	0.000
	Moderate	60	44.4	75	75.8	
	Difficult	40	29.6	13	13.1	
	Very difficult	6	4.4	0	0.00	

More than two thirds (65.9%) of pre-intervention patients reported their ability to avoid asthma attacks to be easy to moderate, compared with 86.9% post-intervention (p=0.000). Response rates were not influenced by gender or age.

### 7.3.7.4 Hospital or emergency room visiting

Respondents were asked if they had been admitted to hospital or attended the Emergency Room at the hospital during the last 3 months, and if so, how many times.

**Table 7.43 Number of patients admitted to hospital or attending ER**

	Responses	Pre-intervention N=135		Post-intervention N=99		p value
		N	%	N	%	
Hospital & ER visits	No	45	33.3	60	60.6	0.000
	Yes	90	66.7	39	39.4	

Admissions to hospital or ER attendances decreased amongst post-intervention patients, with 39.4% admitted to hospital or attending the ER compared with 66.7% of pre-intervention patients (p=0.000). No statistical significance across gender was observed in either stage, but significant differences based on age were noted among the pre-intervention cohort. Young patients were more likely to be admitted to

hospital or attend ER than those who were older. Thirty-three of 38 (86.8 %), patients aged 5 to under 10, 23 of 37 (62.2%) aged 10 to under 15, and 34 of 60 (56.7%) aged 15 to under 18 answered ‘Yes’ to hospital or ER admission, compared with 5 (13.2%), 14 (37.8%) and 26 (43.3%) who replied ‘No’ (p=0.007). No significant difference was seen between age groups in the post-intervention stage (see Appendix H).

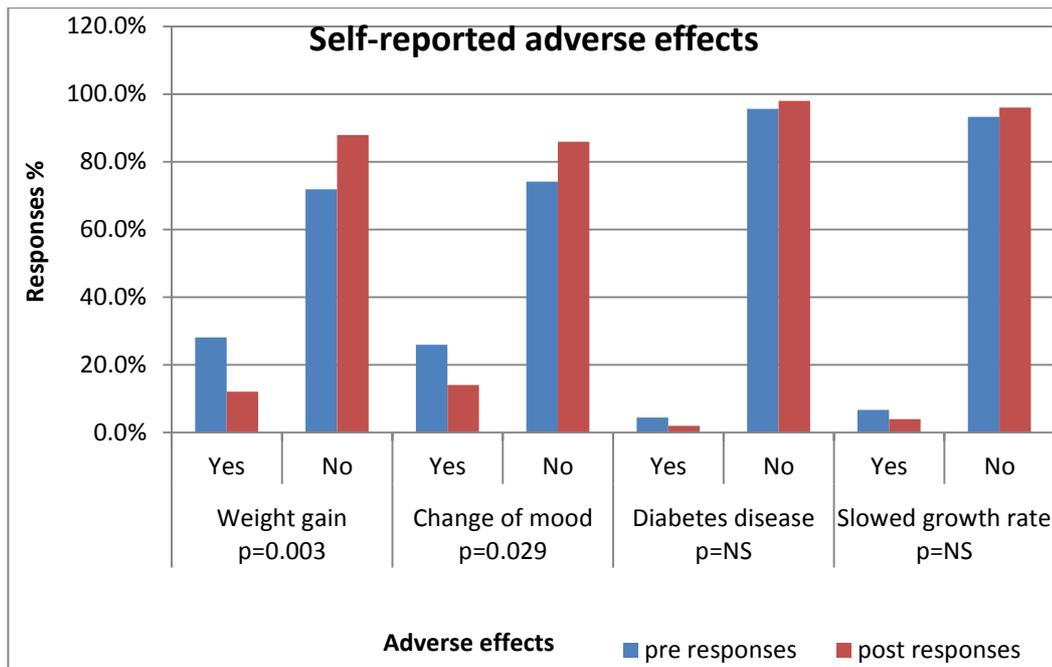
**Table 7.44 Number of times patients were admitted to hospital or attended ER**

Number of admission or attendances	Pre-intervention N=135		Post-intervention N=99		p value
	N	%	N	%	
1 to 3 times	67	74.4	37	94	0.025
4 to 6 times	19	21.1	2	5.1	
7 to 9 times	4	4.4	0	0	

Visits to hospital or ER decreased amongst post-intervention patients. Sixty-seven (74.4%) and 37 (94.0%) of pre- and post-intervention patients respectively visited hospital or ER one to three times in the previous three months, compared with 19 (21.1%) and two (5.1%) who visited four to six times (p=0.025). Response rates were not influenced by gender or age.

#### 7.3.7.5 Adverse effects

Patients and their carers were asked if they or their child had suffered from any adverse effects, particularly weight gain, change of mood, diabetes, or slowed growth rate since commencing asthma treatment.



**Figure 7.9 self-reported side effects**

Significant differences were noted between the stages in weight gain and change of mood. More than one quarter of pre-intervention patients reported weight gain (28.1%) and changes of mood (25.9%), compared with 12 (12.1%,  $p=0.000$ ) and 14 (14.1%,  $p=0.005$ ) post-intervention. No significant differences were observed regarding diabetes or slower growth rate.

### 7.3.8 Asthma medication management (Clinical category)

Respondents were asked about their medication management and in particular their use of reliever and controller medication. The two questions were: ‘Does your child use an inhaler or nebulizer for quick relief from asthma symptoms?’ and ‘Has your child ever had a prescription for asthma medicine that is NOT used for quick relief, but is used to control your child’s asthma?’ Responses are shown in Table 7.45. Participants were also asked about their level of use of their controller medication if they had one; the results are shown in Table 7.46 (see Appendix A: Scoring Instructions).

**Table 7.45 Clinical classification of patients based on reliever and controller medication usage**

Question	Answer option Yes- No- Unsure	Clinical category	Response by stage N (%)	
			Pre-intervention N=135	Post-intervention N=99
Use of an inhaler or nebulizer for quick relief from asthma symptoms Use of a control medication	No <b>AND</b> No	No asthma medication	1 (0.7)	0 (0.00)
	Yes <b>AND</b> No	Use of quick reliever only	34 (25)	12 (12.1)
	Yes <b>AND</b> Yes	Use of a quick reliever and a controller	45 (33.3)	76 (76.8)

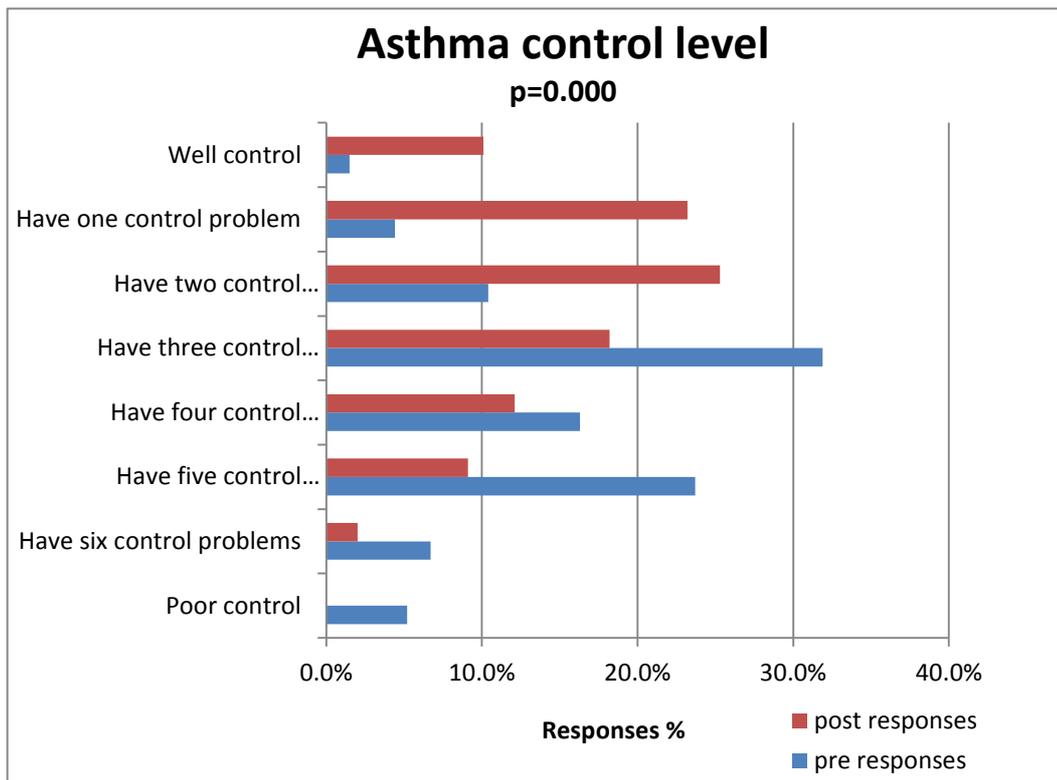
**Table 7.46 Patients' adherence controller medication**

Questions	Answer option Yes- No- Unsure	Clinical category	Response by stage N (%)	
			Pre-intervention N=49	Post-intervention N=67
Use of a control medication: regularity of use	Yes <b>AND</b> Irregular use	Controller use is intermittent (not daily)	42 (85.8)	37 (48.7)
	Yes <b>AND</b> Never took it	Controller prescribed but never taken	0 (0.00)	0 (0.00)
	Yes <b>AND</b> Takes it every day	Controller used daily	7 (14.3)	39 (51.3)

Almost all patients were on asthma medications, although 34 (25.0%) and 45 (33.3%) pre-intervention patients reported using only a reliever or a reliever with control medication, compared with 12 (12.1%) and 76 (76.8%) post-intervention. Post-intervention patients were more likely to use a controller medication on a daily basis than were pre-intervention patients (14.3% vs. 51.3%,  $p=0.0001$ )

### 7.3.9 Patients' asthma control level (Domain)

Using ATAQ and a series of seven questions, individual patients' asthma control levels were determined. Patients with a score of zero were deemed well controlled whilst these with a score of seven were classified as poorly controlled (see Appendix A: Scoring Instructions).

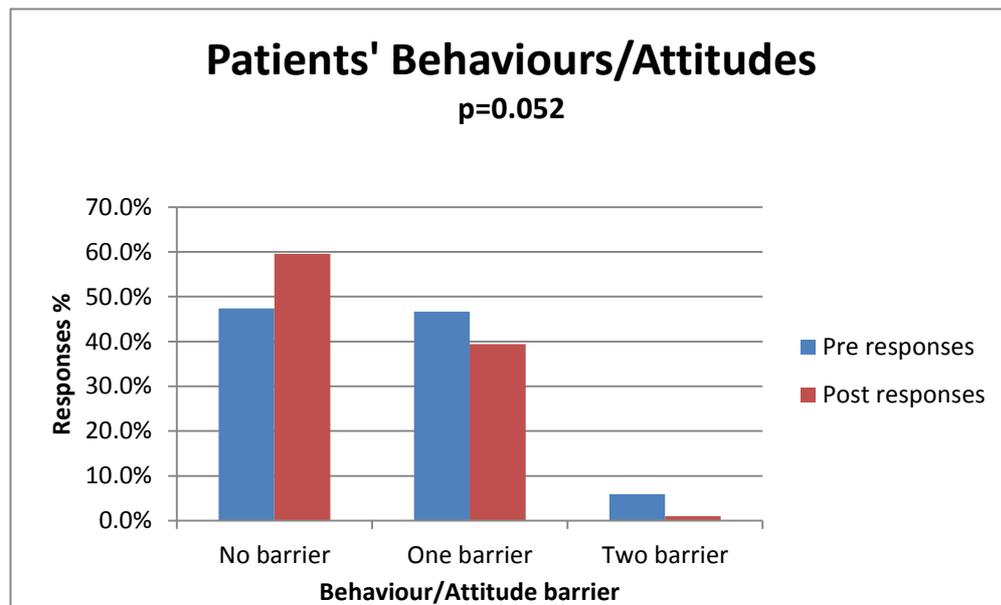


**Figure 7.10 Patients' asthma control levels**

Post-intervention patients had significantly better asthma control than pre-intervention patients: for example, 10.1% of patients post-intervention reported well controlled asthma, compared with 1.55 pre-intervention ( $p=0.000$ ). The response rates were not influenced by gender or age in either stage.

### 7.3.10 Patients' behaviours/ attitudes (Domain)

Using ATAQ and a series of three questions, individual patients' behaviours and attitudes were determined. Patients with a score of zero were deemed to have no behaviour or attitude barriers, whilst those with a score of two were classified as having two barriers (see Appendix A: Scoring Instructions).

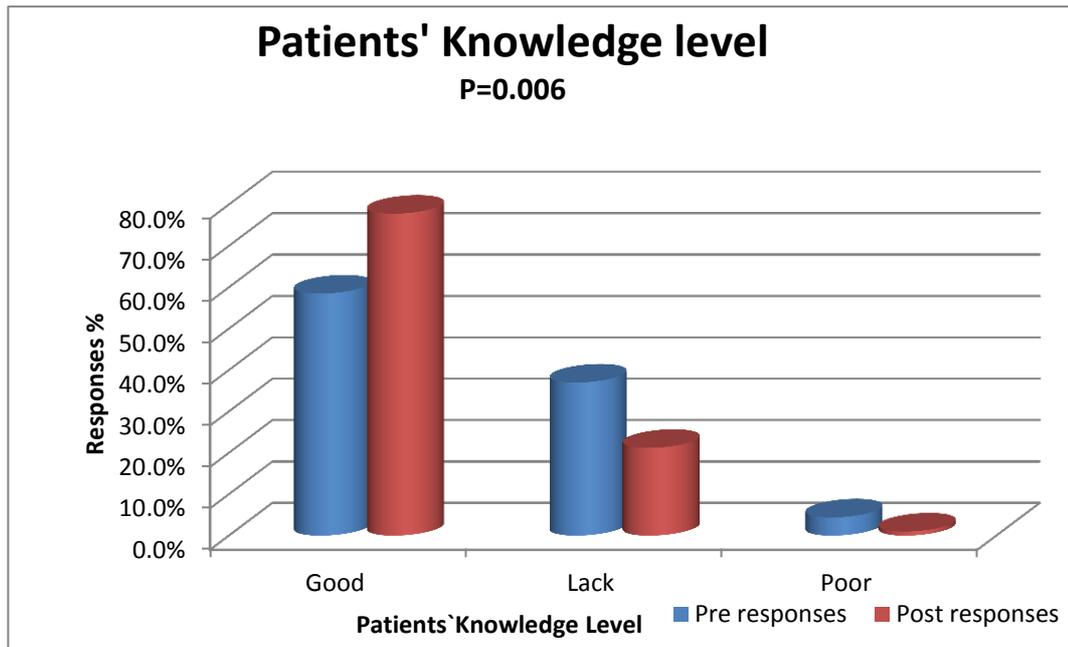


**Figure 7.11 Patients' behaviours and attitudes (Domain)**

Figure 7.11 illustrates patients'/ relatives' behaviours and attitudes. There was no significant difference between the stages, although post-intervention patients were less likely to have behaviour barriers than pre-intervention patients. Fifty-nine (59.6%) post-intervention patients reported no behaviour barriers, compared with 64 (47.4%) pre-intervention. More than half the pre-intervention patients (52.6%) reported one or two barriers, as did 40.4% post-intervention ( $p=0.052$ ). No statistically significant differences were reported across gender or age in either stage.

### 7.3.11 Patients' knowledge (Domain)

Using ATAQ and a series of three questions, individual patients' asthma knowledge was determined. Patients with a score of zero were deemed to have good knowledge, whilst those with a score of three were classified as having poor knowledge.

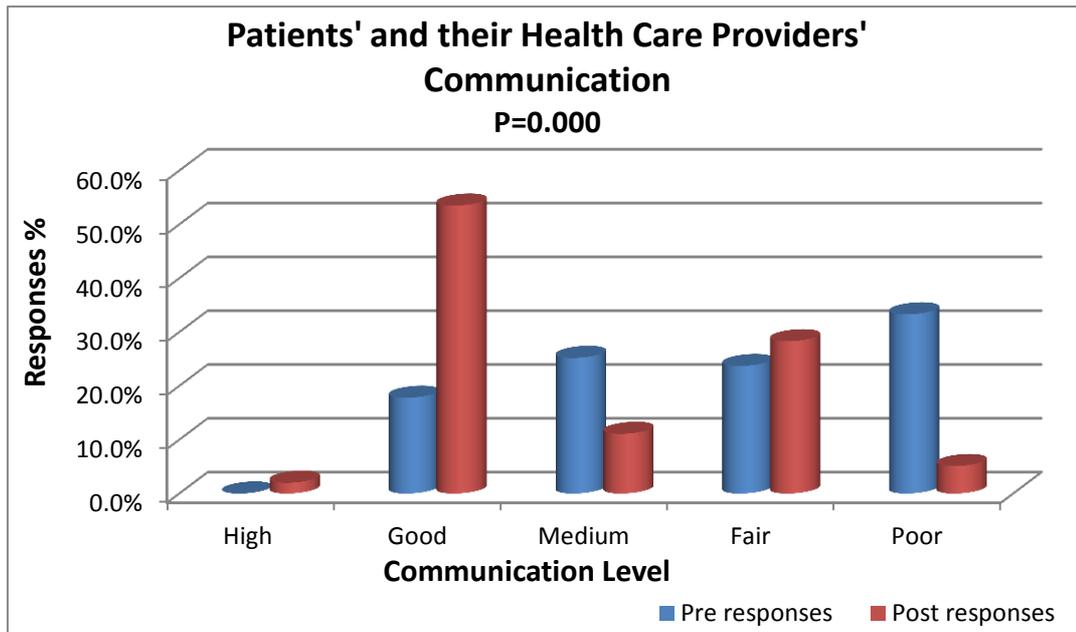


**Figure 7.12 Patients' knowledge (Domain)**

Patients' knowledge increased in the post-intervention stage: pre-intervention, 58.5% reported they had a good knowledge; this rose to 77.8% of patients in the post-intervention stage (p=0.006). The responses were not influenced by gender or age in either stage.

### 7.3.12 Communication (Domain)

Using ATAQ and a series of five questions, the level of communication between patients and their health care providers was determined. Patients with a score of zero were deemed to have a high communication level with their health care provider, whilst those with a score of five had poor communication (see Appendix A: Scoring Instructions).

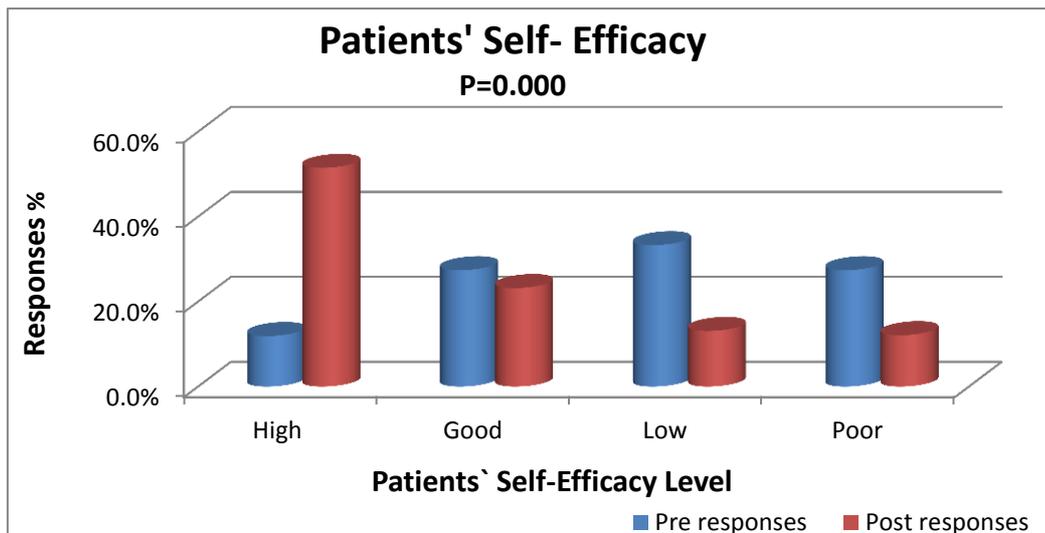


**Figure 7.13 Communication (Domain)**

In the pre-intervention stage there was a lack of communication. Nearly half (48.9%) and one third (33.3%) of pre-intervention patients classified their communication with their health providers as medium, fair or poor, compared with 39.4% and 5.1% post-intervention, who tended to return a ‘good’ or ‘high’ response (55.5% vs. 17.8% pre-intervention,  $p=0.000$ ). There were no significant differences observed based on gender or age.

### 7.3.13 Self-efficacy (Domain)

Using ATAQ and a series of three questions, patients’ individual self-efficacy was determined. Patients with a score of zero were deemed to have high self-efficacy, whilst those with a score of three were classified as poor having self-efficacy (see Appendix A: Scoring Instructions).



**Figure 7.14 Patients' self-efficacy (Domain)**

Post-intervention patients reported higher self-efficacy levels, with more than half (51.5%) reporting high self-efficacy compared with only 16 (11.9%) of pre-intervention patients, who were more likely to have poor self-efficacy (27.4% vs. 12.1% post-intervention,  $p=0.000$ ). No significant differences were observed based on gender or age.

## 7.4 Comparisons of group A and B responses

### 7.4.1 Comparison of pre-intervention in both groups

**Table 7.47 Comparison of pre-intervention responses regarding patients'/ carers' beliefs, perceptions, behaviours, attitudes, and self-efficacy in both groups**

Question	Pre-intervention				
	Group A (n = 135)		Group B (n = 135)		
	Mean	Std. deviation	Mean	Std. deviation	P value
Uses an inhaler or nebulizer as reliever	2.00	0.00	1.88	0.42	0.001
Uses controller medication	1.42	0.88	0.99	0.86	0.000
Adheres to controller use	1.70	1.57	0.97	1.46	0.000
Uses an inhaled corticosteroid (ICS)	1.48	0.50	1.05	0.79	0.000
Able to avoid severe asthma attacks	1.38	0.68	1.17	0.81	0.02
Has limitations on activities because of asthma	1.58	0.88	1.31	0.93	0.02
Physicians pays attention to patients' medication preferences	1.31	0.80	1.08	0.84	0.02
Patient knowledge (Domain)	0.3037	0.49	0.45	0.58	0.02
Communication (Domain)	1.40	1.19	3.72	1.11	0.000

Group A patients/ carers were more likely to use quick relievers, controller medication and ICS than those in Group B, and reported higher mean scores ( $t(268) = 3.247, p < 0.05$ ), ( $t(268) = 4.066, p < 0.05$ ) and ( $t(268) = 5.312, p < 0.05$ ) respectively. They also reported asthma attacks were difficult to avoid ( $t(268) = 2.351, p < 0.05$ ) and that daily activities had been limited in the last four weeks ( $t(268) = 2.408, p < 0.05$ ) more than Group B. However, lack of knowledge and poor communication were more frequently observed amongst pre-intervention respondents in Group B ( $t(268) = -2.368, p < 0.05$ ), ( $t(268) = -16.540, p < 0.05$ ) respectively.

## 7.4.2 Comparison of post-intervention responses in both groups

7.4.2.1 Comparison of post-intervention responses regarding patients'/ carers' beliefs, perceptions, behaviours, attitudes, and self-efficacy from both groups

**Table 7.48 Comparison of post-intervention responses regarding patients'/ carers' beliefs, perceptions, behaviours, attitudes, and self-efficacy from both groups**

Question	Post-intervention				
	Group A (n = 105)		Group B (n = 99)		
	Mean	Std. Deviation	Mean	Std. Deviation	P value
Patients'/ carers' belief in ability to administer medication	1.51	0.81	1.42	0.82	.432
Adequate access to asthma management information	1.81	0.57	1.58	0.80	0.02
Patients/ carers belief in usefulness of medication	1.77	0.64	1.59	0.74	0.05
Patients'/ carers' belief in ability to control asthma in the previous four weeks	1.51	0.83	1.50	0.79	0.06
Ability to avoid severe asthma attacks	0.85	0.48	1.02	0.50	0.012
Use of a peak flow meter to monitor asthma	1.26	0.44	1.07	0.26	0.000
Use of a spacer when using an inhaler	1.23	0.42	1.17	0.38	0.11
Ability to manage asthma attacks	1.83	0.56	1.64	0.75	0.039
Do you feel that you may have suffered weight gain from your medication?	1.06	0.23	1.12	0.33	0.11
Do you feel that you may have suffered change of mood (e.g. depression) from your medication?	1.07	0.25	1.14	0.35	0.07
Do you feel that you may have suffered diabetes from your medication?	1.02	0.137	1.02	0.14	0.95
Do you feel that you may have suffered slowed growth rate from your medication?	1.05	0.21	1.04	0.20	0.80

Patients'/ carers' belief in the usefulness of medication and the availability of information improved more in Group A than in Group B, with higher reported mean scores: ( $t(202) = 1.916, p < 0.05$ ) and ( $t(202) = 2.416, p < 0.05$ ) respectively. Asthma control patients'/ carers' beliefs did not show significant differences between groups, although Group A patients believed they controlled their asthma more than Group B patients did. Positive behaviours and confidence developed more in Group A than in Group B. A higher proportion of Group A respondents were likely to use a PFM to monitor asthma, and felt better able to manage changes than Group B ( $t(202) = 5.588, p < 0.05$ ) and ( $t(202) = 2.081, p < 0.05$ ). Further, Group A tended to self-administer medication(s) and use a spacer more than Group B, although there was no significant difference.

#### 7.4.2.2 Comparison of post-intervention responses regarding patients'/ carers' education by and communication with health care providers in two groups

**Table 7.49 Comparison between post-intervention responses regarding patients'/ carers' education by and communication with health care providers in both groups**

Question	Post-intervention				
	Group A (n = 105)		Group B (n = 99)		
	Mean	Std. deviation	Mean	Std. deviation	p value
Involvement in decisions about asthma treatment	2.00	0.00	1.54	0.67	0.000
Physicians' attentiveness to patients' medication preferences	1.98	0.20	1.51	0.69	0.000
Medication use followed up in the past 12 months	2.00	0.00	1.80	0.61	0.001
Peak flow meter usage education	1.90	0.44	1.77	0.60	.084
Quality of information provided	3.53	0.54	3.22	0.62	0.000

More Group A patients/ carers felt they were involved in making decisions and in having a say in medication choices in the post-intervention stage than those in Group B, and recorded higher mean scores ( $t(202) = 7.057, p < 0.05$ ) and ( $t(202) = 6.780, p < 0.05$  respectively). They believed they had been educated and followed up about

medications, and rated the quality of information higher, than those in Group B ( $t(202) = 3.418, p < 0.05$ ) and ( $t(202) = 3.849, p < 0.05$  respectively).

#### 7.4.2.3 Comparison of post-intervention responses regarding patients' asthma severity and quality of life in both groups

**Table 7.50 Comparison of post-intervention responses regarding asthma severity and quality of life**

Questions	Post-intervention				
	Group A (n = 105)		Group B (n = 99)		P value
	Mean	Std dev	Mean	Std. dev	
Asthma severity	1.30	0.56	1.38	0.63	0.34
Suffering coughing, chest tightness, wheezing	0.64	0.56	0.80	0.59	0.044
Wheezing or having difficulty breathing when exercising	0.76	0.58	0.84	0.57	0.34
Wheezing during the day when not exercising	0.22	0.44	0.39	0.53	0.011
Waking up at night with wheezing or difficult breathing	0.53	0.52	0.65	0.54	0.13
Missing days of school because of asthma	0.30	0.48	0.47	0.56	0.014
Missing daily activities (e.g. playing, visiting friends)	0.54	0.56	0.72	0.57	0.028
Asthma symptoms during winter	1.60	0.53	1.65	0.52	0.45
Asthma symptoms during spring	1.33	0.61	1.15	0.71	0.052
Asthma symptoms during summer	1.34	0.63	1.31	0.66	0.74
Asthma symptoms during fall	0.81	0.64	0.78	0.71	0.74
Frequency of quick reliever use in the previous four weeks	0.66	0.52	0.86	0.50	0.005
Frequency of quick reliever use in the past 12 months	1.99	0.86	1.95	0.81	0.73
Admitted to hospital or attended ER	1.30	0.46	1.39	0.49	0.14
Number of admission or attendances	1.65	0.71	1.90	0.82	0.17
Feeling in trouble during the last four weeks because of asthma	.143	0.35	0.20	0.40	0.27
Feeling worried, anxious or afraid in the last four weeks because of asthma	0.34	0.48	0.48	0.56	0.052
Feeling annoyed or angry because of asthma	.038	0.51	0.36	0.48	0.80
Activity limitation because of asthma	0.75	0.54	0.73	0.59	0.84

In general asthma symptoms were less severe amongst post-intervention respondents in Group A than in Group B, and quality of life was better; but significant differences were only found with coughing and chest tightness, wheezing during the day when not exercising, and missing days of school or daily activities due to asthma ( $t(202) = -1.994, p < 0.05$ ), ( $t(202) = -2.572, p < 0.05$ ), ( $t(202) = -2.466, p < 0.05$ ) and ( $t(202) = -2.208, p < 0.05$  respectively). The frequency of quick reliever usage in the previous four weeks was lower amongst post-intervention respondents in Group A ( $t(202) = -2.843, p < 0.05$ ). Quality of life indicators were better in Group A, and fewer symptoms were reported, as were lower rescue medication use, lower frequency of hospital admissions, higher activity levels, and strong emotional and psychological states; none of these differences were statistically significant.

#### 7.4.2.4 Comparison of post-intervention responses regarding medication used by two groups

**Table 7.51 Comparison of post-intervention responses regarding medication used by two groups**

Question	Post-intervention				
	Group A (n = 105)		Group B (n = 99)		P value
	Mean	Std. deviation	Mean	Std. deviation	
Use of control medication	2.00	0.00	1.66	0.67	0.000
Adherence to controller	1.45	0.80	1.83	1.06	0.006
Use of an inhaled steroid for asthma	1.90	0.41	1.57	0.76	0.000
Adherence to ICS daily use	1.45	0.82	1.94	1.16	0.002
Short Beta agonist ( $\beta_2$ ) use according to medication list	1.00	0.00	0.94	0.24	0.01
Inhaled corticosteroid (ICS) use according to medication list	1.60	0.49	1.28	0.68	0.000
Steroid use according to medication list	0.03	0.17	0.08	0.27	0.10
Montelukast (singular) use according to medication list	0.015	0.10	0.00	0.00	0.32
LABA use according to medication list	0.16	0.37	0.17	0.38	0.85

Post-intervention patients/ carers in Group A were more likely to use medication and adhere to regular daily use than those in Group B. Reported controller and ICS use were higher in Group A ( $t(202) = 5.234, p < 0.05$ ) and ( $t(202) = 3.883, p < 0.05$  respectively). ICS usage, obtained from medication lists, was found to be higher in Group A and was consistent with patients'/ carers' self-reported responses. Group A respondents' adherence to these agents was much better, returning higher mean scores ( $t(202) = , p < 0.05$ ) and ( $t(202) = 7.057, p < 0.05$  respectively). In addition,  $\beta_2$  usage was found to be higher amongst Group A post-intervention patients ( $t(202) = 2.590, p < 0.05$ ).

#### 7.4.2.5 Comparison of post-intervention patients'/ carers' knowledge, behaviours/ attitudes, self-efficacy, communication, and asthma control levels between groups

Using ATAQ and a series of three questions, individual patients' knowledge and self-efficacy were determined. Two, five and seven questions were used to determine individual patients' behaviours, communication and control levels as well.

**Table 7.52 Comparison between post-intervention patients'/ carers' knowledge, behaviours/ attitudes, self-efficacy, communication, and asthma control levels between groups**

Domains	Post-intervention				
	Group A (n = 105)		Group B (n = 99)		
	Mean	Std. deviation	Mean	Std. deviation	P value
Patient knowledge	0.16	0.37	0.23	0.45	0.22
Behaviours/ attitudes	0.31	0.47	0.41	0.52	0.15
Communication	0.01	0.10	2.79	1.08	0.000
Self-efficacy	0.50	0.83	0.86	1.06	0.008
Asthma control level	1.93	1.59	2.34	1.53	0.06

Patients' asthma control tended to be better in group A than in group B, but did not reach statistical significance due to the high standard deviation. There were significant differences found regarding self-efficacy and communication, with Group

A respondents claim greater self-efficacy and a better level of communication than those in Group B, as demonstrated by higher mean scores ( $t(202) = -2.659, p < 0.05$ ) and ( $t(202) = -26.224, p < 0.05$  respectively).

## **7.5 Phase Four Discussion**

The previous phases of the study have shown that the current management of asthma in KSA is suboptimal. Lack of adherence to asthma management protocols was reported by respondents. These included inappropriate medication usage, low use of AAPs and PFMs, and low levels of asthma control. A number of barriers were reported by patients / carers that affected their adherence to asthma management in general and ICS use in particular, especially in Phase Three of this study. Most of these barriers proved to have significant correlations, either positive or negative, with the severity and symptoms of asthma, patients' or their carers' beliefs in the efficacy of the regimen, their involvement in decision-making, their possession of an AAP, and their use of medication. It was observed that the lack of current management and barriers resulted from inadequacies in patients' or carers' knowledge, their misconceptions, poor attitudes and negative behaviours, and their lack of self-efficacy. In addition, poor communication between participants and their health care providers and the shortage of education provided, as well as a lack of social support and motivation, were implicated. McGhan et al. have found that the main education sources reported by participants (40%) were their physicians and other health care providers, but 65.8% of the participants reported that their education in asthma and its treatment and control had been received five years earlier (232).

As asthma patients spend most of their time away from health care sites, they and their carers are required to take a large share of responsibility for the daily management of the disease. Success in doing this is based on the patients'/ carers' knowledge, attitudes, and self-efficacy, and on the availability of both collaborative care and social support.

The fourth phase of this study was conducted to estimate the impact of an intervention program and the impact of AAP use. It involved two groups: both received intervention programs but Group A was provided with AAPs as well. Participants' responses were estimated before and after intervention. One hundred

and thirty-five patients were involved in each group in the pre-intervention stage, and 105 and 99 participants completed the post-intervention stage in Groups A and B respectively. Around one-third of participants in each group were female. Most patients in both groups were aged between 15 and under 18. The majority of participants from both groups had asthma classified as moderately severe or less. It was observed that their symptoms increased during winter and decreased in autumn, perhaps due to weather changes.

A number of studies have found that intervention programs improve patients' and/ or carers' knowledge, behaviours, self-efficacy, and involvement in treatment decisions, all of which enhance asthma management outcomes (35, 67, 135, 173, 203, 225, 227-235) and reduce costs and hospital admissions (241, 242). In addition, the school performance of educated patients improves (227). The current study's findings accord with these. Patients' and/ or carer's knowledge, behaviours, self-efficacy, and beliefs about their involvement in treatment decisions improved in both post-intervention groups, and is evident in the comparison of pre- and post-intervention responses regarding the identification of medication and recognition of its role. For example, in the pre-intervention stage in both Groups A and B, 26% and 37% were unsure if they had used a control medication, but these percentages decreased by 26% in the post-intervention stage in both groups. A similar reduction was found with ICS use: the unsure response in the post-intervention stage decreased by 37.7% in Group A and 31.9% in Group B. It can also be seen that post-intervention responses to medication questions had a high consistency with actual medication usage, indicating that patients/ carers had become more knowledgeable and understanding about their medication after attending the intervention program.

Changes in patients' beliefs about the seriousness of their disease (in the case of asthma, acceptance that it is chronic), and about the efficacy of their medication are other indicators that an intervention program can bring about improvements in knowledge. The percentage of patients/ carers believing their medications were useful for controlling their asthma increased from 48.1% to 88.6% ( $p=0.000$ ) in group A and from 51.9% to 73.7% ( $p=0.001$ ) in group B. The improvement in knowledge, attitude, and beliefs is also reflected in the change in respondents' beliefs regarding their access to adequate asthma management information: 25.2% pre- vs.

89.5% post-intervention ( $p=0.000$ ) in group A and 28.9% pre- vs. 76.8% post- ( $p=0.000$ ) in group B; and it is evident in the altered perception of the ease of control. In the pre-intervention stage most believed that avoiding an asthma attack was easy; after the intervention program they believed that the task was not so easy. This indicates that patients' awareness of their disease had increased, and was more realistic.

In Phase Three of this study, it was found that patients'/ carers' concerns about medication side effects, and misconceptions about the role of asthma medication, were the main common factors influencing compliance. After intervention respondents' behaviours changed, reflected in the increased use of ICS and better adherence to medication regimens. It has been reported that intervention programs may increase medication compliance and improve inhaler technique (135, 173, 223, 232, 233, 237, 239, 241). In our study, an increase in the use of controller medication and a decrease in the use of quick relievers were observed in the post-intervention stage. Most patients, during the education program, did not correctly perform all the inhaler technique steps, but in the post-intervention stage these were more likely to be performed correctly. Furthermore, ICS usage based on self-report improved from 35.6% to 93.3% in Group A and from 23.7% to 72.7% in Group B. The percentage of adherence to ICS daily use increased by 41.1% ( $p=0.000$ ) and 35.8%, ( $p=0.003$ ) in the post-intervention stage in Groups A and B respectively. These results are supported by Prabhakaran et al.'s findings that participants' beliefs in using ICS daily as a control drug increased from 58.8% to 91.8%, and that correct inhaler technique improved from 38.2% to 95.6% after an intervention program (173). Kelly et al. found that using anti-inflammatory drugs increased from 34% at baseline to 95% a year after an intervention program, compared with 60% to 65% in the control group, although the control group reported a higher percentage of usage at baseline (241).

Respondents were found to be unfamiliar with PFM use. The use of PFMs at pre-intervention stages was very low in both groups, which was consistent with the findings in Phases One and Three of this study and supported by the findings of other studies (38, 89, 118, 284, 287). In Phase Two it was found that physicians were not very likely to educate patients about PFMs, perhaps because of the lack of PFM

accessibility and the cost; physicians may also lack confidence that the patients will adhere to PFM use, as is indicated by patients' attitudes and the reliability of their diary keeping. In any case, physicians tend to depend on FEV1 measures if they are available. However, in the current study, the use of PFMs increased in the post-intervention stage by 47.2% and 11.9% in Groups A and B respectively. It should be noted that in this study PFMs were provided to all patients by the researcher.

Patients' assessment of both training and education as well as the quality of information improved in the post-intervention stage. This may be attributed to either the effectiveness of the program and/ or the improvement in interaction between patients and their health care providers. It is observed that in the post-intervention stage communication between patients and health care providers increased, and respondents believed that they were more involved in decisions about their treatment; the belief that they were involved in both decisions about their treatment and in choosing medication grew two-fold in Group A and about 1.5-fold in Group B.

Self-efficacy improved, indicated by changes in both behaviour and knowledge. Post-intervention patients were more confident about managing changes in their asthma and in adhering to specific medication instructions. Pre-intervention respondents demonstrated less confidence in these matters: 57.8% and 54.8% in Groups A and B pre-, compared with 8.9% and 20.2% post-intervention respectively. Furthermore, the ability to administer medication as directed increased after the intervention by more than one third (35.8% in Group A and 34.7% in Group B). The improvement in self-efficacy is clearly indicated by the ATAQ self-efficacy domain response: post-intervention, 66.7% and 51.5% of respondents in Groups A and B were likely to have high self-efficacy, compared with 9.65% and 11.9% pre-intervention.

As a result of the intervention program's positive impact on patients' and/ or carers' knowledge, behaviours, communication with health care providers, and self-efficacy, asthma management outcomes progressed positively in the current study. In the post-intervention stage, medication use and adherence improved amongst patients in both groups. Based upon the use of reliever and controller medication, the percentage of patients who used relievers and had controllers increased by 31.9% and 43.5% in

Groups A and B respectively. In addition, patients' adherence to controller regimens improved by more than one third in both groups. The frequency and severity of asthma symptoms were reported as less in the post-intervention stage. In both groups, across all the symptoms listed, there was a dramatic increase in the proportion of patients who were symptom-free in the post-intervention stage, and who reported being more in control of their disease. In the responses regarding the domain of asthma control level, Group A reported their asthma to be well controlled, from 0 in pre- to 18.1% in post- intervention; this compared with a rise from 1.5 to 10.1% in Group B. Evans et al. similarly found improvements in self-efficacy, asthma management skills, and frequency of episodic asthma after intervention, although they did not establish a significant relationship between school attendance and the intervention program, suggesting that this may be because their sample tended to be of mild severity (227). However, other studies have found that intervention results in a reduction in absenteeism (228, 232, 237).

Quality of life also improved in both groups. This can be reflected by the increased proportion of patients who were not suffering from either psychological or physical aspects such as anxiety, worries, anger, or limitations to their daily activity as a result of their diseases in the post-intervention stage. In addition, the frequency of symptoms was reported as less, and emergency attendances and hospital admissions were reduced in both groups. These improvements, found in the current study, are consistent with several other studies' findings (134, 223, 227, 228, 230-239, 241).

### **7.5.1 Response comparison between Group A and Group B**

AAPs and education with follow-up are recognized as major factors affecting asthma treatment outcomes. Patients' and/ or their carers' medication knowledge, self-efficacy, and behaviours may be improved by intervention programs and self-management plans (134, 135, 225, 234). Several studies have suggested that while education influences knowledge, health outcomes are improved by sharing decisions with the patient/ carer and providing AAPs, resulting in better compliance with recommended asthma management (203, 235, 244). For both groups during the pre-intervention stage, differences were found in the response to the use of controllers, ICS and quick relievers, agents more commonly used among Group A patients than those in Group B. Group A patients and their carers were more likely to report that

asthma limited their daily activity than were Group B patients. The reasons are not fully clear; it may be because Group A reported asthma that was more severe, with slightly higher symptoms, than did group B, although there were no statistically significant differences. It may also be that Group A patients and their carers were more concerned about their disease, and that they believed their asthma attacks were more difficult to avoid than Group B did. In general, the most likely reasons are the lack of knowledge and poor communication with health care providers among group B. This can be supported by the significant differences in level of knowledge and communication between the groups, as those in Group A were found to be more knowledgeable about asthma and to have better communication with their health providers than Group B. Only in these aspects was a significant difference between groups' responses in the pre-intervention stage found.

In the post-intervention stage, several significant differences were observed between both groups. Patients in Group A were more likely to be knowledgeable, to have the ability to change their attitudes and behaviours, to be more confident, and to demonstrate high self-efficacy. They were more involved in making treatment decisions and had better communication with their health care providers. The belief of involvement in decision-making and medication choice in the post-intervention stage doubled in Group A and increased 1.5 times in Group B, resulting in different asthma management outcomes. Group A participants were more likely to have better management outcomes. Patients in Group B were less likely to use controller medications or to adhere to routines, and used more quick relievers than Group A. In addition, Group B patients suffered from asthma symptoms such as wheezing during the day, missing school or daily activities, and being bothered by coughing and chest tightness; and they had more control problems than Group A patients. They also showed less improvement in both their levels of asthma control and in their quality of life than Group A. Group B participants returned higher mean scores in the domains of patient knowledge and behaviours/ attitudes than Group A, although without significant differences. Group B had lower knowledge and more behaviour/ attitude barriers than Group A. However, Group B's knowledge level improved by 19.3%, compared with 12.7 % in Group A. It may be that at the pre-intervention stage, Group A was initially higher than Group B (71.1 5 vs. 58.5%). In the domain of behaviours/ attitudes (no barriers) they improved by 27.9%, compared with

12.2 % in Group B in post-intervention. This suggests that prescribed AAPs are more likely to affect behaviours and attitudes than knowledge; and this in turn makes it clear that the use of education programs improves asthma management outcomes, but when coupled with AAPs it will have more influence – at least on patients’ behaviours, attitudes, self-efficacy, and communication, which will enhance self-asthma management and outcomes.

Shah et al. found that females and 10-year-olds were more affected by intervention than others, with significant improvement found in both the activity and emotions domains of male subjects (228). Gender and age effects were not clearly observed in this study, but there were significant associations reported between some aspects and both gender and age, in both groups. In regard to gender in Group A, all significant associations were found in the post-intervention responses with the exception of the element of controller use. Post-intervention male patients were less likely to have used quick relievers in the last four weeks, and more likely to be educated about PFMs (98.6% vs. 86.1%,  $p=0.000$ ); to have the ability to avoid asthma attacks ( $p=0.028$ ) and to have asthma control than females. Group A male patients in the pre-intervention stage were more likely to use controller medications than females (72.2 % vs. 60%,  $p= 0.004$ ). Boulet found that male patients were more likely to use ICSs than females (179). In Phase Two of this study, it was found that male physicians were more likely to provide education for their patients than females. Perhaps poor communication during the intervention delivery to female patients, the cultural separation of the sexes and the structure of the health care department limiting contact between members from different genders, contributes to this. On the other hand, Group B’s significant differences were reported in the pre-intervention stage, with females more likely to report wheezing during daily exercise than males. Males were more likely to use quick relievers (96.3% vs. 84.9%,  $p=0.014$ ) and spacers. In Group B post-intervention, there were no significant differences compared with Group A.

In the current study, it was observed that children aged under 15 were more likely to reflect improvements and benefits from the intervention program. McQuaid et al. found that asthma knowledge had a positive relationship with gender, age, reasoning about asthma, and disease management responsibility; they also found that there was

a correlation between disease management responsibility and age, but that aspects relating to medication adherence did not correlate with asthma knowledge, reasoning, or management responsibility; adherence instead was negatively associated with age (91).

In Group A, both pre- and post-intervention patients aged 10 to under 15 were more likely to use spacers than other age groups, although the greatest improvement affecting spacer usage was observed in the younger aged group, where it was found that 22.2% of the group in the pre-intervention stage used spacers compared with 45.7% in the post-intervention stage. In Group B, younger patients (i.e. those under ten) were more likely to use spacers than older groups in both the pre- and post-intervention stages, although spacer use increased most in the middle group, from 10.8% pre-intervention to 25.0% post-intervention. Further, the post-intervention middle group in Group A were more likely to have good knowledge. In the post-intervention stage, Group B middle patients were more likely to use ICS medication and to be more satisfied with available information than the older group, while younger patients were more likely to be followed up, were less frequently admitted to hospital, and attended ER less often than the older group. This may be attributed to the role of carers in intervention delivery. It was found that in young children, parents' knowledge, beliefs, worries, and psychosocial state were factors that could affect asthma management (134, 181-183, 301, 309); moreover, younger children were more likely to change behaviours and be influenced by the intervention than older participants. It is likely, too, that some elements of asthma control such as spacer use may be more suitable for younger children than for others.

### **7.5.2 Limitations**

In most clinics there was no suitable venue available for intervention delivery. Other limitations were the communication barrier between the sexes due to religious and cultural restrictions, evidenced in KSA by the health department structure where female clinics are separate from male, with a same-gender staff policy. Moreover, most children are most likely to be accompanied by their mother. In addition, there was a lack of access to good patient records or databases across all service providers. Patients' records were not up to date in regard to personal information and contact

details, which made it very difficult for the investigator to clarify some aspects of the research such as double-checking severity and medication use.

### **7.5.3 Recommendations**

It is clear from the results of this study that intervention programs play an effective role in improving asthma management outcomes. To achieving optimal outcomes from an intervention, a number of issues should be addressed. It is a necessity to have qualified staff, a well-equipped venue and well prepared materials and delivery methods in each clinic. Furthermore, the intervention should include the supply of an AAP, as it was observed that providing AAPs is useful, at the very least helping to change behaviour positively, improve communication between patients/ carers and health care providers, and increase self-efficacy, all of which contribute to improved self-asthma management and outcomes. Involving the patient's family in an intervention programme will be helpful, especially with younger patients.

Culture, religion, and language are factors that may act as barriers to meeting the full objectives of intervention programs in KSA, especially as most physicians and professionals are non-Saudis and may have different cultural and linguistic backgrounds. In addition, a high proportion of patients and their carers have low education levels, and most asthma materials, including instructions in how to use devices, equipment, and medication, are written in languages not known to most KSA citizens, or are highly technical and inaccessible. The communication difficulties created by these factors demonstrate the need for an educator who is a separate staff member who, in addition to being able to avoid such barriers, has the time that effective education and intervention programs require.

Asthma education in schools has reported positive effects. Peer education is likely to have a strong effect especially on adolescent patients, making intervention programs delivered through schools, and peer education, highly effective. It is strongly recommended that programs for health care providers are developed, addressing asthma management issues and communication skills.

#### **7.5.4 Conclusion**

The intervention program outlined in this survey improved patients'/ carers' knowledge, behaviours, and attitudes, increased their self-efficacy, and enhanced communication with their health providers, resulting in improved asthma management outcomes. When patients and carers were treated as partners in the management of asthma, increases in their knowledge and changes in their behaviours, as well as improvement in their self-efficacy, resulted in better communication. Use of controller adherence amongst patients increased. There were significant differences found in the use of inhaled corticosteroid between pre- and post-intervention responses. ICS in post-intervention respondents increased by 57.7% and 49% in Groups A and B respectively, while adherence increased by 41.1% and 35.8%. Patients reported fewer asthma symptoms and felt more in control of their disease, which resulted in a better quality of life. When the intervention was coupled with the provision of AAPs and follow-ups it produced better results in patients'/ carers' knowledge, behaviours, attitudes, and self-efficacy, as well as in their communication with health providers, leading to an overall enhancement of asthma management outcomes.

## Chapter 8

### Summary of Findings, Limitations, and Recommendations

This study investigated asthma management practices amongst children and adolescents under primary health care in two regions (Asser and Riyadh) of KSA. It evaluated the practices of physicians prescribing for mild to severe asthma in primary health care centres in these regions against the guidelines of the Saudi National Protocol for Management of Asthma and identified barriers affecting adherence to asthma management and ICS use among young and adolescent asthmatic patients and their families. Adherence to national and international asthma management guidelines, such as the use of ICS, was found to be suboptimal; AAP prescription, the use of home PFMs and patients' and/or carers' education were all found to be unsatisfactory.

An education intervention and the provision of AAPs was evaluated for its effect on patients'/ carers' knowledge, behaviours/ attitudes, communication and ability to affect asthma management outcomes.

#### 8.1 Phase One: Patient/ Carer Survey

##### 8.1.1 Aims

The aims of Phase One of the study were as follows:

- To compare asthma management practices in KSA PHCCs against the national protocol.
- To document asthma management in children and adolescents in KSA.
- To assess the appropriateness of corticosteroid use in childhood asthma.
- To assess patient's/ relatives' understanding of asthma management.

Questionnaires were distributed to chronic asthma patients or their carers. Of 200 each, 152 (77.5%) and 162 (81%) from Asser and Riyadh were returned, respectively. A total of 230 (57.5%) were useable (56.1 % from male respondents and 43.9% concerning respondents aged 5–<10 yrs).

### **8.1.2 Findings**

Low levels of the use of ICS, PFM, and AAP were found, together with poor levels of patient/ carer education. Poor knowledge, attitudes, behaviours, and levels of self-efficacy were found amongst patients and their carers. A lack of communication between care-providers and their patients was evident. Respondents' feedback revealed that generally the severity of asthma was underestimated, whereas the level of control was overestimated. During winter, respondents reported increased symptoms. Riyadh patients suffered more symptoms in spring than those in Asser ( $p=0.001$ ), perhaps due to their different weathers in this season. Over three months, 79 of 230 patients had been hospitalized and 35.4% had utilized health services three or more times. In Asser 57.5%, and in Riyadh 43.6% of patients ( $p=0.035$ ) reported their asthma to be well-controlled in the month prior to the survey; however, according to the ATAQ responses, only 14.3% of patients had well-controlled asthma, with the remaining 85.7% having one or more control problems indicative of poorly-controlled asthma. Within Phase One the use of corticosteroids was suboptimal at 34.8%. Use of  $\beta_2$  agonists was high at 93.4%, but in combination with ICS was low. Although a high proportion of respondents reported having AAPs, a lack of understanding and adherence was observed, with 20% reporting having PFMs and 36% using a spacer. Few respondents reported the use of PFMs to monitor asthma. In total, 28.2% of respondents did not have access to information, 33.5% were not educated about inhaler use, and 35% had not been observed by a provider when using an inhaler. A lack of knowledge among both patients and carers was found. Lack of adherence with controller medication and PFM use reflected poor attitudes/ behaviours. More than 75% of respondents had one or more behavioural barriers, with poor communication evident in two-thirds and low self-efficacy in 46.9% of the responses.

### **8.1.3 Conclusions**

Management of PHCC patients with asthma (children and adolescents) in KSA fell short of national and international guidelines. Many forms of non-adherence with guidelines were reported, and a majority of participants had at least one or more control problems. Low use of preventative and/ or self-management skills such as use of PFMs and spacers was reported. Use of ICS was suboptimal, given that the

National Guidelines recommend the use of corticosteroids as first-line treatment of chronic asthma. Use of LABA amongst patients with asthma was very low; this may indicate their unavailability at PPCCs or the cost of this agent. Lack of adherence with medications, AAP use, and PFMs was significant amongst both regions' patients/ carers. Variations in PHC practices were found between regions.

## **8.2 Phase Two: Physicians' Survey**

### **8.2.1 Aims**

The aims of Phase Two of the study were as follows:

- To identify physicians' practices for asthma management in KSA.
- To compare practice for asthma management in KSA PHCCs with the National Protocol for the Management of Asthma.
- To assess patterns and appropriateness of medication prescription.

The aims were accomplished through distribution of a three-scale questionnaire to physicians in PHCCs in Asser and Riyadh. The response rate was 72.5% (87/120); 52.8% of respondents were male. A majority (94.3%) of participating physicians were non-Saudi; a majority (95.4%) also worked in government centres. Most physicians (60%) were general specialists; 44.8% had 11 to 20 years' experience. Continuing medical education amongst respondents was low: only 14.9% of participants attended one or more programs a year. Female physicians were less frequent conference attendees and tended to be less experienced than their male counterparts. Asser physicians reported greater access to national guidelines (93.0%) and to assistance (79.1%) than Riyadh physicians (63.6% and 43.2%). Over a third of all physicians reported having access to alternative guidelines such as British, Australia and GINA guidelines. A gap between physicians' asthma management practices and national and international guideline recommendations was evident.

Physicians were likely to provide education to patients with severe asthma, but provided unsatisfactory education to milder cases. Asser physicians were more likely to provide education, perhaps due to a low load of patients or the availability of assistants. Variations in the provision of education are attributable to lack of awareness of and/ or agreement with the guidelines, lack of knowledge about PFM

use, and/or the unavailability of PFMs. A lack of adherence to guidelines, and variations in practice when treating asthma, were observed across six clinical vignettes.

The usage rate of ICSs was revealed to vary from 16.1% to 88.5% across six vignettes. Prescription of anti-inflammatory agents may be affected by the severity of the asthma. Low prescription rates of ICS may be attributed to physicians' disagreement with the recommendation that ICS be the cornerstone of asthma treatment, or to their concerns about the safety of long-term use, the cost of medication, and the perceptions of corticosteroids held by patients or their carers. Physicians' responses in most vignettes included the use of oral corticosteroids, but recommendations were sometimes inappropriate. While reducing reliever use is one of the goals of the asthma guidelines, utilization of bronchodilators remains unsatisfactory. The practice of starting with inhaled ipratropium or oral theophylline and adding non-steroid anti-inflammatory recommendations varied across the sample; physicians tended to 'wait and see', reflecting hesitation in prescribing medication. While antibiotics were not included in answer options, over one third of respondents recommended adding antibiotics. Few physicians recommended LABA, which may be due to cost, its availability in PHCCs, and referral requirements.

Fewer than 50% of the physicians surveyed involved patients in decision-making. Nearly all physicians were non-Saudi and not fluent in Arabic, and a lack of relationship between physicians/ patients was clearly evident. Physicians' unawareness of and unfamiliarity with aspects of asthma and tools for treatment were observed; misconceptions were evident. Lack of self-efficacy and inadequate outcomes expected by physicians may be related to the under-prescription of medication and under-provision of information regarding asthma devices. Physicians' disagreement with guidelines, lack of self-efficacy, and/ or low expectations of outcomes may be perceived as barriers to adherence with ICS prescribing. The availability of medication and devices may also limit adherence. Lack of time and work load pressures, a shortage of staff in organizational roles, a lack of educational materials and a lack of facilities were reported.

### **8.2.2 Summary**

Although most PHCC physicians reported having access to guidelines, there was poor adherence to several guideline components. Failure to provide essential asthma education, especially to patients with mild asthma, was observed. Physicians were unlikely to involve patients or their families in decisions about treatment. They were likely to recommend relievers rather than preventers; suboptimal use of ICS resulted. Inappropriate treatment was observed in the responses to the study vignettes.

## **8.3 Phase Three: Barriers Affecting ICS Use and Patient Adherence**

### **8.3.1 Aims**

The aim of Phase Three of the study was as follows:

- To identify barriers affecting Saudi asthma patients' management adherence in general, and to ICS use in Riyadh PHCCs in particular.

This was accomplished through a questionnaire distributed to patients/ carers in Riyadh PHCCs. Two hundred and thirty questionnaires were administered; the overall response rate was 89.1% (205/230). Of 177 eligible responses, 87 (49.2%) were from females. Questionnaires included two parts: IMS and ICS scales. Most patients (36.7%) had primary school education or less. Nearly half the patients were from households where the monthly income was less than 5000 SR; less than one quarter of respondents had health insurance. The majority of respondents (74.5%) had asthma classified as moderately severe or severe. One hundred and eighteen respondents (65.5%) reported using ICS. A majority of the sample (78.4%) used ICSs intermittently. Most respondents did not have an AAP (61%) or use a PFM (84.6%). Around 40% of participants believed medications were unhelpful and that the doctor did not involve patients in decision-making. Less than 40% of respondents had adequate access to appropriate information (either hard copy or internet).

### **8.3.2 Findings**

Relevant components in the IMS survey were medication issues, doctor-patient relationships, adherence influences, self-efficacy, and negativity factors (54.3% total variance). The ICS survey revealed four factors: health and medication literacy,

patient and family concerns and fears, peer influence and personal beliefs, and treatment cost, convenience and needs (56.1% total variance). In both IMS and ICS, 72.9% of patients/ carers reported being affected by five or more barriers. Positive and negative associations between IMS and ICS scales, both of total barriers and of sub-class factor scores, with patients'/ carers' characteristics and disease severity, as well as asthma management skills, beliefs, and ICS adherence, were observed. While ICS was considered a cornerstone of asthma treatment, patients' and carers' adherence to routines remained suboptimal. In this phase, the IMS and ICS surveys produced different responses, and differences in the sequences of barrier effects were observed. In the IMS survey results the five most common barriers reported by patients/ carers were unintentional, such as confusion; the ICS survey revealed that the five most common barriers indicated by patients/carers were intentional, such as fear of side effects. However, *medication* barriers, such as misunderstanding the need and function of asthma medication, having concerns or misconceptions about the medication and its side effects, failing to establish a good relationship or adequate communication with health providers, or lacking social support, were the most common. Cultural differences and language may play a major role in the relationship of and communications between patients and providers, possibly affecting asthma management outcomes. Involving patients/ carers in decision-making and providing AAPs may improve communication between patients and health professionals, leading to behavioural changes and improved self-efficacy.

### **8.3.3 Conclusions**

Low use of AAPs and PFMs with inappropriate treatment was observed among participants. Reported adherence to ICS use in this phase was low. Participants identified a number of factors affecting adherence with asthma management in general and ICS use in particular, with a majority noting more than five barriers. These included lack of knowledge, negative behaviours and attitudes, low self-efficacy, misconceptions, misunderstandings on the part of patients/ carers, poor communication, lack of motivation, and insufficient social support.

## **8.4 Phase Four: Impact of an Education Program and Provision of AAPs on Knowledge and Health Outcomes of Asthmatic Patients**

### **8.4.1 Aims**

The aims of Phase Four of the study were as follows:

- To assess the impact of an education program and the provision of an AAP on Saudi asthma patients' and carers' knowledge, self-efficacy, and behaviours.
- To assess the impact of an education program and the provision of an AAP on asthma management outcomes among Saudi asthma patients and carers.
- To assess the impact of an education program and the provision of an AAP on patient/carer adherence.
- To compare the impact of an education program combined with the provision of an AAP, as opposed to education alone, on patients' and carers' asthma management.

The aims were accomplished through a questionnaire distributed to two groups of patients/ carers. In Group A, patients/ carers were given asthma education and an Asthma Action Plan, while Group B patients/ carers were given only education. Both groups were surveyed pre- and post-intervention to identify changes in a wide range of issues, including knowledge, beliefs, perceptions, behaviours, adherence, self-efficacy, and asthma control.

One hundred and thirty five questionnaires were issued to each Group. In Group A, 105/135 (78.7%) completed the study; of these, 69 were males. In Group B, 99/135 (73.3%) completed study; 62 were males. Around 40% of respondents in both groups were aged between 15 years and under 18. In both groups, a majority of respondents in both pre- and post-intervention stages had asthma classified as moderately severe or less; post-intervention patients' asthma severity was less likely to be severe than in the pre-intervention stage.

### **8.4.2 Findings**

The proportion of patients who were symptom-free in the post-intervention stages increased dramatically, and a significant improvement in patients'/ carers' beliefs, behaviours, attitudes, self-efficacy, and involvement in decisions regarding management were observed. The frequency of reliever use declined significantly in the post-intervention stages. Post-intervention patients/ carers were more knowledgeable about and more likely to use, as well as to adhere to, medication than in the pre-intervention stages. Self-reported ICS use more than doubled amongst post-intervention patients in both groups, and the use of PFMs and spacers improved. Satisfaction with access to information also improved significantly.

Quality of life improved in the post-intervention stages, reflected by a significant decrease in asthma symptoms, reliever use, hospital admissions and Emergency Room attendance. Patients'/ carers' knowledge, behaviours and attitudes, self-efficacy, communication with health care providers, and asthma control all improved significantly. While intervention programs were provided to all group participants, Group A also received AAPs.

A comparison of Group A and Group B indicated some significant differences during the pre-intervention stage: controller, ICS and quick reliever use were more commonly used among Group A patients, possibly due to the severity of asthma among this group. In the post-intervention stage, patients in Group A were more likely to be knowledgeable, to have the ability to change their attitudes and behaviours, be more confident, have higher self-efficacy, communicate better, and be more involved in decision-making. They were more likely to use controller medication, to adhere to regimens, and to suffer less from symptoms. Patients in Group B showed less improvement in control levels and quality of life.

Gender and age effects were not clearly observed in this study, but significant associations between management aspects and both gender and age in groups were found. Male patients and younger age groups were more likely to reflect improvements and benefits after the intervention program.

### **8.4.3 Conclusions**

An intervention program improved patients' and carers' knowledge, behaviours and attitudes, and self-efficacy, as well as their communication with health providers, resulting in improved asthma management and quality of life; when coupled with AAPs and follow-up, all these elements improved even more, and enhanced asthma management outcomes.

## **8.5 Limitations**

### **8.5.1 Self-reported data of patients as an accurate representation of circumstances and behaviours**

The data collected from patients and analysed within this study came from self-reports, which may limit the extent to which they accurately represent the circumstances and behaviours of the patients and their support network. However, the questionnaire had been previously validated and by this study also. To alleviate the problem of relying on memory in the self-reported data, the self-report was limited to the previous four-week period, the time when respondents would best remember details of the circumstances and behaviours being questioned. Repeating the themes of questions using re-wording with different styles ensured that patient's responses were consistent and evaluated the effect of using different expressions. Allowing respondents to record positive and negative responses aided comparisons between the findings of this study and of other studies in similar contexts; these mechanisms were adopted to ensure data quality. There was no coercion placed upon respondents, who were free to refuse to participate or to answer specific questions.

### **8.5.2 Self-reported data of physicians as an accurate representation of circumstances and behaviours**

The reliance on physician self-reports is similarly a limitation of this study. To minimize the effect of respondent bias on the quality of the data and findings of the investigation, several techniques were used. Physicians were asked about their usual practice in relation to essential aspects of asthma management across three severity classifications, for the purposes of gaining very specific responses. Vignettes were used to reflect actual responses rather than knowledge; the response options in these were unified across all vignettes to avoid any suggestion of the 'most suitable'

choice. In addition, physicians were given the option to add any actions they felt had not been included in the items.

Physicians were found to provide negative responses, which argue for the validity and reliability of this category of self-reported data to some extent. The findings of this study regarding patient education, provision of AAPs, and the recommendation of PFM are congruent with the findings of similar investigations conducted nationally and internationally.

### **8.5.3 A lack of validation of research variables**

The researcher did not access electronic medical records of patients in the PHCCs, which might have been done to verify that the asthma severity triggers, medication, adherence to best practice, and other relevant medical circumstances and behaviours provided by patients/carers were accurate. This was not attempted because the records were often not up to date.

### **8.5.4 Language as a limitation on the generalizability of the findings**

Linguistic problems may limit the generalizability of the findings of this research. Adherence to best practice, specifically, may have been affected by the extraneous variable in this study of language proficiency. It was difficult to double-check patient medication use patterns to assess adherence, because medications were prescribed in written English, which is not the main language of the patients or their carers. To counter this problem, coloured photographs of asthma medications were attached to questionnaires, to help patients identify their medication.

### **8.5.5 The lack of specialized asthma clinics**

Another limitation recognized in the study was that no specialized asthma clinics were included: the proportion of specialist physicians in the study was very low, with only one pulmonologist identified.

### **8.5.6 Separation of genders limiting investigation communication**

A limitation arose concerning the communication barriers between genders due to religious and cultural habits prevailing in KSA, including the structure of the health

system in which female clinics are separated from male clinics and a same-gender staff policy obtains.

## **8.6 Recommendations**

### **8.6.1 Establish specialized asthma clinics in PHCCs**

The availability of specialized clinics within PHCCs would improve the general outcomes of treatment for the following reasons:

- Diagnoses would be more accurate if performed by specialists.
- Drugs would be more uniformly prescribed and available in the PHCCs.
- There would be improved patient adherence and follow-up through control of prescriptions and re-fill supplies.
- There would be improved patient awareness of the chronic nature of the disease and the need for regular follow-up and discipline in its management.
- It would enhance patient and family involvement in the treatment process.

### **8.6.2 Improve the pharmacy's role in asthma care**

The area of pharmaceutical science plays a vital role in developing medicines, yet at the heart of the problem of poor health outcomes lies the failure of the system to ensure adherence to medication regimens. The literature and commentary indicate a positive correlation between education programs provided by pharmacists and increased adherence to medication usage. Pharmacists can play an important role in addressing the misunderstandings, beliefs, and misperceptions of patients and carers regarding asthma medications and drug side effects. They can also facilitate better communication between patients and carers and their health care providers, and in doing so address many of the factors negatively influencing compliance. Further, as most KSA pharmacists and pharmacy assistants are Saudis while the physicians are often non-Saudis, they can help eliminate problems of language, custom and culture on the communication process. The availability of female pharmacy staff also helps in improving communication with asthma patients.

Pharmacy staff should also play an active role in delivering workshops for asthma sufferers and lectures for other health care providers, and in maintaining strong links with drug and equipment manufacturers.

### **8.6.3 Better funding for intervention programs**

Intervention programs must have better funding, but more importantly they need better evaluation mechanisms so that care providers and patients get what they need from these initiatives. Well-developed education programs based on proven social theories have been shown to have positive effects on management outcomes; therefore, education programs for both patients and providers regarding asthma, asthma medication, and management, are desirable. Given that many physicians in the KSA are non-Saudi, education focusing on communication skills must be provided to them together with programs on cultural awareness and safety. For programs delivered to patients and their families, different methods should be used, such as face-to-face consultations, DVDs, or online information sites; these should be tailored to the different education levels of patients and their families. Implementing programs based on peer education are recommended, as these have proven to lead to satisfactory outcomes, especially amongst young sufferers. Such programs could be delivered in schools to ease the pressure on physicians and avoid the problems associated with dealing with non-Saudi doctors; they will be delivered by people with the same language, culture and gender as the recipients. Intervention programs also may reduce negative social impacts by improving knowledge and attitudes about the disease and medications. It is important to acknowledge that carers' knowledge, beliefs, and attitudes, and behaviours affect patients' practices, especially those of children; carers' involvement in any intervention is essential.

### **8.6.4 Increased provision of Asthma Action Plans and recommendations for Peak Flow Monitoring**

Physicians must be encouraged to prescribe AAPs as this may increase patient motivation and improve the communication process, leading to a better patient–physician relationship and patient adherence. Further, increased use of PFMs may help patients monitor the severity of their disease and become more actively involved in its treatment.

### **8.6.5 Improved access to National Asthma Management Guidelines**

Access to the National Asthma Management Guidelines must be dramatically and immediately increased through its provision in electronic and hard copy. Access to

guidelines can significantly influence practice, and should be supported by continuing education programs. Initiatives at the PHCC level, such as workshops and group meetings, need to be put in place to help change provider attitudes, behaviours, and self-efficacy in regard to the implementation of the national guidelines.

Based on observations during the study, a further recommendation follows:

#### **8.6.6 Improving quality of record-keeping**

Developing awareness of the need to keep documents updated will assist both health care providers and patients in easing the process of follow-up, determining a patient's condition, stopping treatment repetition, developing focus in patients, and improving communication.

## References

1. Global Initiative for Asthma. Global strategy for asthma management and prevention. Bethesda, MD: National Heart, Lung and Blood Institute, 2002 (NIH Publication 02–3659). Global Initiative for Asthma and Associated Press; 2004 February. Available from: URL: <http://www.ginasthma.com/>
2. Marks G. Asthma deaths on the decline but burden remains high. [Online]. Australian Institute of Health and Welfare - ACAM; 2003 [cited 2005 25/05]. Available from URL: <http://www.asthmaresearch.org.au>
3. U.S Department of Health and Human Services: National Center for Health Statistics [Online]. 2005 Apr 07 [cited 2005 May 02]. Available from URL: <http://www.cdc.gov/nchs/Default.htm>.
4. The National Scientific Committee of Bronchial Asthma. The National Protocol for the Management of Asthma. 3rd ed. Riyadh (KSA): Ministry of Health; 2000.
5. Kingdom of Saudi Arabia, Ministry of Health. Health statistic book year 2001 [online]. 2001 [cited 2005 Mar 10]. Available from: URL: <http://www.moh.gov.sa/statistics/2001/index2001.html>
6. National Asthma Council Australia, Media Centre. Australian Asthma Deaths [online]. 2004, December 21 [cited 2005 May 13]. Available from: URL: <http://www.nationalasthma.org.au/media.html#stats2004>.
7. World Health Organization (WHO) Media centre. Bronchial asthma [online]. 2005 [cited 2005 Apr 20]. Available from: URL: <http://www.who.int/mediacentre/factsheets/fs206/en/>.
8. Halm A E, Mora P, Leventhal H. No symptoms, No asthma: the acute episodic disease belief is associated with poor self-management among inner-city adults with persistent asthma. *Chest*. 2006; 129:573-80.

9. GINA Dissemination Committee. The global initiative for asthma (GINA): dissemination and implementation of asthma guidelines. UK; 2002.
10. Prabhakaran L, Lim G, Abisheganaden J, Chee CBE, Choo YM. Impact of an asthma education programme on patients' knowledge, inhaler technique and compliance to treatment. *Singapore Med J.* 2006; 47(3): 225-31.
11. Glasgow RE, Tracy Orleans C, Wagner EH, Curry SJ, Solberg LI. Does the chronic care model serve also as a template for improving prevention? *Milbank Quarterly.* 2001; 79(4): 579-612.
12. Barlow J, Wright C, Sheasby J, Turner A, Hainsworth J. Self-management approaches for people with chronic conditions: a review. *Patient Educ Couns* 2002; 48(2): 177-87. doi: 10.1016/S0738-3991(02)00032-0.
13. National Asthma Council Australia. Asthma management handbook. Melbourne: National Asthma Council Australia; 2002.
14. National Asthma Council Australia, Media Centre. Report on the cost of asthma in Australia [Online]. Available from: URL: <http://www.nationalasthma.org.au/publications/costs/costindx.html>.
15. Alshehri MA, Abolfotouh MA, Sadeg A, Al Najjar YM, Asindi AA, Al Harthi AM. Screening for asthma and associated risk factors among urban school boys in Abha city. *Saudi Med J.* 2000; 21: 1048-53.
16. Al-Ghamdi BR, Mahfouz AA, Abdelmoneim I, Khan MY, Daffallah AA. Altitude and bronchial asthma in south-western Saudi Arabia. *Eastern Mediterranean Health J* 2008; 14: 17.
17. Bacharier LB, Strunk RC, Mauger D, White D, Lemanske RF Jr., Sorkness CA. Classifying asthma severity in children: mismatch between symptoms, medication use, and lung function. *Am J Respir Crit Care Med.* 2004 August 15, 2004; 170(4): 426-32.

18. Hamilton R. Assessment of indoor allergen exposure. *Current Allergy and Asthma Reports*. 2005; 5(5): 394-401.
19. Samet JM, Marbury MC, Spengler JD. Respiratory effects of indoor air pollution. *J of Allergy and Clinical Immunology*. 1987; 79(5): 685-700.
20. Murray CS, Woodcock A, Custovic A. The role of indoor allergen exposure in the development of sensitization and asthma. *Current Opinion in Allergy and Clinical Immunology*. 2001; 1(5): 407-12.
21. Murray CS, Poletti G, Kebabze T, Morris J, Woodcock A, Johnston SL, et al. Study of modifiable risk factors for asthma exacerbations: virus infection and allergen exposure increase the risk of asthma hospital admissions in children. *Thorax*. May 1, 2006; 61(5): 376-82.
22. Platts-Mills TAE, Rakes G, Heymann PW. The relevance of allergen exposure to the development of asthma in childhood. *J of Allergy and Clinical Immunology*. 2000; 105(2, Part 2): S503-S8.
23. Arshad SH. Indoor allergen exposure in the development of allergy and asthma. *Current Allergy and Asthma Reports*. 2003; 3(2):115.
24. Bacharier LB, Boner A, Carlsen KH, Eigenmann PA, Frischer T, Götz M, et al. Diagnosis and treatment of asthma in childhood: a PRACTALL consensus report. *Allergy*. 2008; 63(1): 5-34.
25. Mao Y. Increased rates of illness and death from asthma in Canada. *Canadian Medical Association J; CMAJ*. 1987; 137(7): 620.
26. Hijazi N, Abalkhail B, Seaton A. Asthma and respiratory symptoms in urban and rural Saudi Arabia. *Eur Respir J*. 1998; 12: 41-4.
27. Siersted HC, John PR, Evans SJW, Boldsen J, Hansen HS, Mostgaard G, et al. Population based study of risk factors for underdiagnosis of asthma in adolescence: Odense schoolchild study. *Commentary: Risk factors for*

- underdiagnosis of asthma in adolescence Commentary: Identifying the correct risks in diagnosis. *BMJ*. 1998 1998-02-28 00:00:00; 316(7132): 651-7.
28. Speight AN, Lee DA, Hey EN. Underdiagnosis and undertreatment of asthma in childhood. *BMJ*. 1983 1983-04-16 00:00:00; 286(6373): 1253-6.
  29. van Schayck CP, van der Heijden FMMA, van den Boom G, Tirimanna PRS, van Herwaarden CLA. Underdiagnosis of asthma: is the doctor or the patient to blame? The DIMCA project. *Thorax*. 2000 July 1, 2000; 55(7): 562-5.
  30. Barnes NC, Williams AE. Unscheduled healthcare resource use among asthma patients receiving low-dose inhaled corticosteroids maintenance treatment. *Int J of Clin Prac*. 2005; 59(9):1017-24.
  31. Jones AP, Bentham G. Health service accessibility and deaths from asthma in 401 local authority districts in England and Wales, 1988-92. *Thorax*. 1997 March 1, 1997; 52(3): 218-22.
  32. Fischer GB, Camargos PAM. Paediatric asthma management in developing countries. *Paediatric Respiratory Reviews*. 2002; 3(4): 285-91.
  33. Mansour ME, Lanphear BP, DeWitt TG. Barriers to asthma care in urban children: parent perspectives. *Pediatrics*. 2000 September 1, 2000; 106(3): 512-9.
  34. Cote J, Cartier A, Robichaud P, Boutin H, Malo J, Rouleau M, et al. Influence on asthma morbidity of asthma education programs based on self-management plans following treatment optimization. *Am J Respir Crit Care Med*. 1997 May 1, 1997; 155(5): 1509-14.
  35. Leickly FE. Asthma and adherence: how to get your child to take medications. *Asthma Magazine*. 2004 May: 10-2.
  36. National Asthma Education and Prevention Program. Expert Panel Report 3: guidelines for the diagnosis and management of asthma. 2007: Bethesda, MD: National Heart, Lung, and Blood Institute; 2007. Publication No. 07-4051

Available from: URL: <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm>

37. Vermeire PA, Rabe KF, Soriano JB, Maier WC. Asthma control and differences in management practices across seven European countries. *Resp Med*. 2002; 96(3): 142-9. doi: 10.1053/rmed.2001.1241.
38. Schmittziel JA. The effect of primary health care orientation on chronic illness management [Phd]. Berkeley: University of California; 2004.
39. Bateman ED, Boushey HA, Bousquet J, Busse WW, Clark TJH, Pauwels RA, et al. Can guideline-defined asthma control be achieved? The gaining optimal asthma control study. *Am J Respir Crit Care Med*. 2004; 170(8): 836-44.
40. Al-Jahdali HH, Al-Omar AM, Al-Moamary MS, Al-Duhaim AS, Al-Hodeib AS, Hassan IS, et al. Implementation of the National Asthma Management Guidelines in the Emergency Department. *SAUDI MED J SAUDI MED J* 20. [serial on the internet]. 2004; 2006 December 11; 25(9):1208-11.
41. American Lung Association. Landmark survey reveals asthma in children remains significantly out of control in the United States [online]. 2004 [cited 2005 May 08]; [4 screens]. Available from: URL: <http://www.lungusa.org/site/apps/nl/newsletter3.asp?c=dvLUK9O0E&b=34851>.
42. Dashash NA, Mukhtar SH. Prescribing for asthmatic children in primary care: Are we following guidelines? *Saudi Med J*. 2003; 24(5): 507-11.
43. Gillissen A. Managing asthma in the real world. *Int J Clin Prac*. 2004; 58(6): 592- 603.
44. Dougherty D, Simpson LA. Measuring the quality of children's health care: a prerequisite to action. *Pediatrics*. 2004; 113(1): 185-98.
45. Potts AL. Thinking outside the inhaler: potential barriers to controlled asthma in children. *J of Pharmacy Practice*. 2004; 17(3): 211-20.

46. Sheffer AL, Taggart VS. The National Asthma Education Program: expert panel report guidelines for the diagnosis and management of asthma. *Medical Care*. 1993; 31(3): MS20-MS8.
47. Nathan RA, Sorkness CA, Kosinski M, Schatz M, Li JT, Marcus P, et al. Development of the asthma control test: a survey for assessing asthma control. *J of Allergy Clin Immun*. 2004; 113(1): 59-65. doi: 10.1016/j.jaci.2003.09.008.
48. Roche N, Morel H, Martel P, Godard P. Clinical practice guidelines: medical follow-up of patients with asthma – adults and adolescents. *Resp Med*. 2005; 99(7): 793-815. doi: 10.1016/j.rmed.2005.03.011.
49. Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, FitzGerald M, et al. Global strategy for asthma management and prevention: GINA executive summary. *Eur Respir J*. 2008; 31(1): 143-78.
50. Stoloff SW, Boushey HA. Severity, control, and responsiveness in asthma. *J Allergy Clin Immun*. 2006; 117(3): 544-8. doi: 10.1016/j.jaci.2006.01.005.
51. Humbert M, Holgate S, Boulet LP, Bousquet J. Asthma control or severity: that is the question. *Allergy*. 2007; 62(2): 95-101.
52. Boulet LP, Boulet V, Milot J. How should we quantify asthma control? *Chest*. 2002; 122(6): 2217.
53. Soyer OU, Beyhun NE, Demir E, Yıldırım S, Bingöl Boz A, Altinel N, et al. A multicenter survey of childhood asthma in Turkey – II: utilization of asthma drugs, control levels and their determinants. *Pediatr Allergy Immu*. 2009; 20(2): 172-9.
54. Carlton BG, Lucas DO, Ellis EF, Conboy-Ellis K, Shoheiber O, Stempel DA. The status of asthma control and asthma prescribing practices in the United States: results of a large prospective asthma control survey of primary care practices. *J Asthma*. 2005; 42(7): 529-35.

55. Yawn BP, Brennenman SK, Allen-Ramey FC, Cabana MD, Markson LE. Assessment of asthma severity and asthma control in children. *Pediatrics*. 2006; 118(1): 322-9.
56. Neffen H, Fritscher C, Cuevas Schacht F, Levy G, Chiarella P, Soriano JB, et al. Asthma control in Latin America: the asthma insights and reality in Latin America (AIRLA) survey. *Revista Panamericana de Salud Pública*. 2005; 17: 191-7.
57. Rabe KF, Adachi M, Lai CKW, Soriano JB, Vermeire PA, Weiss KB, et al. Worldwide severity and control of asthma in children and adults: the global asthma insights and reality surveys. *J Allergy Clin Immunol*. 2004;114(1):40-7. doi: 10.1016/j.jaci.2004.04.042.
58. Sekerel BE, Gemicioğlu B, Soriano JB. Asthma insights and reality in Turkey (AIRET) study. *Resp Med*. 2006; 100(10): 1850-4. doi: 10.1016/j.rmed.2006.01.024.
59. Fueyo A, Ruiz MA, Ancochea J, Guilera M, Badia X. Asthma control in Spain. do season and treatment pattern matter? The ESCASE study. *Resp Med*. 2007; 101(5): 919-24. doi: 10.1016/j.rmed.2006.09.017.
60. Peters SP, Jones CA, Haselkorn T, Mink DR, Valacer DJ, Weiss ST. Real-world evaluation of asthma control and treatment (REACT): findings from a national web-based survey. *J Allergy Clin Immunol*. 2007; 119(6): 1454-61.
61. Rabe K, Vermeire P, Soriano J, Maier W. Clinical management of asthma in 1999: the asthma insights and reality in Europe (AIRE) study. *Eur Resp J*. 2000; 16(5): 802-7.
62. Lai C, De Guia T, Kim Y, Kuo S, Mukhopadhyay A, Soriano J, et al. Asthma control in the Asia-Pacific region: the asthma insights and reality in Asia-Pacific Study. *J Allergy Clin Immunol*. 2003; 111(2): 263-8.
63. Williams LK, Pladevall M, Xi H, Peterson EL, Joseph C, Lafata JE, et al. Relationship between adherence to inhaled corticosteroids and poor outcomes

- among adults with asthma. *J Allergy Clin Immunol*. 2004; 114(6): 1288-93. doi: 10.1016/j.jaci.2004.09.028.
64. Halm EA, Mora P, Leventhal H. No Symptoms, no asthma. *Chest*. 2006; 129(3): 573-80.
  65. Dales RE, Choi B, Chen Y, Tang M. Influence of family income on hospital visits for asthma among Canadian school children. *Thorax* [serial online] 2002 [cited 2005 May 24]; 57 :513-17. Available from: URL: <http://thorax.bmjournals.com/cgi/reprint/57/6/513>.
  66. Levy M, Heffner B, Stewart T, Beeman G. The efficacy of asthma case management in an urban school district in reducing school absences and hospitalizations for asthma. *J School Health*. 2006;76(6):320-4.
  67. Pinto Pereira L, Clement Y, Simeon D. Educational intervention for correct pressurised metered dose inhaler technique in Trinidadian patients with asthma. *Patient Educ Couns*. 2001;42(1):91-7. doi: 10.1016/S0738-3991(00)00090-2.
  68. Green RM, Custovic A, Sanderson G, Hunter J, Johnston SL, Woodcock A. Synergism between allergens and viruses and risk of hospital admission with asthma: case-control study. *BMJ*. 2002; 324(7340): 763.
  69. Heymann PW, Carper HT, Murphy DD, Platts-Mills TAE, Patrie J, McLaughlin AP, et al. Viral infections in relation to age, atopy, and season of admission among children hospitalized for wheezing. *J Allergy Clin Immunol*. 2004; 114(2):239-47. doi: 10.1016/j.jaci.2004.04.006.
  70. Beasley R, Coleman ED, Hermon Y, Holst PE, O'Donnell TV, Tobias M. Viral respiratory tract infection and exacerbations of asthma in adult patients. *Thorax*. 1988 1988; 43(9): 679-83.
  71. Hogg JC. Childhood Viral Infection and the Pathogenesis of Asthma and Chronic Obstructive Lung Disease. *Am J Respir Crit Care Med*. 1999 November 1, 1999;160(5):S26-8.

72. Levy ML, Thomas M, Small I, Pearce L, Pinnock H, Stephenson P. Summary of the 2008 BTS/SIGN British guideline on the management of Asthma. *Primary Care Respiratory Journal*. 2009; 18(Suppl 1): S1-S16.
73. Lozano P, Finkelstein JA, Hecht J, Shulruff R, Weiss KB. Asthma medication use and disease burden in children in a primary care population. *Arch Pediatr Adolesc Med*. 2003; 157(1): 81-8.
74. Majeed A, Ferguson J, Field J. Prescribing of beta-2 agonists and inhaled steroids in England: trends between 1992 and 1998, and association with material deprivation, chronic illness and asthma mortality rates. *Journal of Public Health*. 1999 December 1, 1999; 21(4): 395-400.
75. Bousquet J, Clark TJH, Hurd S, Khaltaev N, Lenfant C, O'Byrne P, et al. GINA guidelines on asthma and beyond. *Allergy*. 2007; 62(2): 102-12.
76. Pinto Pereira LM, Clement Y, Da Silva CK, McIntosh D, Simeon DT. Understanding and use of inhaler medication by asthmatics in specialty care in Trinidad. *Chest*. 2002; 121(6): 1833-40.
77. Partridge M, van der Molen T, Myrseth S-E, Busse W. Attitudes and actions of asthma patients on regular maintenance therapy: the INSPIRE study. *BMC Pulmonary Medicine*. 2006; 6(1):13.
78. Goldman M, Rachmiel M, Gendler L, Katz Y. Decrease in asthma mortality rate in Israel from 1991-1995: is it related to increased use of inhaled corticosteroids? *J Allergy Clin Immun*. 2000;105(1, Part 1):71-4. doi: 10.1016/S0091-6749(00)90180-5.
79. Suissa S, Ernst P, Kezouh A. Regular use of inhaled corticosteroids and the long term prevention of hospitalisation for asthma. *Thorax*. 2002; 57(10): 880-4.
80. Adams RJ, Fuhlbrigge A, Finkelstein JA, Lozano P, Livingston JM, Weiss KB, et al. Impact of inhaled antiinflammatory therapy on hospitalization and

- emergency department visits for children with asthma. *Pediatrics*. 2001 April 1, 2001; 107(4): 706-11.
81. Williams L, Pladevall M, Xi H, Peterson E, Joseph C, Lafata D, et al. Relationship between adherence to inhaled corticosteroids and poor outcomes among adults with asthma. *J Allergy Clin Immunol*. 2004; 114(6): 1288-93.
  82. Fabbri LM. Does mild persistent asthma require regular treatment? *New Engl J Med*. 2005; 352(15): 1589-91.
  83. Global Initiative for Asthma. Global strategy for asthma management and prevention: NHLBI/WHO workshop report. Updated 2006. Bethesda, MD.: National Heart, Lung, and Blood Institute.
  84. Anarella J, Roohan P, Balistreri E, Gesten F. A Survey of medicaid recipients with asthma: perceptions of self-management, access, and care. *Chest*. 2004 April 1, 2004; 125(4): 1359-67.
  85. Finkelstein JA, Lozano P, Farber HJ, Miroshnik I, Lieu TA. Underuse of controller medications among medicaid-insured children with asthma. *Arch Pediatr Adolesc Med*. 2002; 156(6): 562-7.
  86. Diette GB, Skinner EA, Markson LE, Algatt-Bergstrom P, Nguyen TTH, Clark RD, et al. Consistency of care with national guidelines for children with asthma in managed care. *J Pediatr*. 2001; 138(1): 59-64. doi: 10.1067/mpd.2001.109600.
  87. Khadadah M, Mahboub B, Al-Busaidi NH, Sliman N, Soriano JB, Bahous J. Asthma insights and reality in the Gulf and the Near East. *Int J Tuberc Lung D*. 2009; 13: 1015-22.
  88. Marks GB, Abramson MJ, Jenkins CR, Kenny P, Mellis CM, Ruffin RE, et al. Asthma management and outcomes in Australia: a nation-wide telephone interview survey. *Respirology*. 2007; 12(2): 212-9.

89. FitzGerald JM, Boulet LP, McIvor RA, Zimmerman S, Chapman KR. Asthma control in Canada remains suboptimal: the reality of asthma control (TRAC) study. *Canadian Respiratory Journal*. 2006; 13(5): 253.
90. McQuaid EL, Kopel SJ, Klein RB, Fritz GK. Medication adherence in pediatric asthma: reasoning, responsibility, and behavior. *J Pediatr Psychol*. 2003; 28(5): 323-33.
91. Bender B, Wamboldt F, O'Connor SL, Rand C, Szeffler S, Milgrom H, et al. Measurement of children's asthma medication adherence by self report, mother report, canister weight, and Doser CT. *Ann Allerg Asthma Im*. 2000; 85(5): 416-21. doi: 10.1016/S1081-1206(10)62557-4].
92. Chapman KR, Walker L, Cluley S, Fabbri L. Improving patient compliance with asthma therapy. *Resp Med* 2000; 94(1): 2-9. doi: 10.1053/rmed.1999.0667.
93. Schmittdiel JA, Shortell SM, Rundall TG, Bodenheimer T, Selby JV. Effect of primary health care orientation on chronic care management. *Ann Fam Med*. 2006; 4(2): 117-23.
94. Gillissen A. Managing asthma in the real world. *Int J Clin Pract*. 2004; 58(6): 592-603.
95. Verberne AAPH, Frost C, Duiverman E J, Grol Marion H, Kerrebijn Karel F, the Dutch Paediatric Asthma Study Group. Addition of salmeterol versus doubling the dose of beclomethasone in children with asthma. *Am J Respir Crit Care Med*. 1998; 158(1): 213-9.
96. Masoli M, Weatherall M, Holt S, Beasley R. Clinical dose-response relationship of fluticasone propionate in adults with asthma. *Thorax*. 2004; 59(1): 16-20.
97. Rodrigo GJ. Comparison of inhaled fluticasone with intravenous hydrocortisone in the treatment of adult acute asthma. *Am J Respir Crit Care Med*. 2005; 171(11): 1231-6.

98. FitzGerald JM, Becker A, Sears MR, Mink S, Chung K, Lee J. Doubling the dose of budesonide versus maintenance treatment in asthma exacerbations. *Thorax*. 2004; 59(7): 550-6.
99. Smith M, Iqbal S, Elliott TM, Everard M, Rowe BH. Corticosteroids for hospitalised children with acute asthma. *Cochrane Database Syst Rev* (online). 2003 (2).
100. Boushey HA, Sorkness CA, King TS, Sullivan SD, Fahy JV, Lazarus SC, et al. Daily versus As-needed corticosteroids for mild persistent asthma. *New Engl J Med*. 2005; 352(15): 1519-28.
101. FitzGerald JM, Olsson P, Michils A. Adjustable maintenance dosing with budesonide/formoterol in a single inhaler – efficacy and safety. *Int J Clin Pract*. 2004; 58: 18-25.
102. O’Byrne PM, Barnes PJ, Rodriguez-Roisin R, Runnerstrom E, Sanstrom T, Svensson K, et al. Low dose inhaled budesonide and formoterol in mild persistent asthma: the OPTIMA randomized trial. *Am J Respir Crit Care Med*. 2001; 164(8): 1392-7.
103. Lemiere C, Becker A, Boulet L-P, Bowie D, Cartier A, Cockroft D, et al. Should combination therapy with inhaled corticosteroids and long-acting {beta}2-agonists be prescribed as initial maintenance treatment for asthma? *CMAJ*. 2002; 167(9): 1008-9.
104. Fardon TC, Lee DKC, Haggart K, McFarlane LC, Lipworth BJ. Adrenal suppression with dry powder formulations of fluticasone propionate and mometasone furoate. *Am J Respir Crit Care Med*. 2004; 170(9): 960-6.
105. Barnes P J, Pedersen S, Busse WW. Efficacy and safety of inhaled corticosteroids: new developments. *Am J Respir Crit Care Med*. 1998; 157(3): S1-53.
106. Gerald MC, O’Bannon FV. *Nursing pharmacology and therapeutics*. 2nd ed. CA; Prentice-Hall, 1988.

107. Barnes NC. The properties of inhaled corticosteroids: similarities and differences. *Primary Care Respiratory Journal*. 2007; 16(3): 149-54.
108. Doull IJM, Campbell MJ, Holgate ST. Duration of growth suppressive effects of regular inhaled corticosteroids. *Arch Dis Child*. 1998; 78(2): 172-3.
109. Doull IJM. The effect of asthma and its treatment on growth. *Arch Dis Child*. 2004; 89(1): 60-3.
110. McCowan C, Neville RG, Thomas GE, Crombie IK, Clark RA, Ricketts IW, et al. Effect of asthma and its treatment on growth: four year follow up of cohort of children from general practices in Tayside, Scotland. *BMJ*. 1998; 316(7132): 668-72.
111. Tattersfield AE, Harrison TW, Hubbard RB, Mortimer K. Safety of inhaled corticosteroids. *Proc Am Thorac Soc*. 2004; 1(3): 171-5.
112. Calam R, Gregg L, Goodman R. Psychological adjustment and asthma in children and adolescents: the UK nationwide mental health survey. *Psychosom Med*. 2005; 67(1): 105-10.
113. Rau JL. Practical problems with aerosol therapy in COPD. *Respiratory Care*. 2006; 51(2): 158-72.
114. Dolovich MB, Ahrens RC, Hess DR, Anderson P, Dhand R, Rau JL, et al. Device selection and outcomes of aerosol therapy: evidence-based guidelines. *Chest*. 2005; 127(1): 335-71.
115. Cochrane MG, Bala MV, Downs KE, Mauskopf J, Ben-Joseph RH. Inhaled corticosteroids for asthma therapy. *Chest*. 2000; 117(2): 542-50.
116. Scarfone RJ, Capraro GA, Zorc JJ, Zhao H. Demonstrated use of metered-dose inhalers and peak flow meters by children and adolescents with acute asthma exacerbations. *Arch Pediatr Adolesc Med*. 2002; 156(4): 378-83.
117. Alsheri MA. Comparative study of different inhaler devices in asthmatic children. *Ann Saudi Med*. 2003; 23(6): 349-53.

118. Burkhart PV, Rayens MK, Bowman RK. An evaluation of children's metered-dose inhaler technique for asthma medications. *Nurs Clin N Am*. 2005; 40(1): 167-82.
119. Kamps AWA, van Ewijk B, Roorda RJ, Brand PLP. Poor inhalation technique, even after inhalation instructions, in children with asthma. *Pediatr Pulm*. 2000; 29(1): 39-42.
120. Crompton GK, Barnes PJ. Aerosol delivery devices. *Chest*. 2006; 129(5): 1388-9.
121. Hanania NA, Wittman R, Kesten S, Chapman KR. Medical personnel's knowledge of and ability to use inhaling devices: metered-dose inhalers, spacing chambers, and breath-actuated dry powder inhalers. *Chest*. 1994; 105(1): 111-6.
122. Interiano B, Guntupalli KK. Metered-dose inhalers: do health care providers know what to teach? *Arch Intern Med*. 1993 January 11, 1993; 153(1): 81-5.
123. Kesten S, Zive K, Chapman KR. Pharmacist knowledge and ability to use inhaled medication delivery systems. *Chest*. 1993; 104(6): 1737-42.
124. Allen SC, Prior A. What determines whether an elderly patient can use a metered dose inhaler correctly? *Brit J Dis Chest*. 1986; 80(0): 45-9.
125. Dawes M, Sampson U. Knowledge management in clinical practice: a systematic review of information seeking behavior in physicians. *Int J Med Inform*. 2003; 71(1): 9-15.
126. Ram FSF, Wright J, Brocklebank D, White JES. Systematic review of clinical effectiveness of pressurised metered dose inhalers versus other hand held inhaler devices for delivering  $\beta_2$  agonists bronchodilators in asthma. *BMJ*. 2001; 323(7318): 901.
127. Stoloff SW, Stempel DA, Meyer J, Stanford RH, Carranza Rosenzweig JR. Improved refill persistence with fluticasone propionate and salmeterol in a

- single inhaler compared with other controller therapies. *J Allergy Clin Immun.* 2004; 113(2): 245-51.
128. Stempel DA, Stoloff SW, Carranza Rosenzweig JR, Stanford RH, Ryskina KL, Legorreta AP. Adherence to asthma controller medication regimens. *Resp Med.* 2005; 99(10): 1263-7.
129. Marceau C, Lemièrè C, Berbiche D, Perreault S, Blais L. Persistence, adherence, and effectiveness of combination therapy among adult patients with asthma. *J Allergy Clin Immun.* 2006; 118(3): 574-81.
130. Apter A, Reisine S, Affeck G, Barrows E, Zuwallack R. Adherence with Twice-daily Dosing of Inhaled Steroids. *Am J Resp Crit Care.* 1998; 157(6): 1810-7.
131. Divertie V. Strategies to promote medication adherence in children with asthma. *MCN, The American Journal of Maternal Child Nursing.* 2002; 27(1): 10.
132. Warschburger P, von Schwerin A-D, Buchholz HT, Petermann F. An educational program for parents of asthmatic preschool children: short- and medium-term effects. *Patient Educ Couns.* 2003; 51(1): 83-91. doi: 10.1016/S0738-3991(02)00169-6.
133. van der Palen J, Klein JJ, Zielhuis GA, van Herwaarden CLA, Seydel ER. Behavioural effect of self-treatment guidelines in a self-management program for adults with asthma. *Patient Educ Couns.* 2001; 43(2): 161-9. doi: 10.1016/S0738-3991(00)00155-5.
134. Newman S, Steed L, Mulligan K. Self-management interventions for chronic illness. *Lancet.* 2004; 364(9444): 1523-37. doi: 10.1016/S0140-6736(04)17277-2.
135. Lorig K, Holman H. Self-management education: history, definition, outcomes, and mechanisms. *Ann Behav Med.* 2003; 26(1): 1-7.

136. Jerant AF, von Friederichs-Fitzwater MM, Moore M. Patients' perceived barriers to active self-management of chronic conditions. *Patient Educ Couns.* 2005;57(3):300-7. doi: 10.1016/j.pec.2004.08.004.
137. Bayliss EA, Steiner JF, Fernald DH, Crane LA, Main DS. Descriptions of barriers to self-care by persons with comorbid chronic diseases. *Ann Fam Med.* 2003; 1(1): 15-21.
138. Bodenheimer T, Lorig K, Holman H, Grumbach K. Patient self-management of chronic disease in primary care. *JAMA: The Journal of the American Medical Association.* 2002; 288(19): 2469-75.
139. Gibson P, Powell H, Coughlan J, Wilson A, Abramson M, Haywood P, et al. Self-management education and regular practitioner review for adults with asthma. *Cochrane Database Syst Rev.* 2003; 1: CD001117.
140. Wolf FM, Guevara JP, Grum CM, Cates CJ. Educational interventions for asthma in children (review). *Cochrane Database Syst Rev.* 2002; 4.
141. Gibson PG. Monitoring the patient with asthma: an evidence-based approach. *J Allergy Clin Immun.* 2000; 106(1): 17-26. doi: 10.1067/mai.2000.108307.
142. Turner MO, Taylor D, Bunnett R, FitzGerald JM. A randomized trial comparing peak expiratory flow and symptom self-management plans for patients with asthma attending a primary care clinic. *Am J Respir Crit Care Med.* 1998; 157(2): 540-6.
143. Fuhlbrigge AL, Kitch BT, Paltiel AD, Kuntz KM, Neumann PJ, Dockery DW, et al. FEV1 is associated with risk of asthma attacks in a pediatric population. *J Allergy Clin Immun.* 2001; 107(1): 61-7.
144. Kamps AWA, Roorda RJ, Brand PLP. Peak flow diaries in childhood asthma are unreliable. *Thorax.* 2001; 56(3): 180-2.
145. Brand PLP, Roorda RJ. Usefulness of monitoring lung function in asthma. *Arch Dis Child.* 2003; 88(11): 1021-5.

146. Stout JW, Visness CM, Enright P, Lamm C, Shapiro G, Gan VN, et al. Classification of asthma severity in children: the contribution of pulmonary function testing. *Arch Pediatr Adolesc Med*. 2006; 160(8): 844-50.
147. Warman KL, Silver EJ, McCourt MP, Stein REK. How does home management of asthma exacerbations by parents of inner-city children differ from NHLBI guideline recommendations? *Pediatrics*. 1999; 103(2): 422-7.
148. Brouwer AFJ, Roorda RJ, Brand PLP. Home spirometry and asthma severity in children. *Eur Resp J*. 2006; 28(6): 1131-7.
149. van der Meer V, Rijkers-Mutsaerts ERVM, Sterk PJ, Thiadens HA, Assendelft WJJ, Sont JK. Compliance and reliability of electronic PEF monitoring in adolescents with asthma. *Thorax*. 2006; 61(5): 457-8.
150. Cowie RL, Revitt SG, Underwood MF, Field SK. The effect of a peak flow-based action plan in the prevention of exacerbations of asthma. *Chest*. 1997; 112(6): 1534-8.
151. Bhogal SK, Zemek RL, Ducharme F. Written action plans for asthma in children. *Cochrane Database Syst Rev* 2006, Issue 3. Art. No.: CD005306. doi: 10.1002/14651858.CD005306.pub2.
152. Lefevre F, Piper M, Weiss K, Marks D, Clark N, Aronson N. Do written action plans improve patient outcomes in asthma? An evidence-based analysis. *Journal Fam Practice*. 2002; 51(10): 842.
153. Zemek RL, Bhogal SK, Ducharme FM. Systematic review of randomized controlled trials examining written action plans in children: what is the plan? *Arch Pediatr Adolesc Med*. 2008; 162(2): 157-63.
154. Gibson PG, Powell H. Written action plans for asthma: an evidence-based review of the key components. *Thorax*. 2004; 59(2): 94-9.

155. Adams RJ, Smith BJ, Ruffin RE. Factors associated with hospital admissions and repeat emergency department visits for adults with asthma. *Thorax*. 2000; 55(7): 566-73.
156. Adams RJ, Appleton S, Wilson DH, Ruffin RE. Participatory decision making, asthma action plans, and use of asthma medication: a population survey. *J Asthma*. 2005; 42(8): 673-8.
157. Handley M, MacGregor K, Schillinger D, Sharifi C, Wong S, Bodenheimer T. Using action plans to help primary care patients adopt healthy behaviors: a descriptive study. *J Am Board Fam Med*. 2006; 19(3): 224-31.
158. Dinakar C, Van Osdol TJ, Wible K. How frequent are asthma exacerbations in a pediatric primary care setting and do written asthma action plans help in their management? *J Asthma*. 2004; 41(8): 807-12.
159. Taylor DM, Auble TE, Calhoun WJ, Mosesso VN. Current Outpatient Management of Asthma Shows Poor Compliance With International Consensus Guidelines\*. *Chest*. 1999 December 1, 1999;116(6):1638-45.
160. Haby MM, Powell CVE, Oberklaid F, Waters EB, Robertson CF. Asthma in children: gaps between current management and best practice. *J Paediatr Child H*. 2002; 38(3): 284-9.
161. Jin R, Choi BC, Chan BT, McRae L, Li F, Cicutto L, et al. Physician asthma management practices in Canada. *Canadian Respiratory Journal*. 2000; 7(6): 456-65.
162. Wilson DH, Adams JR, Appleton LS, Hugo G, Wilkinson D, Hiller J et al. Prevalence of asthma and asthma action plans in South Australia: population surveys from 1990 to 2001. *Med J Australia*. 2003; 178(10): 483.
163. Goeman DP, Hogan DC, Rosalie AA, Michael JA. Barriers to delivering asthma care: a qualitative study of general practitioners. *Med J Australia*. 2005; 7; 183(9): 457-60.

164. Moffat M, Cleland J, van der Molen T, Price D. Poor communication may impair optimal asthma care: a qualitative study. *Fam Pract*. 2007; 24(1): 65-70.
165. Ruffin RE, Wilson D, Southcott AM, Smith B, Adams RJ. A South Australian population survey of the ownership of asthma action plans. *MJA*. 1999; 171: 348-51.
166. Douglass J, Aroni R, Goeman D, Stewart K, Sawyer S, Thien F, et al. A qualitative study of action plans for asthma. *BMJ*. 2002 April 27, 2002; 324(7344): 1003.
167. MacGregor K, Handley M, Wong S, Sharifi C, Gjeltema K, Schillinger D, et al. Behavior-change action plans in primary care: a feasibility study of clinicians. *J Am Board Fam Med*. 2006; 19(3): 215-23.
168. Fink J. Inhalers in asthma management: is demonstration the key to compliance? *Respiratory Care*. 2005; 50(5): 598-600.
169. Wolf FM, Guevara JP, Grum CM, Clark NM, Cates CJ. Educational interventions for asthma in children. *Cochrane Database Syst Rev* 2002, Issue 4. Art. No.: CD000326. doi: 10.1002/14651858.CD000326.
170. Cabana MD, Rand CS, Becher OJ, Rubin HR. Reasons for pediatrician nonadherence to asthma guidelines. *Arch Pediatr Adolesc Med*. 2001; 155(9): 1057-62.
171. Prabhakaran L, Lim G, Abisheganaden J, Chee CBE, Choo YM. Impact of an asthma education programme on patients' knowledge, inhaler technique and compliance to treatment. *Singapore Med J*. 2006; 47(3): 225-31.
172. Eiser C, Town C, Tripp JH. Illness experience and related knowledge amongst children with asthma. *Child Care Hlth Dev*. 1988; 14(1):11-24.
173. Conway T, Hu T-C, Bennett S, Nieves M. A pilot study describing local residents' perceptions of asthma and knowledge of asthma care in selected Chicago communities. *Chest*. 1999; 116(suppl 2): 229S-34S.

174. Burkhart PV, Rayens MK, Bowman RK. An evaluation of children's metered-dose inhaler technique for asthma medications. *Nurs Clin North Am.* 2005; 40(1): 167-82.
175. Chambers CV, Markson L, Diamond JJ, Lasch L, Berger M. Health beliefs and compliance with inhaled corticosteroids by asthmatic patients in primary care practices. *Resp Med.* 1999; 93(2): 88-94. doi: 10.1016/S0954-6111(99)90296-2.
176. Chen S, Yin T, Huang J. An exploration of the skills needed for inhalation therapy in schoolchildren with asthma in Taiwan. *Ann Allerg Asthma Im.* 2002; 89(3): 311-5. doi: 10.1016/S1081-1206(10)61960-6.
177. Boulet L-P. Perception of the role and potential side effects of inhaled corticosteroids among asthmatic patients. *Chest.* 1998; 113(3): 587-92.
178. Halterman JS, Yoos HL, Sidora K, Kitzman H, McMullen A. Medication use and health care contacts among symptomatic children with asthma. *Ambulatory Pediatrics.* 2001; 1(5): 275-9.
179. Wakefield M, Staugas R, Ruffin R, Campbell D, Beilby J, McCaul K. Risk factors for repeat attendance at hospital emergency departments among adults and children with asthma. *Australian and New Zealand Journal of Medicine.* 1997;27(3):277-84.
180. Winnick S, Lucas DO, Hartman AL, Toll D. How do you improve compliance? *Pediatrics.* 2005; 115(6): e718-e24.
181. Conn KM, Halterman JS, Fisher SG, Yoos HL, Chin NP, Szilagyi PG. Parental beliefs about medications and medication adherence among urban children with asthma. *Ambulatory Pediatrics.* 2005; 5(5): 306-10. doi: 10.1367/A05-004R1.1.
182. Hussain SF, Zahid S, Khan JA, Haqee R. Asthma management by general practitioners in Pakistan. *Int J Tuberc Lung Dis.* 2003; 8(4): 414-17.

183. Baker KM, Brand DA, Hen J. Classifying asthma: disagreement among specialists. *Chest*. 2003; 124(6): 2156-63.
184. Diette GB, Skinner EA, Nguyen TTH, Markson L, Clark BD, Wu AW. Comparison of quality of care by specialist and generalist physicians as usual source of asthma care for children. *Pediatrics*. 2001; 108(2): 432-7.
185. Reeves MJ, Bohm SR, Korzeniewski SJ, Brown MD. Asthma care and management before an emergency department visit in children in Western Michigan: how well does care adhere to guidelines? *Pediatrics*. 2006; 117(4): S118-26.
186. Lagerlov P, Veninga C, Muskova M, Hummers-Pradier E, Stalsby Lundborg C, Andrew M, et al. Asthma management in five European countries: doctors' knowledge, attitudes and prescribing behaviour. Drug Education Project (DEP) group. *Eur Resp J*. 2000 January 1, 2000; 15(1): 25-9.
187. Halterman JS, Yoos HL, Kaczorowski JM, McConnochie K, Holzhauer RJ, Conn KM, et al. Providers underestimate symptom severity among urban children with asthma. *Arch Pediatr Adolesc Med*. 2002; 156(2): 141-6.
188. Gharagozlou M. A survey of pediatricians' knowledge on asthma management in children. *Iranian Journal of Allergy, Asthma, and Immunology*. 2008; 7(2): 85-90.
189. Cabana MD, Ebel BE, Cooper-Patrick L, Powe NR, Rubin HR, Rand CS. Barriers pediatricians face when using asthma practice guidelines. *Arch Pediatr Adolesc Med*. 2000; 154(7): 685-93.
190. Civelek E, Soyer OU, Gemicioglu B, Şekerel BE. Turkish physicians' perception of allergic rhinitis and its impact on asthma. *Allergy*. 2006; 61(12): 1454-8.
191. Doerschug KC, Peterson MW, Dayton CS, Kline JN. Asthma guidelines: an assessment of physician understanding and practice. *Am J Respir Crit Care Med*. 1999; 159(6): 1735-41.

192. Laforest L, Ganse EV, Devouassoux G, Chretien S, Osman L, Bauguil G, et al. Management of asthma in patients supervised by primary care physicians or by specialists *Eur Respir J* 2006; 27(1): 42-50.
193. Liwsrisakun C, Pothirat C. Actual implementation of the Thai asthma guideline. *J Med Assoc Thai* 2005; 88(7): 898-902.
194. Cabana MD, Slish KK, Evans D, Mellins RB, Brown RW, Lin X, et al. Impact of physician asthma care education on patient outcomes. *Pediatrics*. 2006; 117(6): 2149-57.
195. Halterman JS, Aligne CA, Auinger P, McBride JT, Szilagyi PG. Inadequate therapy for asthma among children in the United States. *Pediatrics*. 2000; 105(1): 272-6.
196. Wahlström R, Lagerløv P, Stålsby Lundborg C, Veninga CCM, Hummers-Pradier E, Dahlgren LO, et al. Variations in general practitioners' views of asthma management in four European countries. *Social Science & Medicine*. 2001; 53(4):507-18. doi: 10.1016/S0277-9536(00)00356-7.
197. Cloutier MM, Hall CB, Wakefield DB, Bailit H. Use of asthma guidelines by primary care providers to reduce hospitalizations and emergency department visits in poor, minority, urban children. *J Pediatr*. 2005;146(5): 591-7. doi: 10.1016/j.jpeds.2004.12.017.
198. Kolbe J, Vamos M, Fergusson W, Elkind G, Garrett J. Differential influences on asthma self-management knowledge and self-management behavior in acute severe asthma. *Chest [serial on the internet]*. 1996 Dec; 110(6): 1463-8.
199. Ferguson W, Candib L. Culture, language, and the doctor-patient relationship. *Fam Med*. 2002; 34(5): 353-61.
200. Kolbe J. The influence of socioeconomic and psychological factors on patient adherence to self-management strategies: lessons learned in asthma. *Dis Manag Health Out*. 2002; 10(9): 551-70.

201. Shegog R, Bartholomew LK, Parcel GS, Sockrider MM, Mâsse L, Abramson SL. Impact of a computer-assisted education program on factors related to asthma self-management behavior. *J Am Med Inform Assn.* 2001; 8(1): 49-61.
202. Bender BG, Bender SE. Patient-identified barriers to asthma treatment adherence: responses to interviews, focus groups, and questionnaires. *Immunol Allergy Clin.* 2005; 25(1): 107-30.
203. Boychuk RB, DeMesa CJ, Kiyabu KM, Yamamoto F, Yamamoto LG, Sanderson R, et al. Change in approach and delivery of medical care in children with asthma: results from a multicenter emergency department educational asthma management program. *Pediatrics.* 2006; 117(4): S145-51.
204. Logan D, Zelikovsky N, Labay L, Spergel J. The Illness Management Survey: identifying adolescents' perceptions of barriers to adherence. *J Pediatr Psychol.* 2003; 28(6): 383-92.
205. Rhee H, Belyea MJ, Ciurzynski S, Brasch J. Barriers to asthma self-management in adolescents: relationships to psychosocial factors. *Pediatr Pulm.* 2009; 44(2):183-91.
206. Modi AC, Quittner AL. Barriers to treatment adherence for children with cystic fibrosis and asthma: what gets in the way? *J Pediatr Psychol.* 2006; 31(8): 846-58.
207. Buston KM, Wood SF. Non-compliance amongst adolescents with asthma: listening to what they tell us about self-management. *Fam Pract.* 2000; 17(2): 134-8.
208. Janson SL, Earnest G, Wong KP, Blanc PD. Predictors of asthma medication nonadherence. *Heart Lung.* 2008 ;37(3): 211-8.
209. Williams LK, Joseph CL, Peterson EL, Wells K, Wang M, Chowdhry VK, et al. Patients with asthma who do not fill their inhaled corticosteroids: a study of primary nonadherence. *J Allergy Clin Immun.* 2007; 120(5):1153-9. doi: 10.1016/j.jaci.2007.08.020.

210. Farber HJ, Capra AM, Finkelstein JA, Lozano P, Quesenberry CP, Jensvold NG, et al. Misunderstanding of asthma controller medications: association with nonadherence. *J Asthma*. 2003; 40(1): 17-25.
211. Blais L, Beauchesne M-F, Lévesque S. Socioeconomic status and medication prescription patterns in pediatric asthma in Canada. *J Adolescent Health*. 2006; 38(5): 607.e9-.e16. doi: 10.1016/j.jadohealth.2005.02.010.
212. Orrell -Valente JK, Jarlsberg LG, Rait MA, Thyne SM, Rubash T, Cabana MD. Parents' specific concerns about daily asthma medications for children. *J Asthma*. 2007; 44(5): 385-90.
213. Gazala E, Sadka R, Bilenko N. Parents' fears and concerns toward inhaled corticosteroid treatment for their asthmatic children. *Pediatr Asthma Aller*. 2005; 18(2): 82-7.
214. Kozyrskyj AL, Mustard CA, Simons FER. Socioeconomic status, drug insurance benefits, and new prescriptions for inhaled corticosteroids in schoolchildren with asthma. *Arch Pediatr Adolesc Med*. 2001; 155(11): 1219-24.
215. Zoratti Edward M, Havstad S, Rodriguez J, Robens-Paradise Y, Lafata J, Mccarthy B. Health service use by african americans and caucasians with asthma in a managed care setting. *Am J Respir Crit Care Med*. 1998; 158(2): 371-7.
216. Bender BG. Overcoming barriers to nonadherence in asthma treatment. *J Allergy Clin Immun*. 2002; 109(6, Part 2): 554-9.
217. Farber HJ. High-quality asthma care: it's not just about drugs. *Permanente Journal*. 2005; 9(3):32-6.
218. Von Korff M, Gruman J, Schaefer J, Curry SJ, Wagner EH. Collaborative management of chronic illness. *Ann Intern Med*. 1997; 127(12): 1097-102.

219. Coleman TM, Newton SK. Supporting self-management in patients with chronic illness. *Am Fam Physician*. 2005; 72(8): 1503-10
220. Bodenheimer T, Handley MA. Goal-setting for behavior change in primary care: an exploration and status report. *Patient Educ Couns*. 2009; 76(2):174-80. doi: 10.1016/j.pec.2009.06.001.
221. Bruzzese J-M, Unikel L, Gallagher R, Evans D, Colland V. Feasibility and impact of a school-based intervention for families of urban adolescents with asthma: results from a randomized pilot trial. *Fam Process*. 2008 ;47(1): 95-113.
222. Berg J, Dunbar-Jacob J, Sereika SM. An evaluation of a self-management program for adults with asthma. *Clinical Nursing Research*. 1997; 6(3): 225-38.
223. Bartholomew LK, Sockrider MM, Abramson SL, Swank PR, Czyzewski DI, Tortolero SR, et al. Partners in school asthma management: evaluation of a self-management program for children with asthma. *J School Health*. 2006; 76(6): 283-90.
224. Bruzzese J-M, Bonner S, Vincent EJ, Sheares BJ, Mellins RB, Levison MJ, et al. Asthma education: the adolescent experience. *Patient Educ Couns*. 2004; 55(3): 396-406.
225. Evans D, Clark NM, Feldman CH, Rips J, Kaplan D, Levison MJ, et al. A school health education program for children with asthma aged 8-11 years. *Health Educ Behav*. 1987; 14(3): 267-79.
226. Shah S, Peat JK, Mazurski EJ, Wang H, Sindhusake D, Bruce C, et al. Effect of peer led programme for asthma education in adolescents: cluster randomised controlled trial. *BMJ*. 2001; 322(7286): 583.
227. Gibson PG, Shah S, Mamoon HA. Peer-led asthma education for adolescents: impact evaluation. *J Adolescent Health*. 1998; 22(1): 66-72.

228. Bartholomew LK, Gold RS, Parcel GS, Czyzewski DI, Sockrider MM, Fernandez M, et al. Watch, discover, think, and act: evaluation of computer-assisted instruction to improve asthma self-management in inner-city children. *Patient Educ Couns.* 2000; 39(2-3): 269-80. doi: 10.1016/S0738-3991(99)00046-4.
229. Coffman JM, Cabana MD, Yelin EH. Do school-based asthma education programs improve self-management and health outcomes? *Pediatrics.* 2009; 124(2): 729-42.
230. McGhan SL, Wong E, Jhangri GS, Wells HM, Michaelchuk DR, Boechler VL, et al. Evaluation of an education program for elementary school children with asthma. *J Asthma.* 2003; 40(5): 523-33.
231. Krishna S, Francisco BD, Balas EA, König P, Graff GR, Madsen RW. Internet-enabled interactive multimedia asthma education program: a randomized trial. *Pediatrics.*, 2003; 111(3): 503-10.
232. Butz A, Pham L, Lewis L, Lewis C, Hill K, Walker J, et al. Rural Children with asthma: impact of a parent and child asthma education program. *J Asthma.* 2005; 42(10): 813-21.
233. Chiang LC, Huang JL, Yeh KW, Lu CM. Effects of a self-management asthma educational program in Taiwan based on PRECEDE-PROCEED model for parents with asthmatic children. *J Asthma.* 2004; 41(2): 205-15.
234. Krieger J, Takaro TK, Song L, Beaudet N, Edwards K. A Randomized controlled trial of asthma self-management support comparing clinic-based nurses and in-home community health workers: the Seattle-King County Healthy Homes II project. *Arch Pediatr Adolesc Med.* 2009; 163(2): 141-9.
235. Joseph CLM, Peterson E, Havstad S, Johnson CC, Hoerauf S, Stringer S, et al. A web-based, tailored asthma management program for urban African-American high school students. *Am J Respir Crit Care Med.* 2007; 175(9): 888-95.

236. Clark NM, Brown R, Joseph CLM, Anderson EW, Liu M, Valerio MA. Effects of a comprehensive school-based asthma program on symptoms, parent management, grades, and absenteeism. *Chest*. 2004 May 1, 2004; 125(5): 1674-9.
237. Herborg H, Soendergaard B, Froekjaer B, Fonnesbaek L, Jorgensen T, Hepler CD, Grainger-Rousseau TJ, Ersboell BK. Improving drug therapy for patients with asthma: part 1: patient outcomes. *J Am Pharm Assoc*. 2001; 41(4): 539-50.
238. Coffman JM, Cabana MD, Halpin HA, Yelin EH. Effects of asthma education on children's use of acute care services: a meta-analysis. *Pediatrics*. 2008; 121(3): 575-86.
239. Kelly CS, Morrow AL, Shults J, Nakas N, Strobe GL, Adelman RD. Outcomes evaluation of a comprehensive intervention program for asthmatic children enrolled in Medicaid. *Pediatrics*. 2000; 105(5): 1029-35.
240. Clark NM, Feldman CH, Evans D, Levison MJ, Wasilewski Y, Mellins RB. The impact of health education on frequency and cost of health care use by low income children with asthma. *J Allergy Clin Immun*. 1986; 78(1, Part 1): 108-15.
241. McColl MP, Paton J. Impact of a nurse-led home management training programme in children admitted to hospital with acute asthma: a randomised controlled study. *Thorax*. 1997; 52(3): 223-8.
242. Couturaud F, Proust A, Frachon I, Dewitte JD, Oger E, Quiot JJ, et al. Education and Self-management: a one-year randomized trial in stable adult asthmatic patients. *J Asthma*. 2002; 39(6): 493-500.
243. Algatt-Bergstrom PJ, Markson LE, Murray RK, Berger ML. A population-based approach to asthma disease management. *Dis Manag Health Out*. 2000; 7(4): 179-86.

244. McPherson A, Glazebrook C, Smyth A. Educational intervention: computers for delivering education to children with respiratory illness and to their parents. *Paediatric Respiratory Reviews*. 2005; 6(3): 215-26.
245. Al-Ahmadi H, Roland M. Quality of primary health care in Saudi Arabia: a comprehensive review. *Int J Qual Health C*. 2005; 17(4): 331-46.
246. Hartert TV, Windom HH, Stokes Peebles JR, Freidhoff LR, Togias A. Inadequate outpatient medical therapy for patients with asthma admitted to two urban hospitals. *Am J Med*. 1996; 100(4):386-94 doi: 10.1016/S0002-9343(97)89513-7.
247. Levy ML. International primary care respiratory group (IPCRG) guidelines: diagnosis of respiratory diseases in primary care. *Primary Care Respiratory Journal*. 2006; 15(1): 20-34.
248. Ostbye T, Yarnall KSH, Krause KM, Pollak KI, Gradison M, Michener JL. Is there time for management of patients with chronic diseases in primary care? *Ann Fam Med*. 2005; 3(3): 209-14.
249. Al-Shammari SA, Khoja TA, Al-Ansary LA, MJ A-Y. Care of asthmatic patients in primary health care centers. *Ann Saudi Med*. 1996; 16(1): 28-8.
250. Campbell SM, Hann M, Hacker J, Burns C, Oliver D, Thapar A, et al. Identifying predictors of high quality care in English general practice: observational study. *BMJ*. 2001; 323(7316): 784.
251. Khoja TA, Al-Ansary LA. Asthma in Saudi Arabia: is the system appropriate for optimal primary care? *Journal of Public Health Management and Practice*. 1998; 4(3): 64-72.
252. Qatari G, Haran D. Determinants of users' satisfaction with primary health care settings and services in Saudi Arabia. *Int J Qual Health C*. 1999; 11(6):5 23-31.
253. Mansour AA, Al-Osimy MH. A study of satisfaction among primary health care patients in Saudi Arabia. *J Commun Health*. 1993; 18(3): 163-73.

254. El Shabrawy AM, Ali Mahmoud ME. A study of patient satisfaction with primary health care services in Saudi Arabia. *J Commun Health*. 1993; 18(1): 49-54.
255. Al-Faris EA, Khoja T, Muneera F, Saeed AAW. Patients' satisfaction with accessibility and services offered in Riyadh health centers. *Saudi Med J*. 1996; 17(1): 11-7.
256. Roghmann M-C, Sexton M. Adherence to asthma guidelines in general practices. *J Asthma*. 1999; 36(4): 381-7.
257. Jepson G, Butler T, Gregory D, Jones K. Prescribing patterns for asthma by general practitioners in six European countries. *Resp Med*. 2000;94(6):578-83. doi: 10.1053/rmed.2000.0782.
258. Wolfenden LL, Diette GB, Skinner EA, Steinwachs DM, Wu AW. Gaps in asthma care of the oldest adults. *J Am Geriatr Soc*. 2002; 50(5): 877-83.
259. Verleden GM, De Vuyst P. Assessment of asthma severity and treatment by GPs in Belgium: an asthma drug utilization research study (ADUR). *Resp Med*. 2002; 96(3):170-7. doi: 10.1053/rmed.2001.1242.
260. Wolfenden LL, Diette GB, Krishnan JA, Skinner EA, Steinwachs DM, Wu AW. Lower physician estimate of underlying asthma severity leads to undertreatment. *Arch Intern Med*. 2003; 163(2): 231-6.
261. Wu AW, Young Y, Skinner EA, Diette GB, Huber M, Peres A, et al. Quality of care and outcomes of adults with asthma treated by specialists and generalists in managed care. *Arch Intern Med*. 2001; 161(21): 2554-60.
262. Finkelstein JA, Lozano P, Shulruff R, Inui TS, Soumerai SB, Ng M, et al. Self-reported physician practices for children with asthma: are national guidelines followed? *Pediatrics*. 2000 October 1, 2000; 106(4): 886-96.
263. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud P-AC, et al. Why don't physicians follow clinical practice guidelines? a framework for

- improvement. *Journal of the American Medical Association*. 1999; 282(15): 1458-65.
264. Ait-Khaled N, Enarson DA, Bencharif N, Boulahdib F, Camara LM, Dagli E, et al. Implementation of asthma guidelines in health centres of several developing countries. *Int J Tuberc Lung D*. 2006; 10(1): 104-9.
265. Picken H, Greenfield S, Teres D, Hirway P, Landis J. Effect of local standards on the implementation of national guidelines for asthma. *J Gen Intern Med*. 1998; 13(10): 659-63.
266. Wisnivesky JP, Lorenzo J, Lyn-Cook R, Newman T, Aponte A, Kiefer E, et al. Barriers to adherence to asthma management guidelines among inner-city primary care providers. *Ann Allerg Asthma Im*. 2008; 101(3):264-70. doi: 10.1016/S1081-1206(10)60491-7.
267. Cabana MD, Rand C, Slish K, Nan B, Davis MM, Clark N. Pediatrician self-efficacy for counseling parents of asthmatic children to quit smoking. *Pediatrics*. 2004; 113(1):78-81.
268. Wahlström R, Hummers-Pradier E, Lundborg CS, Muskova M, Lagerlöv P, Denig P, et al. Variations in asthma treatment in five European countries—judgement analysis of case simulations. *Fam Pract*. 2002; 19(5): 452-60.
269. Tan NC, Chow MH, Goh P, Goh LG, Lim TK. Primary care doctors' practice in the management of adult asthma patients. *Singapore Medical Journal*. 2002; 43(2): 061-66.
270. Diette GB, Skinner EA, Nguyen T, Markson L, Clark DB, Wu AW. Comparison of quality of care by specialist and generalist physicians as usual source of asthma care for children. *Paediatrics*. [serial on the internet]. 2001; 108(2): 432-37.
271. Cerveri I, Zoia M, Bugiani M, Corsico A, Carosso A, Piccioni P, et al. Inadequate antiasthma drug use in the north of Italy. *Eur Resp J*. 1997; 10(12): 2761-5.

272. Horne R, Price D, Cleland J, Costa R, Covey D, Gruffydd-Jones K, et al. Can asthma control be improved by understanding the patient's perspective? *BMC Pulmonary Medicine*. 2007; 7(1): 8.
273. Chiovetti A. Bridging the gap between health literacy and patient education for people with multiple sclerosis. *Journal of Neuroscience Nursing*. 2006; 38(5): 374-8.
274. Safer RS, Keenan J. Health literacy: the gap between physicians and patients. *Am Fam Physician*. 2005; 72(3): 463-8.
275. Wagner EH. The role of patient care teams in chronic disease management. *BMJ*. 2000 February 26, 2000; 320(7234): 569-72.
276. Ministry of Health, Kingdom of Saudi Arabia, MOH, Statistics and Indicators. Health statistic book year 2004. [cited 2006 Mar 10]; Available from: URL: <http://www.moh.gov.sa/Ministry/Statistics/book/Pages/default.aspx>
277. Skinner EA, Diette GB, Algatt-Bergstrom PJ, Nguyen TTH, Clark RD, Markson LE, et al. The asthma therapy assessment questionnaire (ATAQ) for children and adolescents. *Dis Manag*. 2004; 7(4): 305-13.
278. The Foundation of Accountability. FACCT quality measures measurement guide aa, version 2.0. [serial on the internet] 1999 [cited 2005 11/10]; Available from: URL: [http://www.facct.org/facct/doclibfiles/documentfile\\_307.pdf](http://www.facct.org/facct/doclibfiles/documentfile_307.pdf)
279. ALRuwaith MA. The geographical identity of the Kingdom of Saudi Arabia. *Al-Madinah Al-Munawwarah: Dar Al-Waha Al-Arabia*; 2000.
280. Kingdom of Saudi Arabia, Presidency of meteorology and environment (PME) Riyadh 2011; Available from: URL: <http://www.pme.gov.sa/en/eindex.asp>
281. Cicutto LC. A survey of asthma management : the physicians perspective. Toronto: University of Toronto; 1997.

282. Mahboub BS, Santhakumar S, Soriano J, Pawankar R. Asthma insights and reality in the United Arab Emirates. *Annals of Thoracic Medicine*. 2010; 5(4): 217.
283. Jentzsch NS, Camargos PAM, Colosimo EA, Bousquet J. Monitoring adherence to beclomethasone in asthmatic children and adolescents through four different methods. *Allergy*. 2009; 64(10): 1458-62.
284. Sunshine J, Song L, Krieger J. Written action plan use in inner-city children: is it independently associated with improved asthma outcomes? *Ann Allerg Asthma Im*. 2011; 107(3): 207-13.
285. Kendrick AH, Higgs CM, Whitfield MJ, Laszlo G. Accuracy of perception of severity of asthma: patients treated in general practice. *BMJ*. 1993; 307(6901): 422-4.
286. Bukstein DA, Luskin AT, Bernstein A. 'Real-world' effectiveness of daily controller medicine in children with mild persistent asthma. *Ann Allerg Asthma Im*. 2003; 90(5): 543-9.
287. Massicot JG, Cohen SG. Epidemiologic and socioeconomic aspects of allergic diseases. *J Allergy Clin Immun*. 1986; 78(5, Part 2): 954-8. doi10.1016/0091-6749(86)90284-8.
288. Nafti S, Taright S, El Ftouh M, Yassine N, Benkheder A, Bouacha H, et al. Prevalence of asthma in North Africa: the Asthma insights and reality in the Maghreb (AIRMAG) study. *Resp Med*. 2009; 103, Supplement 2(0): S2-S11.
289. Öneş Ü, Sapan N, Somer A, Dişç R, Salman N, Güler N, et al. Prevalence of childhood asthma in Istanbul, Turkey. *Allergy*. 1997; 52(5): 570-5.
290. Levy ML, Fletcher M, Price DB, Hausen T, Halbert RJ, Yawn BP. International primary care respiratory group (IPCRG) guidelines: diagnosis of respiratory diseases in primary care. *Prim Care Respir J*. 2006; 15(1): 20-34.

291. Shivbalan S, Balasubramanian S, Anandnathan K. What do parents of asthmatic children know about asthma?: An Indian perspective. *Indian J Chest Dis Allied Sci* 2005; 47(81–87).
292. Rastogi D, Gupta S, Kapoor R. Comparison of asthma knowledge, management, and psychological burden among parents of asthmatic children from rural and urban neighborhoods in India. *J Asthma*. 2009; 46(9): 911-5.
293. Hazir T, Das C, Piracha F, Waheed B, Azam M. Carers' perception of childhood asthma and its management in a selected Pakistani community. *Arch Dis Child*. 2002 October 1, 2002; 87(4): 287-90.
294. Mavale-Manuel S, Duarte N, Alexandre F, Albuquerque O, Scheinmann P, Poisson-Salomon AS, et al. Knowledge, attitudes, and behavior of the parents of asthmatic children in Maputo. *J Asthma*. 2004; 41(5): 533-8.
295. Cicutto LC, Llewellyn-Thomas HA, Geerts WH. Physicians' approaches to providing asthma education to patients and the level of patient involvement in management decisions. *J Asthma*. 1999; 36(5): 427-39.
296. Cicutto LC, Llewellyn-Thomas HA, Geerts WH. The management of asthma: a case-scenario-based survey of family physicians and pulmonary specialists. *J Asthma*. 2000; 37(3): 235-46.
297. Sleath B, Callahan L, Vellis RFD, Sloane PD. Patients' perceptions of primary care physicians' participatory decision-making style and communication about complementary and alternative medicine for arthritis. *Journal of Alternative and Complementary Medicine*. 2005; 11(3): 449-53.
298. Le TT, Bilderback A, Bender B, Wamboldt FS, Turner CF, Rand CS, et al. Do asthma medication beliefs mediate the relationship between minority status and adherence to therapy? *J Asthma*. 2008; 45(1): 33-7.
299. Conn KM, Halterman JS, Lynch K, Cabana MD. The impact of parents' medication beliefs on asthma management. *Pediatrics*. 2007; 120(3): e521-e6.

300. Piette JD, Heisler M, Krein S, Kerr EA. The role of patient-physician trust in moderating medication nonadherence due to cost pressures. *Arch Intern Med.* 2005; 165(15): 1749-55.
301. Elliott RA. Poor adherence to anti-inflammatory medication in asthma: reasons, challenges, and strategies for improved disease management. *Disease Management and Health Outcomes.* 2006; 14(4): 223-33.
302. Cochrane M, Bala M, Downs K, Mauskopf J, Ben Joseph R. Inhaled corticosteroids for asthma therapy: patient compliance, devices, and inhalation technique. *Chest.* 2000; 117(2): 542-50.
303. van Grunsven PM. The magnitude of fear of adverse effects as a reason for nonparticipation in drug treatment: a short review. *J Asthma.* 2001; 38(2): 113-9.
304. Menckeberg TT, Bouvy ML, Bracke M, Kaptein AA, Leufkens HG, Raaijmakers JAM, et al. Beliefs about medicines predict refill adherence to inhaled corticosteroids. *J Psychosom Res.* 2008; 64(1): 47-54.
305. Mårdby A-C, Åkerlind I, Jörgensen T. Beliefs about medicines and self-reported adherence among pharmacy clients. *Patient Educ Couns.* 2007; 69(1-3): 158-64.
306. Bokhour BG, Cohn ES, Cortés DE, Yinusa-Nyahkoon LS, Hook JM, Smith LA, et al. Patterns of concordance and non-concordance with clinician recommendations and parents' explanatory models in children with asthma. *Patient Educ Couns.* 2008; 70(3): 376-85.
307. Yoos HL, Kitzman H, McMullen A. Barriers to anti-inflammatory medication use in childhood asthma. *Ambulatory Pediatrics.* 2003; 3(4): 181-90.

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Every reasonable effort has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

**Appendix A:**  
**Phase One Patients' Questionnaire (English)**

**Consent (English version)**

I agree to participate in the study having complete understanding of the following:

- Participation is voluntary, and I am free to withdraw at any time, without having to give any excuse whatsoever.
- The full purpose of the study/research has been explained to me, and all my questions have been answered to my satisfaction.
- I may benefit from the study by learning more about my asthma, and others may be helped by the outcomes of the research.
- All information obtained during this study is confidential and my identity will be protected at all times. It will be stored separately in locked filing cabinets in the School of pharmacy, Curtin University, and will be available only to the researcher and the study supervisor.

I have read and I understand the consent form for this study. By signing this consent form, I am indicating that I agree to participate in the study.

Patient Signature

Date

Parent /Guardian Signature

Date

## Questionnaire

Section I:																															
<b>1. What is your child's gender? (Mark one box.)</b>	<input type="checkbox"/> Male <input type="checkbox"/> Female																														
<b>2. How old is your child?</b>	<input type="checkbox"/> less than 5 years <input type="checkbox"/> 5 to less than 10 years <input type="checkbox"/> 10 to less than 15 years <input type="checkbox"/> 15 years to less than 18																														
<b>3. Has a doctor or medical provider ever told you that your child has asthma?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No <b>(If no, please stop here and return the questionnaire)</b>																														
<b>4. For each season of the year, to what extent does your child usually have asthma symptoms?</b>	<p><b>(Mark one box on each line.)</b></p> <table style="width: 100%; border: none;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 15%; text-align: center;">A lot</th> <th style="width: 15%; text-align: center;">A little</th> <th style="width: 10%; text-align: center;">None</th> </tr> </thead> <tbody> <tr> <td>Winter</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Spring</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Summer</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Fall</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		A lot	A little	None	Winter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Spring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Summer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>										
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<b>5. In the <u>past 4 weeks</u>, how many days did your child...</b>	<table style="width: 100%; border: none;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 15%; text-align: center;">None</th> <th style="width: 15%; text-align: center;">1 to 3</th> <th style="width: 15%; text-align: center;">4 to 7</th> <th style="width: 15%; text-align: center;">over 7</th> </tr> </thead> <tbody> <tr> <td>a) Have wheezing or difficulty breathing when exercising?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>b) Have wheezing during the day when <b>not</b> exercising?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>c) Wake up at night with wheezing or difficult breathing?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>d) Miss days of school because of his/her asthma?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>e) Miss any daily activities (such as playing, going to a friend's house, or any family activity) because of his/her asthma?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		None	1 to 3	4 to 7	over 7	a) Have wheezing or difficulty breathing when exercising?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	b) Have wheezing during the day when <b>not</b> exercising?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	c) Wake up at night with wheezing or difficult breathing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	d) Miss days of school because of his/her asthma?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	e) Miss any daily activities (such as playing, going to a friend's house, or any family activity) because of his/her asthma?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<b>6. Are you dissatisfied with any part of your child's <u>current</u> asthma treatment?</b>	<table style="width: 100%; border: none;"> <tbody> <tr> <td style="width: 60%;">Yes</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>No</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>																										
Yes	<input type="checkbox"/>																														
No	<input type="checkbox"/>																														

	Unsure [ ]
<b>(If yes, please explain)</b>	
<b>7. In the <u>past 12 months</u>, has your child taken any medicine for his/her asthma?</b>	Yes [ ] No [ ]
<b>8. Do you believe...</b>	Yes No Unsure
a) Your child's asthma was well controlled in the past 4 weeks? ^	[ ] [ ] .[ ]
b) Your child is able to administer his/her asthma medicine(s) as directed?	[ ] [ ] .[ ]
You have access to enough information to help your child control his/her asthma?	[ ] [ ] .[ ]
d) The medicine(s) your child takes are useful in controlling his/her asthma?	[ ] [ ] .[ ]
	[ ] [ ] .[ ]
<b>9. Does your child's doctor or medical provider...</b>	Yes No Unsure
a) Involve you and your child in making decisions about your child's asthma treatment?	[ ] [ ] .[ ]
b) Know how your child prefers to take his/her asthma medicine(s) (such as by chewable tablet, liquid or inhaler)?	[ ] [ ] .[ ]
<b>10. In the <u>past 12 months</u>, has your child's doctor or medical provider gone over with you or your child how to take his/her asthma medicine(s)?</b>	Yes No Unsure [ ] [ ] .[ ]
<b>11. Do you or your child have/has written instructions from his/her doctor or medical</b>	Yes No Unsure

<p><b>provider...</b></p> <p>a) On what to do if he/she is having an asthma attack?</p> <p>b) On how to take his/her medicine(s) on days when he/she is not having an asthma attack?</p>	<p>[ ] [ ] .[ ]</p> <p>[ ] [ ] .[ ]</p>
<p><b>12. Does your child use an inhaler or nebulizer (blue inhaler) for <u>quick relief</u> from asthma symptoms?</b></p>	<p>Yes No Unsure</p> <p>[ ] [ ] .[ ]</p>
<p><b>A. If yes, In the <u>past 4 weeks</u>, what was the highest number of times <u>in one day</u> your child used this inhaler/nebulizer (blue inhaler)?</b></p>	<p>0 [ ]</p> <p>1 to 2 [ ]</p> <p>3 to 4 [ ]</p> <p>5 to 6 [ ]</p> <p>over 6 [ ]</p>
<p><b>B- In the <u>past 12 months</u>, on days your child used an inhaler/nebulizer for quick relief, how many times a day did he/she <u>usually</u> use it (blue inhaler)?</b></p>	<p>0 [ ]</p> <p>1 to 2 [ ]</p> <p>3 to 4 [ ]</p> <p>5 to 6 [ ]</p> <p>over 6 [ ]</p>
<p><b>13. Has your child ever had a prescription for asthma medicine that is <u>NOT</u> used for quick relief, but is used to <u>control</u> your child's asthma?</b></p>	<p>Yes No Unsure</p> <p>[ ] [ ] .[ ]</p>
<p><b>If you answered yes to the question above, what best describes how your child takes this medicine?</b></p>	<p>[ ] Takes it every day</p> <p>[ ] Takes it some days, but not other days</p> <p>[ ] Used to take it, but now does not</p> <p>[ ] Only takes it when having symptoms</p> <p>[ ] Never took it</p>
<p><b>14. Thank you for completing this section of the questionnaire! Is there anything</b></p>	

**you would like to tell us about your child's asthma or the care he/she is receiving?**

## **Section II**

In this section, we would like to find out how often your asthma has bothered you  
DURING THE PAST 4 WEEKS.

**1. Over the past 4 weeks, how often has your child been bothered by the following symptoms:**

**a. Cough**

1. Never
2. Once a week or less
3. 2 to 3 times a week
4. 4 to 5 times a week
5. Daily

**b. Sputum (phlegm or mucus when coughing)**

1. Never
2. Once a week or less
3. 2 to 3 times a week
4. 4 to 5 times a week
5. Daily

**c. Chest tightness (difficulty taking a deep breath)**

1. Never
2. Once a week or less
3. 2 to 3 times a week
4. 4 to 5 times a week
5. Daily

**d. Wheezy or whistling sound in the chest**

1. Never
2. Once a week or less
3. 2 to 3 times a week
4. 4 to 5 times a week
5. Daily

**2. In the past 4 weeks, on average, how often did your child's asthma awaken them at night?**

1. Not at all
2. Less than once a week
3. Once or twice a week
4. Three or more times a week

**3. In the past 4 weeks, on average, how often did your child have asthma attacks? ("Asthma attack" means increased difficulty breathing that may be accompanied by increased coughing, wheezing, chest tightness or other symptoms).**

1. Not at all
2. Less than once a week
3. Once or twice a week
4. Three or more times a week

### Section III

The next questions ask about various experiences your child may have had with asthma.

**1. In general, would you say your child asthma is (circle the appropriate answer):**

Very mild	Mild	Moderate	Severe	Very severe
1	2	3	4	5

**2. How easy is it for your child to avoid having severe asthma attacks (flare-ups worse than usual asthma symptoms)? (Circle the appropriate answer)**

Very easy	Easy	Moderate	Difficult	Very difficult
1	2	3	4	5

**3a. Does your child use inhaled steroids (such as Beclomethasone (Becotide, Viarex), Budesonide (Pulmicort), Fluticasone/salmeterol (Seretide), Budesonide/formoterol (Symbicort), or others for his/her asthma?**

1. Yes **IF YES, please answer Question 3b below.**
2. No **Please go on to Section IV, Question 1.**
3. Don't know **Please go on to Section IV, Question 1.**

**3b. If you answered "yes" to question 3a above, which of the following best describes how your child's uses his/her inhaled steroid medication? (please circle only ONE)**

1. He/she uses inhaled steroids *every day*, whether or not he/ she has asthma symptoms.
2. Even though the doctor wants inhaled steroids to be used every day, he/she uses them *less often* than that.
3. He/she uses inhaled steroids several times a week.
4. He/she uses inhaled steroids only when they have asthma symptoms.

**Section IV**

The next two questions ask about peak flow meters (a peak flow meter is a hand-held device that measures how much air you can blow out of your lungs) and inhalers, and education about medicine and how adjust it .

**1. Which of the following is true for your child? (Please tick only ONE)**

- 1. He/she does not have a home peak flow meter.
- 2. He/she has a home peak flow meter and uses it regularly. **Please answer Question 2 below**
- 3. he/she has a home peak flow meter, but ALMOST never uses it. **Please answer Question 2 below**

**IF YOU TICKED 2 OR 3 ABOVE, please answer question 2.**

**2. Which of the following are true for your child? (Please mark one box in each row.)**

	YES	NO
1. He/she has been taught how to use a peak flow meter by their doctor or nurse.		
2. He/she knows their personal best reading on their home peak flow meter		
3. He/she keeps a peak flow meter diary		
4. He/she alters their medications based on their home peak flow meter reading.		
5. I notify their doctor if their peak flow meter reading drops below a certain point		

**3. Has your child been shown the correct way to use their inhaler by your doctor, nurse or other health care provider?**

- 1. He/she does not use an inhaler for their asthma. [ ]
- 2. Yes [ ]
- 3. No [ ]

**4. During an office visit, has your child's doctor, nurse or other health care provider watched your child use the inhaler to check that he/ she is using it correctly?**

- 1. He/she does not use an inhaler for their asthma. [ ]
- 2. Yes [ ]
- 3. No [ ]

**5. Has your child been given written directions by a doctor, nurse or other health care provider about how to take their asthma medicine and what to do in a severe asthma attack?**

- 1. Yes, and he/she (I) understand completely. [ ]
- 2. Yes, and he/she (I) understand pretty well. [ ]
- 3. Yes, but he/she (I) am still confused. [ ]
- 4. No, not at all. [ ]

**Has a doctor or nurse explained each of the following to your child:**

**6. What to do when your child has a severe asthma attack?**

- 1. Yes, and he/she (I) understand completely. [ ]
- 2. Yes, and he/she (I ) understand pretty well. [ ]
- 3. Yes, but he/she (I) am still confused. [ ]
- 4. No, not at all. [ ]

**7. How to adjust his/her medication when their asthma gets worse?**

- 1. Yes, and he/she (I) understand completely. [ ]
- 2. Yes, and he/she (I) understand pretty well. [ ]
- 3. Yes, but he/she (I) am still confused. [ ]
- 4. No, not at all. [ ]
- 5. Does not apply [ ]

**8. Do you know what things can make your child's asthma worse and how to avoid them?**

- 1. Yes, and he/she (I) understand completely. [ ]
- 2. Yes, and he/she (I) understand pretty well. [ ]
- 3. Yes, but he/she (I) am still confused. [ ]
- 4. No, not at all. [ ]

**9. How would you rate the quality of the information given to your child about their asthma by their doctor, nurse or other health care provider:**

None	Very bad	Bad	OK	Good	Very good

**10. Which of the following are true for your child?**

(Please mark one box in each row.)

	<b>YES</b>	<b>NO</b>
1. He/she usually uses a spacer when using an inhaler for asthma.	[ ]	[ ]
2. He/she uses a peak flow meter to monitor their asthma	[ ]	[ ]
3. He/she is able to manage changes in their asthma themselves most of the time.	[ ]	[ ]
4. He/she follows the care plan given by the current doctor or nurse.	[ ]	[ ]
5. He/she recognizes things that make their asthma worse.	[ ]	[ ]
6. I know what to do during an asthma attack.	[ ]	[ ]
7. He/she takes asthma medicines when they are appropriate.	[ ]	[ ]
8. He/she knows the early warning signs of an asthma attack.	[ ]	[ ]

## Section V

In this section, we ask you to rate your satisfaction with the health care your child has received for their asthma.

### 1. The quality of the education your child has been given to help them manage their asthma daily

Poor	Fair	Good	Very good	Excellent

### 2. How well your child's doctors and nurses have listened to their/your concerns about your child's asthma

Poor	Fair	Good	Very good	Excellent

### 3. Overall, how would you rate the quality of health care your child has received for their asthma during the past 12 months?

(0 =Very poor, as bad as health care can be; 5= Average ; 10= Excellent)

0	1	2	3	4	5	6	7	8	9	10

### 4. Could you please list your child's medicines' name, frequency of dosage, dosage form and dose:

Drug name

Dose (i.e. number of tablets, puffs per day)

Frequency (i.e. times used per day)

Dosage form (e.g. tablet, inhaler)

**5. Has your child suffered any of the following problems since commencing treatment for asthma:**

	<b>Yes</b>	<b>No</b>
1- weight gain	[ ]	[ ]
2- change of mood (e.g. depression)	[ ]	[ ]
3- diabetes	[ ]	[ ]
4- slowed growth rate	[ ]	[ ]

**6. Has your child been admitted to hospital or attended the Emergency Room at the hospital during the last 3 months**

Yes [ ] how many times ( ) number  
No [ ]

## Permission to use FACCT questionnaire

Josh Lemieux <lmx@omnimedix.org> Thu, Sep 8, 2005 at 11:45 PM

To: salthagfan@gmail.com

Cc: Kathleen DeCarlo <KDeCarlo@markle.org>

Hello Sultan:

As long as you cite FACCT - Foundation for Accountability as the author, you are free to use the asthma measurements survey in your post-grad research. FACCT is no longer in business, but the Markle Foundation has graciously made key FACCT content available at its web site, and the survey in question is located at the following URL:

[http://www.markle.org/resources/facct/doclibFiles/documentFile\\_118.pdf](http://www.markle.org/resources/facct/doclibFiles/documentFile_118.pdf)

Thanks,

Josh Lemieux (former executive director at FACCT) Omnimedix Institute

503.227.7893

# Permission to use ATAQ Questionnaire and Instructions for Use

Merck & Co., Inc.  
U.S. Human Health  
PO Box 4  
West Point, PA 19486-0004



October 5, 2005

Sultan Al-Thagfan  
99 Forest Crescent  
Thornlie, WA 6108  
Australia

Dear Mr. Al-Thagfan:

Thank you for your interest in the Asthma Therapy Assessment Questionnaire (ATAQ). The ATAQ is comprised of questions that reflect five conceptual domains useful for asthma management: control/symptoms, communication and knowledge gaps, and behavior/attitude and self-efficacy barriers.

Included is the pediatric questionnaire and instructions for scoring each domain and categorizing by medication use and possible control issues. For each completed survey, a score of zero on the control domain indicates no control issues, and the highest possible score indicates all possible control issues. Five possible clinical classifications can be assigned to each person with 1 or more control issues. The five clinical classes are: no medication use, reliever medication use only, uses reliever medication and has controller medication, intermittent or never use controller medication, and daily controller medication use.

For each of the remaining four domains, a score of zero suggests that gaps and barriers to self-management are absent versus a score of one or more which indicates the presence and nature of gaps and/or barriers.

The domain scores and clinical classification schemes may be useful to assess asthma management in individual patients or aggregates of patients, by provider and payer. Interpretation of the scores may guide and target interventions in quality improvement programs and clinical practice.

Should you use any or all of the questions and response categories contained in the ATAQ instrument, the following statement must be included:

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The instruments may be described in scientific presentations or publication, but please refrain from presenting the verbatim questions of ATAQ. Feel free to contact us with any questions about using the ATAQ. Further, we may contact you in the future to learn about your experience using the ATAQ.

We hope that this questionnaire will assist providers and patients in improving asthma management.

Kind regards,

A handwritten signature in black ink, appearing to read "Felicia Ramsey".

Felicia Allen-Ramsey, Ph.D.  
Manager, Outcomes Research & Management  
215-652-7546

**Instructions For Scoring**  
**Pediatric/Adolescent Behavior/Attitude Domain**  
 Asthma Therapy Assessment Questionnaire (ATAQ)

Behavior/Attitude Barriers		
Score = sum of x = 1, range of 0 to 2		
Question	Response options	Answers where score= 1
6) Are you dissatisfied with any part of your child's current asthma treatment?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/>	<i>IF Yes OR Unsure THEN = 1</i>
13) Has your child ever had a prescription for an asthma medication that is NOT used for quick relief, but is used to control your child's asthma? What best describes how your child takes this medicine now?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/>  <input type="checkbox"/> Takes it some days, but not other days <i>OR</i> <input type="checkbox"/> Used to take it, but now does not <i>OR</i> <input type="checkbox"/> Only takes it when having symptoms <i>OR</i> <input type="checkbox"/> Never took it	<i>IF Yes or Unsure AND</i>  <i>X OR</i> <i>X OR</i> <i>X OR</i> <i>X THEN = 1</i>

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**Instructions For Scoring**  
**Pediatric/Adolescent Knowledge Domain**  
 Asthma Therapy Assessment Questionnaire (ATAQ)

Knowledge Domain		
Score = sum of x = 1, range of 0 to 3		
13) Has your child ever had a prescription for an asthma medication that is NOT used for quick relief, but is used to control your child's asthma?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/>	<i>IF Unsure THEN = 1</i>
12) Does your child use an inhaler or nebulizer for quick relief from asthma symptoms?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/>	<i>IF Unsure THEN = 1</i>
8) Do you believe... a. Your child's asthma was well controlled in the past 4 weeks?  (If Yes) In the <u>past 4 weeks</u> , what was the highest number of times <u>in one day</u> your child used this inhaler/nebulizer?  (If Yes) In the <u>past 12 months</u> , on days your child used an inhaler/nebulizer for <u>quick relief</u> , how many times a day did he/she <u>usually</u> use it?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure <input type="checkbox"/>  0 <input type="checkbox"/> 1 to 2 <input type="checkbox"/> 3 to 4 <input type="checkbox"/> 5 to 6 <input type="checkbox"/> Over 6 <input type="checkbox"/>  1 to 2 <input type="checkbox"/> 3 to 4 <input type="checkbox"/> 5 to 6 <input type="checkbox"/> Over 6 <input type="checkbox"/>	<i>IF Yes AND</i>  <i>5 to 6 OR</i> <i>Over 6 OR</i>  <i>5 to 6 OR</i> <i>Over 6 THEN = 1</i>

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**Instructions For Scoring**  
**Pediatric/Adolescent Self-Efficacy Domain**  
**Asthma Therapy Assessment Questionnaire (ATAQ)**

<b>Self-Efficacy Domain</b>			
Score = sum of x = 1, range of 0 to 3			
8) Do you believe...	Yes	No	Unsure
b. Your child is able to administer his/her medicine(s) as directed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<i>If No or Unsure Then = 1</i>
c. You have enough information to help your child control his/her asthma?			
			<i>If No or Unsure Then = 1</i>
d. The medicine(s) your child takes are useful for controlling his/her asthma?			
			<i>If No or Unsure Then = 1</i>

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**Instructions For Scoring**  
**Pediatric/Adolescent Communication Domain**  
**Asthma Therapy Assessment Questionnaire (ATAQ)**

<b>Patient/Provider Communication Domain</b>			
Score = sum of x = 1, range of 0 to 5			
9) Does your child's doctor or medical provider...	Yes	No	Unsure
a. Involve you and your child in making decisions about your child's asthma treatment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<i>If No or Unsure Then = 1</i>
b. Know how your child prefers to take his/her asthma medicine(s) (such as by chewable tablet, liquid or inhaler)?			
			<i>If No or Unsure Then = 1</i>
10) In the past 12 months, has your child's doctor or medical provider gone over with you or your child how to take his/her asthma medicine(s)?	Yes	No	Unsure
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<i>If No or Unsure Then = 1</i>
11) Do you or your child have written instructions from his/her doctor or medical provider...	Yes	No	Unsure
a. On what to do if he/she is having an asthma attack?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<i>If No or Unsure Then = 1</i>
b. On how to take his/her medicine(s) on days when he/she is not having an asthma attack?			
			<i>If No or Unsure Then = 1</i>

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### Instructions For Clinical Classification

This classification scheme is for 2 sub-sets of patients with a control score. One sub-set is those with no control problems. The second sub-set is those with 1 or more control problems.

Question	Answer Option	Clinical Category
	Yes No Unsure <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
12) Does your child use an inhaler or nebulizer for <u>quick relief</u> from asthma symptoms? 13) Has your child ever had a prescription for asthma medicine that is <b>NOT</b> used for quick relief, but is used to <u>control</u> your child's asthma?	<i>No</i> <b>AND</b> <i>No</i>	<i>No asthma medication(s)</i>
12) Does your child use an inhaler or nebulizer for <u>quick relief</u> from asthma symptoms? 13) Has your child ever had a prescription for asthma medicine that is <b>NOT</b> used for quick relief, but is used to <u>control</u> your child's asthma?	<i>Yes</i> <b>AND</b> <i>No</i>	<i>Use of quick reliever only</i>
12) Does your child use an inhaler or nebulizer for <u>quick relief</u> from asthma symptoms? 13) Has your child ever had a prescription for asthma medicine that is <b>NOT</b> used for quick relief, but is used to <u>control</u> your child's asthma?	<i>Yes</i> <b>AND</b> <i>Yes</i>	<i>Use of a quick reliever and has a controller</i>

13) Has your child ever had a prescription for asthma medicine that is <b>NOT</b> used for quick relief, but is used to <u>control</u> your child's asthma?  If you answered Yes: What best describes how you take this medicine?	<i>Yes</i> <b>AND</b> <input type="checkbox"/> <i>Some days I take it, but other days I don't</i> <b>OR</b> <input type="checkbox"/> <i>I used to take it, but now I don't</i> <b>OR</b> <input type="checkbox"/> <i>I only take it when I have symptoms</i>	<i>Controller use is intermittent (not daily)</i>
13) Has your child ever had a prescription for asthma medicine that is <b>NOT</b> used for quick relief, but is used to <u>control</u> your child's asthma?  If you answered Yes: What best describes how you take this medicine?	<i>Yes</i> <b>AND</b> <input type="checkbox"/> <i>I never took it</i>	<i>Controller prescribed but never taken</i>
13) Has your child ever had a prescription for asthma medicine that is <b>NOT</b> used for quick relief, but is used to <u>control</u> your child's asthma?  If you answered Yes: What best describes how you take this medicine?	<i>Yes</i> <b>AND</b> <input type="checkbox"/> <i>I take it every day</i>	<i>Controller used daily</i>

# **Appendix B:**

## **Phase Two Physicians' Survey (English)**

### **Physician Questionnaire**

#### **SECTION 1**

##### **PATIENT EDUCATION STRATEGIES**

In this section, we will be asking you about your usual approach in providing asthma information to patients with mild, moderate and severe asthma.

##### **INSTRUCTIONS**

The information below is to provide you with some general guidelines for classifying asthma severity.

##### **Mild intermittent asthma**

intermittent & infrequent (days with symptoms < 2 times/ week and nights with symptoms < 2/month ) asthma symptoms (wheeze, cough, dyspnoea)

PEF > 80% of predicted lung function

##### **Mild persistent asthma**

intermittent & infrequent (days with symptoms > 2 times/ week and nights with symptoms > 2/month ) asthma symptoms (wheeze, cough, dyspnoea)

PEF tests > 80% of predicted lung function

##### **Moderate asthma**

symptoms (wheeze, cough, dyspnoea) experienced daily and > 1/month during nights

PEF tests 60-80% of predicted lung function

**Severe asthma**

symptoms (wheeze, cough, dyspnoea) experienced daily, and frequently during nights

PEF tests <60% of predicted lung function

On the next few pages you will be presented with several different educational strategies that you may or may not provide or use with your patients. For each educational strategy, please indicate which statement most closely reflects your usual approach for providing information to patients with mild, moderate, and severe asthma by placing a check mark in the appropriate box.

What is your usual approach for providing general information about asthma (e.g. structure of the respiratory system, mechanisms of asthma, inflammation, common triggers) to patients with...

a- Mild asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- moderate asthma;

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

2. What is your usual approach to providing information about prescribed asthma medication (e.g. mode of action, proper dose, side effects) to patients with...

a- Mild asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- moderate asthma;

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

3. What is your usual approach to demonstrating the proper use of inhalational devices (e.g. metered dose inhaler, spacer device, turbuhaler) to patients with....

a- Mild asthma:

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma;

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

4. What is your usual approach to providing information on the avoidance of asthma triggers an environmental control (e.g. control of house dust mites, mould, etc.....) to patients with...

a- Mild asthma:

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma:

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

5. What is your usual approach to providing information on the warning signs of worsening or uncontrolled asthma to patients with...

a- Mild asthma:

I do not provide this information.     I provide this information Only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma:

I do not provide this information.     I provide this information Only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

6. What is your usual approach to providing an asthma action plan based upon symptoms (e.g. written plan that outlines steps to control/regain control of asthma including increasing dosage of drug) to patients with...

a- Mild asthma:

I do not provide this information.     I provide this information Only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma;

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

7. What is your usual approach to providing information about monitoring peak flow rates (e.g. purpose, use of peak flow meters and proper recording of peak flow rates) to patients with...

a- Mild asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma:

- I do not provide this information.     I provide this information Only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

8. What is your usual approach to providing an asthma action plan that is based upon peak expiratory flow rates in conjunction with symptoms (e.g. written plan that outlines steps to control asthma) to patients with...

a- Mild asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

- I do not provide this information.     I provide this information Only if the patient asks.     I provide this information without waiting for the patient to ask.

9. What is your usual approach to providing information about community non-profit organizations that provide further information about asthma (e.g. The National Scientific Committee of Bronchial Asthma ) to patients with...

a- Mild asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

10. What is your usual approach to providing other information ( please specify the information) \_\_\_\_\_ ) to patients with...

a- Mild asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

b- Moderate asthma;

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

c- Severe asthma:

- I do not provide this information.     I provide this information only if the patient asks.     I provide this information without waiting for the patient to ask.

**THANK YOU FOR COMPLETING SECTION 1**

## **SECTION 2**

### **TREATING ASTHMA**

In this section, we will ask you to select the treatment options you would recommend to patient with differing degrees of asthma severity.

### **INSTRUCTIONS**

You will be presented with six different clinical profiles. Each profile describes an asthma patient whom you may treat. For each profile, you will be asked to indicate which treatment action(s) you would or would not recommend to patients. The therapeutic actions may include the following:

1. Inhaled B2 agonists (e.g. Ventolin, Bricanyl)
2. Inhaled Ipratropium bromide (Atrovent)
3. Inhaled corticosteroids (e.g. Beclomethasone (Becotide, Viarex), Budesonide (Pulmicort), Fluticasone/salmeterol (Seretide), Budesonide/formoterol (Symbicort).
4. Non-steroidal anti-inflammatories (these include the following medications: Intal (cromolyn), Tilade (nedocromil), & Zaditen (ketotifen))
5. Oral corticosteroids
6. Wait and see: at this time the patient does not need to take any asthma medication(s)
7. Outpatient visit — including seeing the patient in your office on the same day or referring the patient to an emergency department

Please indicate for each therapeutic action listed whether or not you would recommend the action by placing a check mark in the appropriate column. A check mark in Column A indicates that you would not recommend the action and a check mark in Column B indicates that you would recommend the action. If you indicate that you would recommend more than one action, please go on to Column C: First Priority Action and indicate which of the actions that you selected is the most appropriate, given that particular clinical profile, by placing a check mark next to the action.

When indicating whether or not you would recommend each action, please keep in mind these two points:

- (1) Ensure your response reflects what you do in your normal practice.
- (2) Assume that the individual can obtain or purchase these medications without difficulty.

**Clinical Profile A:** Imagine that a patient of yours is usually free of asthma symptoms and is currently not taking any anti-asthma medication. He/she experiences brief and infrequent episodes of asthma symptoms (about 2 times a week for less than 15 minutes). This morning the patient awoke feeling perfectly well, experiencing no symptoms. However, later in the day he/she experienced some coughing, wheezing and shortness of breath after doing strenuous work around the house.

Potential Action	Column A  I would not recommend...	Column B  I would recommend....	Column C  First priority Action (choose one)
1. Starting an inhaled B2 agonist			
2. Starting inhaled Atrovent (ipratropium bromide)			
3. Starting an inhaled corticosteroid			
4. Adding a non- steroid anti-inflammatory			
5. Starting an oral theophylline			
6. Starting oral corticosteroid			
7. Waiting and seeing (no medication needed at this time)			
8. Outpatient visit (e.g. same day office visit or refer to Emergency Department )			
9. Other (please specify)			

**Clinical profile B:** Imagine that normally the patient's asthma is well controlled using an inhaled B2 agonist on an as-needed basis. However, over the past 2 days, the patient notices an increase in cough, wheeze and shortness of breath and an increase in the use of the inhaled B2 agonist (from 1-2 times a day to every 4-6 hours).

Potential Action	Column A I would not recommend...	Column B I would recommend....	Column C First priority Action (choose one)
1. Increasing current use of the inhaled B2 agonist			
2. Adding inhaled Atrovent (ipratropium bromide)			
3. Starting an inhaled corticosteroid			
4. Adding a non-steroid anti-inflammatory			
5. Starting an oral theophylline			
6. Starting an oral corticosteroid			
7. Waiting and seeing (no medication needed at this time)			
8. Outpatient visit (e.g. same day office visit or refer to Emergency Department )			
9. Other (please specify)			

**Clinical Profile C:** Imagine that a patient of yours, whose asthma is usually asymptomatic, has been experiencing an increase in symptoms (e.g. cough, wheeze, shortness of breath ) over the past 3 days. For the past 2 nights, this patient has experienced nocturnal awakenings due to asthma symptoms and last night woke 3 times. Yesterday, the use of an inhaled B2 agonist controlled asthma symptoms for 3-4 hours. Today, the patient is using his/her inhaled B2 agonist approximately every 1-2 hours. The patient’s usual activities are limited by these symptoms.

Potential Action	Column A I would not recommend...	Column B I would recommend....	Column C First priority Action (choose one)
1. Increasing current use of the inhaled B2 agonist			
2. Adding inhaled Atrovent (ipratropium bromide)			
3. Starting an inhaled corticosteroid			
4. Adding a non- steroid anti-inflammatory			
5. Starting an oral theophylline			
6. Starting an oral corticosteroid			
7. Waiting and seeing ( no medication needed at this time)			
8. Outpatient visit (e.g. Same day office visit or refer to Emergency Department )			
9. Other (please specify)			

**Clinical profile D:** Imagine that a patient of yours felt fine yesterday. However, he/she awoke early this morning experiencing wheezing and coughing which was incompletely relieved by an inhaled B2. One hour later, the patient was experiencing difficulty speaking and could only manage to speak 2-3 words before needing to take another breath.

Potential Action	Column A I would not recommend...	Column B I would recommend....	Column C First priority Action (choose one)
1. Increasing current use of the inhaled B2 agonist			
2. Adding inhaled Atrovent (ipratropium bromide)			
3. Starting an inhaled corticosteroid			
4. Adding a non- steroid anti- inflammatory			
5. Starting an oral theophylline			
6. Starting an oral corticosteroid			
7. Waiting and seeing (no medication needed at this time)			
8. Outpatient visit (e.g. same day office visit or refer to Emergency Department )			
9. Other (please specify)			

**Clinical profile E:** Imagine that a patient of yours is experiencing asthma symptoms daily despite use of an inhaled B2 agonist on an as-needed basis and an inhaled corticosteroid in a dosage <500µg/day (e.g. 2 puffs Beclovent QID or 1 puff Pulmicort BID). The patient's activities are interrupted an average of 2-3 times a day due to asthma symptoms but are controlled by taking the inhaled B2 agonist. The patient is experiencing no nocturnal awakenings.

Potential Action	Column A I would not recommend...	Column B I would recommend....	Column C First priority Action (choose one)
1. Increasing current use of the inhaled B2 agonist			
2. Adding inhaled Atrovent (ipratropium bromide)			
3. Increasing an inhaled corticosteroid			
4. Adding a non-steroid anti-inflammatory			
5. Starting an oral theophylline			
6. Starting an oral corticosteroid			
7. Waiting and seeing (no medication needed at this time)			
8. Outpatient visit (e.g. same day office visit or refer to Emergency Department )			
9. Other (please specify)			

**Clinical Profile F:** Imagine a patient of yours has been experiencing flu-like symptoms for the past 2-3 days. These symptoms include a sore throat, nasal and sinus congestion and rhinorrhea. Additionally, the patient notices an increased cough productive of whitish-yellow sputum and increased wheezing and dyspnea to the point of disrupting his/her normal activities. The patient's asthma is usually well controlled by using an inhaled B2 agonist in a dosage of 2 puffs QID and an inhaled corticosteroid at a dosage of 400 µg/day.

Potential Action	Column A I would not recommend...	Column B I would recommend....	Column C First priority Action (choose one)
1. Increasing current use of the inhaled B2 agonist			
2. Adding inhaled Atrovent (ipratropium bromide)			
3. Increasing an inhaled corticosteroid			
4. Adding a non- steroid anti- inflammatory			
5. Starting an oral theophylline			
6. Starting an oral corticosteroid			
7. Waiting and seeing (no medication needed at this time)			
8. Outpatient visit (e.g. same day office visit or refer to Emergency Department )			
9. Other (please specify)			

**THANK YOU FOR COMPLETING SECTION 2**

## SECTION 3

### INDIVIDUAL PRACTICE

**In this section, we will ask for your opinions about the management of asthma**

1. **Usually**, in your practice, to what extent does the average patient with asthma get involved with the management decisions about his/her disease?

I make the decisions using all that is known about the treatments.

I make the decisions, but strongly consider the patient's opinion.

The patient and I make the decisions together on an equal basis.

The patient makes the decisions, but strongly considers my opinion.

The patient makes the decisions using all the information he/she knows about the treatments.

2. **Ideally**, in your practice, to what extent does the average patient with asthma get involved with the management decisions about his/her disease? (Please check ( ) the statement that most accurately reflects your opinion).

I make the decisions using all that is known about the treatments.

I make the decisions, but strongly consider the patient's opinion.

The patient and I make the decisions together on an equal basis.

The patient should make the decisions, but strongly consider my opinion.

The patient makes the decisions using all the information he/she knows about the treatments.

3. If there are any other areas or aspects of your management approach to asthma that have not been covered in this questionnaire, please take a minute to highlight them in the space provided below.

---

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THANK YOU FOR COMPLETING SECTION 3.

## SECTION 4

### PRACTICE CHARACTERISTICS

In this section, we will ask you some general questions about yourself and your medical practice.

#### CHARACTERISTICS

Please place a check mark in the appropriate box.

**a- Working place:** government centre

Private centre

**b- Nationality:** Saudi

Non Saudi

#### 1. I am a/an:

Allergist/ Immunologist

Family Physician

General Internist

Respirologist/Respiratory physician

Other (please specify)-----

#### 2. I have been in medical practice for:

0 to 5 years

6 to 10 years

11 to 15 years

16 to 20 years

over 20 years

**3. I am:**

Female                       Male

**4. My birth date is** ...../.....(month / year )

**5. My practice is predominantly:**

- University associated
- Community-based group practice
- Community-based solo practice
- Other (please specify) -----

**6. I attend conferences or seminars that have at least one session related to asthma management:**

- less than every 5 years
- less than every 2-4 years
- once every 2 years
- once a year
- 2 to 4 times a year
- 5 or more times a year

**7. Have you, personally, ever experienced asthma-like symptoms?**

yes                       No

**8. Do you have a nurse or other health care professional to assist you with care or education of patients with asthma?**

Yes                       No

**9. Please fill in the blanks below.**

Over the past year,----- % of my practice has been managing patients with asthma.

In an average month, I see a total of-----\_ (number please) asthma patients.

Of these patients, I would say that:

-----% have mild asthma

-----% have moderate asthma

-----% have severe asthma

**Do you have any access to The National Protocol for the Management of Asthma?**

Yes

No Please go to question 11

**Which is the type of access?**

Hard copy

Internet access

**9. Do you have access to any another guidelines for asthma management?**

Yes (Please specify)

---

No

**THANK YOU FOR COMPLETING THIS QUESTIONNAIRE AND  
PARTICIPATING IN THE STUDY**

Please use the space below to make comments about this questionnaire. Your input is appreciated and will be used in future research endeavours.

---

---

---

---

---

**Permission to use ‘A Survey of Asthma Management: the Physician’s Perspective’**

Wed, Oct 5, 2005 at 12:55 AM

To: sultans.althagfan@postgrad.curtin.edu.au

Our Reference No.: 23419

Dear Sultan Al-Thagfan:

Thank you for your recent inquiry regarding questionnaires used in the thesis “ A survey of asthma management: the physician’s perspective” by Lisa Chantelle Cicutto.

The pages containing the questionnaires are in Appendix B of the study (pages 217 to 241). Other pages in the study are related directly to those questionnaires; they might be of interest to you. We suggest, for copyright reasons, that you either buy a copy of that thesis or borrow it through interlibrary loan by making arrangements with your university library. If you decide to buy a copy, you can contact ProQuest Information and Learning: by e-mail at: [info@umi.com](mailto:info@umi.com) by telephone at: 1-800-521-3042 (toll free in North America) or by fax at: 1-800-864-0019. For further information on their services you can visit their website at: [www.umi.com](http://www.umi.com)

If you prefer, you can borrow the microform copy of that item from Library and Archives Canada’s collection. Information on our service can be found from our website at: <http://www.collectionscanada.ca/ill/index-e.html>.

We hope this information will prove useful and best of luck with your research.

Francine Falardeau

Reference and Genealogy Division

Library and Archives Canada

**Appendix C:**  
**Phase Three Questionnaire (English)**

**Including permission to use Illness Management Survey**

**Permission**

Hello,

Attached is the measure and some scoring information. You are welcome to use it, there are no costs involved.

Best,

Deirdre Logan

Deirdre Logan, Ph.D.

Psychologist, Pain Treatment Service

Children's Hospital Boston

333 Longwood Avenue 5th Floor

Boston, MA 02115

tel 617-355-6694

fax 617-730-0199

## Consent Form

I agree to participate in the study having complete understanding of the following:

- Participation is voluntary, and I am free to withdraw at any time, without having to give any reason whatsoever.
- The full purpose of the study/research has been explained to me, and all my questions have been answered to my satisfaction.
- I may benefit from the study by learning more about my asthma, and that others may be helped by the outcomes of the research.
- All information obtained during this study is confidential and my identity will be protected at all times. It will be stored separately in locked filing cabinets in the School of Pharmacy, Curtin University, and will be available only to the researcher and the study supervisor.

I have read and I understand the consent form of this study. By signing this consent form, I am indicating that I agree to participate in the study.

Patient's Signature

Date

Parent /Guardian's Signature

Date

**Questionnaire completed by:**

- Child
- Parent/carer
- Child with parent/carer

**PART 1: GENERAL INFORMATION**

**1. Child's gender?**

- Male
- Female

**2. Child's age?**

- Less than 5 years
- 5 to less than 10 years
- 10 to less than 15 years
- 15 years to less than 18

**3. What is the highest education level obtained by...**

	Primary school or less	Secondary school	High school	University degree
Child	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child's father	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child's mother	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**4. What is your household's income monthly?**

- Less than 5000 SR
- 5001- 10000 SR
- 10001- 15000 SR
- 15001-20000 SR
- More than 20000 SR

**5. Do you have health insurance?**

Yes

No

**6. In general, how severe is the child's asthma?**

Very mild

Mild

Moderate

Severe

**7. How often did the child suffer from asthma symptoms (Cough, Wheeze, Difficulty Breathing) in the last month?**

Once or less

Once per week

Twice per week

Daily

**8. In the past 4 weeks, on average, how often did the child's asthma awaken him/her at night?**

Not at all

Less than once a week

Once or twice a week

Three or more times a week

**9. How often did the child miss school or was unable to do normal daily activities because of his/her asthma?**

- Once per month or less
- Once per week
- Twice per week
- More than twice per week

**10. Which of the following are TRUE about the child?**

- |                                                                                                                                         | Yes                      | No                       | Unsure                   |
|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|
| A Does the child have written instructions on how to manage their from his/her doctor or medical provider (i.e. an asthma action plan)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B Does the child have a peak flow meter and use it regularly?                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C Does the child use inhaled corticosteroids (e.g. Becotide, Flixotide, Pulmicort, Symbicort or Seretide) ?                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D Are the medicines the child takes useful for controlling his/her asthma?                                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E Does the doctor involve the child or his/her parents in making decisions about their asthma treatment?                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F Does the child or his/her parents have access to enough information to help the child control his/her asthma?                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**11. IF YOU ANSWERED “YES” TO QUESTION 10C ABOVE (inhaled corticosteroid), What best describes how the child takes this medicine? (please tick only ONE)**

- Uses the inhaler every day, even when he/she is symptom free
- Uses the inhaler regularly, but not every day
- Uses the inhaler only when he/she has asthma symptoms

## **PART 2: HEALTH BELIEFS**

Directions: We are interested in what can make it difficult to take care of children with asthma. Below is a list of things that some children (or their parents) think or feel about what they have to do to take care of their illness. When you read the words “my treatment program” please think about what you as a child (or parent) have to do to take care of your asthma on a daily basis. This includes taking pills or other medicines, limiting your activities, things you have to avoid (like dust, animals, cigarette smoke or certain foods), having to come to doctor’s visits or to the hospital, etc.

**After each statement, please circle the answer that best says how the child feels**

SD = Strongly Disagree (This is definitely NOT true for me/my child)

D = Disagree (This is not really true for me/my child)

N = Neutral (This is neither true nor untrue for me/my child)

A = Agree (This is somewhat true for me/my child)

SA = Strongly Agree (This is VERY true for me/child)

1. I hate the idea of giving up the things the doctors say I have to give up.	SD D N A SA
2. I believe that if I take care of myself and follow my treatment program, my health will improve.	SD D N A SA
3. I try to forget that I have an illness.	SD D N A SA
4. My regimen takes a lot of time and work.	SD D N A SA
5. Sometimes I can't remember everything I'm supposed to do about my illness.	SD D N A SA
6. I don't want my friends to know about my illness.	SD D N A SA
7. When there are changes to my treatment program I sometimes get confused.	SD D N A SA
8. When I feel nervous or worried, it's hard to follow my treatment program.	SD D N A SA
9. None of my friends have to deal with this, why do I?	SD D N A SA
10. My illness is easier to take care of than a lot of other illnesses.	SD D N A SA
11. I understand what I am supposed to do to care for my illness.	SD D N A SA
12. The doctors treat me like a little kid who can't take care of myself.	SD D N A SA
13. I have difficulty understanding the information the doctor tells me about my medications	SD D N A SA
14. I don't always trust the doctors and nurses.	SD D N A SA
15. Following my treatment program causes me physical pain or discomfort.	SD D N A SA
16. Nothing bad would happen to me if I didn't follow my treatment program.	SD D N A SA
17. My doctors are friendly and easy to talk to.	SD D N A SA
18. It's hard for me to plan things out carefully, so sometimes I don't get around to following my treatment program.	SD D N A SA
19. My medications have side effects that I really don't like.	SD D N A SA
20. I have difficulty taking my medication when I am not at home	SD D N A SA
21. My family doesn't understand what it's like to live with my illness.	SD D N A SA
22. I don't mind if my friends bring up my illness or ask me questions about it.	SD D N A SA

23. The doctors don't seem to understand how much my treatment program gets in the way of important things in my life.	SD D N A SA
24. My family gives me a lot of support to help me follow my treatment program.	SD D N A SA
25. The doctors do a good job of explaining things to me.	SD D N A SA
26. It's hard for me to stay organized enough to keep track of medications or other things related to my illness.	SD D N A SA
27. I refuse to give up time with friends to take care of my illness.	SD D N A SA
28. It feels like the doctors are too busy or rushed to talk to me about my illness and my treatment.	SD D N A SA
29. My treatment program causes changes to my body that I don't like.	SD D N A SA

### PART 3: CORTICOSTEROIDS ADHERENCE BARRIERS

In your opinion, to what extent are the following barriers to the child's daily use of corticosteroids? (Rate on a scale of 1 to 5, where 1 = strong effect and 5 = no effect)

Barrier	1	2	3	4	5
	Strong effect	Moderate effect	Mild effect	Weak effect	No effect
Forgetfulness	<input type="checkbox"/>				
Fear of side effects	<input type="checkbox"/>				
worry of addiction/ dependence	<input type="checkbox"/>				
Cost of medication and /or health services	<input type="checkbox"/>				
Lack of understanding the role of medication	<input type="checkbox"/>				
Lack of understanding the correct use of inhaler device	<input type="checkbox"/>				
Lack of reliable information sources	<input type="checkbox"/>				
Difficulty in reading and understanding medication instruction	<input type="checkbox"/>				
Belief that medication is ineffective	<input type="checkbox"/>				
Absence of warning signs (symptoms) means no medication is needed	<input type="checkbox"/>				
Level of medication instruction language	<input type="checkbox"/>				

Barrier	1	2	3	4	5
	Strong effect	Moderate effect	Mild effect	Weak effect	No effect
Use of traditional therapy	<input type="checkbox"/>				
Different types of inhaler devices	<input type="checkbox"/>				
Different numbers of medication types (control and reliever medication)	<input type="checkbox"/>				
Embarrassment or discomfort	<input type="checkbox"/>				
Asthma is not a serious illness that need continuous treatment	<input type="checkbox"/>				
The inconvenience of scheduled appointment times and waiting times for refills	<input type="checkbox"/>				
My relatives' and friends' awareness (concern) about my illness and medication	<input type="checkbox"/>				

**Appendix D:**  
**Phase Four Questionnaire (English)**

**Consent**

I agree to participate in the study having complete understanding of the following:

- Participating is voluntary, and I am free to withdraw at any time, without having to give any reason whatsoever.
- The full purpose of the study/research has been explained to me, and all my questions have been answered to my satisfaction.
- I may benefit from the study by learning more about my asthma, and others may be helped by the outcomes of the research.
- All information obtained during this study is confidential and my identity will be protected at all times. It will be stored separately in locked filing cabinets in the School of Pharmacy, Curtin University, and will be available only to the researcher and the study supervisor.

I have read and I understand the consent form of this study. By signing this consent form, I am indicating that I agree to participate in the study.

Patient's Signature

Date

Parent /Guardian's Signature

Date

## Questionnaire

Section I:																																					
<b>1. What is your child's gender? (mark one box.)</b>	<input type="checkbox"/> Male <input type="checkbox"/> Female																																				
<b>2. How old is your child?</b>	<input type="checkbox"/> less than 5 years <input type="checkbox"/> 5 to less than 10 years <input type="checkbox"/> 10 to less than 15 years <input type="checkbox"/> 15 years to less than 18																																				
<b>3. Has a doctor or medical provider ever told you that your child has asthma?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No - (If no, please stop here and return the questionnaire)																																				
<b>4. For each season of the year, to what extent does your child usually have asthma symptoms?</b>	<p><b>(Mark one box on each line)</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 20%;">A lot</th> <th style="width: 20%;">A little</th> <th style="width: 20%;">None</th> </tr> </thead> <tbody> <tr> <td>Winter</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Spring</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Summer</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Fall</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		A lot	A little	None	Winter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Spring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Summer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																
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Fall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																		
<b>5. In the <u>past 4 weeks</u>, how many days did your child...</b>	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 10%;">None</th> <th style="width: 10%;">1 to 3</th> <th style="width: 10%;">4 to 7</th> <th style="width: 10%;">over</th> <th style="width: 10%;">7</th> </tr> </thead> <tbody> <tr> <td>a) Have wheezing or difficulty breathing when exercising?</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>b) Have wheezing during the day when <b>not</b> exercising?</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>c) Wake up at night with wheezing or difficult breathing?</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>d) Miss days of school because of his/her asthma?</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>e) Miss any daily activities (such as playing, going to a friend's house, or any family activity) because of his/her asthma?</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		None	1 to 3	4 to 7	over	7	a) Have wheezing or difficulty breathing when exercising?	<input type="checkbox"/>	b) Have wheezing during the day when <b>not</b> exercising?	<input type="checkbox"/>	c) Wake up at night with wheezing or difficult breathing?	<input type="checkbox"/>	d) Miss days of school because of his/her asthma?	<input type="checkbox"/>	e) Miss any daily activities (such as playing, going to a friend's house, or any family activity) because of his/her asthma?	<input type="checkbox"/>																				
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<b>6. Are you dissatisfied with any part of your child's <u>current</u> asthma treatment?</b>	<table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 60%;">Yes</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>No</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>																																
Yes	<input type="checkbox"/>																																				
No	<input type="checkbox"/>																																				

	Unsure	[ ]	
<b>(If yes, please explain)</b>			
<b>7. In the <u>past 12 months</u>, has your child taken any medicine for his/her asthma?</b>	Yes	[ ]	
	No	[ ]	
<b>8. Do you believe...</b>	Yes	No	Unsure
a) Your child's asthma was well controlled in the past 4 weeks?`	[ ]	[ ]	.[ ]
b) Your child is able to administer his/her asthma medicine(s) as directed?	[ ]	[ ]	.[ ]
You have access to enough information to help your child control his/her asthma?	[ ]	[ ]	.[ ]
d) The medicine(s) your child takes are useful in controlling his/her asthma?	[ ]	[ ]	.[ ]
<b>9. Does your child's doctor or medical provider...</b>	Yes	No	Unsure
a) Involve you and your child in making decisions about your child's asthma treatment?	[ ]	[ ]	.[ ]
b) Know how your child prefers to take his/her asthma medicine(s) (such as by chewable tablet, liquid or inhaler)?	[ ]	[ ]	.[ ]
<b>10. In the <u>past 12 months</u>, has your child's doctor or medical provider gone over with you or your child how to take his/her asthma medicine(s)?</b>	Yes	No	Unsure
	[ ]	[ ]	.[ ]
<b>11. Do you or your child have written instructions from his/her doctor or medical provider...</b>	Yes	No	Unsure
a) On what to do if he/she is having an asthma attack?	[ ]	[ ]	.[ ]
b) On how to take his/her medicine(s) on days when he/she is not having an asthma attack?	[ ]	[ ]	.[ ]

<b>12. Does your child use an inhaler or nebulizer (blue inhaler) for <u>quick relief</u> from asthma symptoms?</b>	Yes      No      Unsure <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
A. If yes) In the <u>past 4 weeks</u> , what was the highest number of times <u>in one day</u> your child used this inhaler/nebulizer (blue inhaler)?	0 <input type="checkbox"/> 1 to 2 <input type="checkbox"/> ] 3 to 4 <input type="checkbox"/> ] 5 to 6 <input type="checkbox"/> ] over 6 <input type="checkbox"/>
B. In the past 12 months, on days your child used an inhaler/nebulizer for quick relief, how many times a day did he/she usually use it (blue inhaler) ?	0 <input type="checkbox"/> 1 to 2 <input type="checkbox"/> 3 to 4 <input type="checkbox"/> 5 to 6 <input type="checkbox"/> over 6 <input type="checkbox"/>
<b>13. Has your child ever had a prescription for asthma medicine that is <u>NOT</u> used for quick relief, but is used to <u>control</u> your child's asthma?</b>	Yes      No      Unsure <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<b>If you answered yes to the question above, what best describes how your child takes this medicine</b>	<input type="checkbox"/> Takes it every day <input type="checkbox"/> Takes it some days, but not other days <input type="checkbox"/> Used to take it, but now does not <input type="checkbox"/> Only takes it when having symptoms <input type="checkbox"/> Never took it
<b>14. Thank you for completing this section of the questionnaire! Is there anything you would like to tell us about your child's asthma or the care he/she is receiving?</b>	

## Section II

In this section, we would like to find out how often your child's asthma has bothered him/her DURING THE PAST FOUR WEEKS.

**1. Over the past 4 weeks, how often has your child been bothered by the following symptoms: coughing, chest tightness, wheezing?**

1. Never
2. Once a week or less
3. 2 to 3 times a week
4. 4 to 5 times a week
5. Daily

## Section III:

The next questions ask about various experiences your child may have had with asthma.

**1. In general, how severe is your child's asthma?**

- |           |                          |
|-----------|--------------------------|
| Very mild | <input type="checkbox"/> |
| Mild      | <input type="checkbox"/> |
| Moderate  | <input type="checkbox"/> |
| Severe    | <input type="checkbox"/> |

**2. How easy is it for your child to avoid having severe asthma attacks (flare-ups worse than the usual asthma symptoms)? (Circle the appropriate answer)**

- |      |          |           |                |
|------|----------|-----------|----------------|
| Easy | Moderate | Difficult | Very difficult |
| 1    | 2        | 3         | 4              |

**3a. Does your child use an inhaled steroid (such as Beclomethasone (Becotide, Viarex), Budesonide (Pulmicort), Fluticasone/salmeterol (Seretide), Budesonide/formoterol (Symbicort), or others) for his/her asthma?**

1. Yes           **IF YES, please answer Question 3b below.**
2. No           **Please go on to Section IV.**
3. Don't know    Please    go    on    to    Section    IV.

**3b. If you answered “yes” to question 3a above, which of the following best describes how your child’s uses his/her inhaled steroid medication? ( please tick only ONE)**

1. He/she uses an inhaled steroids *every day*, whether or not he/she has asthma symptoms.
2. Even though his/her doctor wants them to use inhaled steroids every day, he/she uses them *less often*.
3. He/she uses inhaled steroids several times a week.
4. He/she uses inhaled steroids only when they have asthma symptoms.

## Section IV

A. The next two questions ask about peak flow meters. A peak flow meter is a hand-held device that measures how much air you can blow out of your lungs. And inhaler and education about medicine and how adjust it

	Yes	No	Unsure
1. He/she has been taught how to use a peak flow meter by their doctor or nurse			
2. He/she uses a peak flow meter to monitor the asthma.			
3. He/she usually uses a spacer when using an inhaler for the asthma.			
4. He/she is able to manage changes in their asthma themselves most of the time.			

**B. How would you rate the quality of the information given to your child about their asthma by their doctor, nurse or other health care provider:**

1. Very good
2. Good
3. OK
4. Bad
5. Very bad
6. None

**C. Could you please list your child's medicines' names, frequency, dosage form and dose?**

Drug name	Dosage form (e.g. tablet, inhaler, nebulizer)	Dose (i.e. number of tablets/puffs)	Frequency (i.e. times used per day)

**D. Has your child suffered any of the following problems since commencing treatment for their asthma:**

	<b>Yes</b>	<b>No</b>
5- weight gain	[ ]	[ ]
6- change of mood (e.g. depression)	[ ]	[ ]
7- diabetes	[ ]	[ ]
8- slowed growth rate	[ ]	[ ]

**E. Has your child been admitted to hospital or attended the Emergency Room at the hospital during the last 3 months?**

Yes [ ] how many times? ( ) number

No [ ]

## **Section V: Quality of life**

The following questions relate to the impact of your child's asthma on their general well being.

**Q1- Have you feel in trouble during the last four weeks because of your asthma?**

1. Never
2. Some of the time (**Once a week or less**)
3. Often (**2 to 4 times a week**)
4. Always (**Daily**)

**Q2- Did you feel worried, anxious or afraid in the last four weeks because your asthma?**

1. Never
2. Some of the time
3. Often
4. Always (**Daily**)

**Q3- In the last four weeks did you feel annoyed or angry because of your asthma?**

1. Never
2. Some of the time
3. Often
4. Always (**Daily**)

**Q4- In the last four weeks how often could you do your regular activities because of your asthma?**

1. Never
2. Some of the time
3. Often
4. Always (**Daily**)

## Appendix E:

### Phase One Results (Patients)

This appendix reflects the association between asthma management aspects and gender.

**Table E 1 Patients' self-assessment of severity**

Patients' self- assessment severity	Gender	Asser	Riyadh	Total	P value
		N=113	N= 117	N=230	
		N (%)	N (%)	N (%)	NS
Very mild	Male	4 (6.9)	1 (1.4)	5 (3.9)	
	Female	8 (14.5)	1 (2.2)	9 (8.9)	
	Total	12 (10.2)	2 (1.7)	14 (6.1)	
Mild	Male	19 (32.8)	16 (22.5)	35 (27.1)	
	Female	20 (36.4)	7 (15.2)	27 (26.7)	
	Total	39 (34.5)	23 (19.7)	62 (27.0)	
Moderate	Male	30 (51.7)	39 (54.9)	69 (53.5)	
	Female	24 (43.6)	28 (60.9)	52 (51.2)	
	Total	54 (47.8)	67 (57.3)	121 (52.6)	
Severe	Male	5 (6.6)	15 (21.1)	20 (15.5)	
	Female	3 (5.5)	10 (21.7)	13 (12.9)	
	Total	8 (7.1)	25 (20.4)	33 (14.3)	

**Table E 2 Patients' seasonal asthma symptoms**

Season	Frequency of symptoms	Asser (112)*		Riyadh (117)		P value
		Male n= 57 N (%)	Female n= 55 N (%)	Male N= 71 N (%)	Female N= 46 N (%)	
Winter	None	5 (8.8)	5 (9.1)	4 (5.6)	0 (0.0)	NS
	A little	24 (42.1)	21 (38.2)	26 (36.6)	13 (28.3)	
	A lot	28 (49.1)	29 (52.7)	41 (57.7)	33 (71.7)	
Summer	None	10 (17.5)	15 (27.3)	20 (28.2)	12 (26.1)	NS
	A little	28 (49.1)	24 (43.6)	40 (56.3)	23 (23.9)	
	A lot	19 (33.3)	16 (29.1)	11 (15.5)	11 (23.9)	
Spring	None	5 (8.8)	5 (9.1)	12 (16.9)	9 (19.6)	NS
	A little	38 (66.7)	40 (72.7)	32 (45.1)	20 (43.5)	
	A lot	14 (24.6)	10 (18.2)	27 (38.0)	17 (37.0)	
Fall	None	12 (21.1)	17 (30.9)	14 (19.7)	10 (21.7)	NS
	A little	34 (59.6)	25 (45.5)	35 (49.3)	25 (54.3)	
	A lot	11 (19.3)	13 (23.6)	22 (31.0)	11 (23.9)	

**Table E 3 Number of patients using medication over the past 12 months.**

Region	Genders	Use an asthma medication		
		Yes	No	Total
		N (%)	N (%)	N (%)
Asser	Male	56(96.6)	2(3.4)	58(100.0)
	Female	53(96.4)	2(3.6)	55(100.0)
	Total	109(96.5)	4(3.5)	113(100.0)
Riyadh	Male	69(97.2)	2(2.8)	71(100.0)
	Female	43(93.5)	3(6.5)	46(100.0)
	Total	112(95.7)	5(4.3)	117(100.0)
Total	Male	125(96.9)	4(3.1)	129(100.0)
	Female	96(95.0)	5(5.0)	101(100.0)
	Total	221(96.1%)	9(3.9)	230(100.0)
Difference between Gender p Value		NS		

**Table E 4 Number of patients using an inhaler or nebulizer for quick relief from asthma symptoms.**

Region	Gender	Use of an inhaler or nebulizer for <u>quick relief</u> from asthma symptoms.			
		Yes	No	Unsure	Total
		N (%)	N (%)	N (%)	N (%)
Asser	Male N=58	45(77.6)	11(19.0)	2(3.4)	58(100.0)
	Female N=55	34(61.8)	20(36.4)	1(1.8)	55(100.0)
	Total N=113	79(69.9)	31(27.4)	3(2.7)	113(100.0)
Riyadh	Male N=71	59(83.1)	12(16.9)	0(0.0)	71(100.0)
	Female N=46	36(78.3)	9(19.6)	1(2.2)	46(100.0)
	Total N=117	95(81.2)	21(17.90)	1(0.9)	117(100.0)
Total	Male N=129	104(80.6)	23(17.8)	2(1.6)	129(100.0)
	Female N=101	70(69.3)	29(28.7)	2(2.0)	101(100.0)
	Total N=230	174(75.70)	52(22.6)	4(1.7)	230(100.0)
Difference in Gender p value		NS			

**Table E 5 Number of patients using control medication**

Number of patients using control medication, self-reported		Asser N=113	Riyadh N= 117	Total N=230	P value
		N (%)	N (%)	N (%)	
Yes	Male	42 (72.4)	47 (66.2)	89 (69.0)	NS
	Female	42 (76.4)	35 (76.1)	77 (76.2)	
	Total	84 (74.3)	82 (70.1)	166 (72.2)	
No	Male	16 (27.6)	24 (33.8)	40 (31.0)	
	Female	13 (23.6)	11 (23.9)	24 (23.8)	
	Total	29 (25.7)	35 (29.9)	64 (27.8)	

**Table E 6 Classes of medication used**

Class of medication used	Gender	Response option		P value
		Yes	No	
		N (%)	N (%)	
Adrenoceptor Agonist (select $\beta_2$ Agonist)	Male	124 (96.1)	5 (3.9)	NS
	Female	93 (92.1)	8 (7.9)	
	Total	217 (94.3)	13 (5.7)	
Anticholinergic	Male	4 (3.1)	125 (96.9)	
	Female	1 (1.0)	100 (99.0)	
	Total	5 (2.2)	225 (97.8)	
Corticosteroid	Male	36 (27.9)	93 (72.1)	NS
	Female	32 (31.7)	69 (68.3)	
	Total	68 (29.6)	162 (70.4)	
Theophylline	Male	3 (2.3)	126 (97.7)	NS
	Female	3 (3.0)	98 (97.0)	
	Total	6 (2.6)	224 (97.4)	
Anti-Histamine	Male	9 (7.0)	120 (93.0)	NS
	Female	2 (2.0)	99 (98.0)	
	Total	11 (4.8)	219 (95.2)	
Sodium cromoglycate	Male	2 (1.6)	127 (98.49)	NS
	Female	3 (3.0)	98 (97.0)	
	Total	5 (2.2)	225 (97.8)	
Anti-leukotriene receptor	Male	1 (0.8)	128 (99.2)	NS
	Female	5 (5.0)	96 (95.0)	
	Total	6 (2.6)	224 (97.4)	
Antibiotics	Male	1 (0.8)	128 (99.2)	NS
	Female	0 (0.0)	101 (100.0)	
	Total	1 (0.4)	229 (99.6)	

**Table E 7 Medication usage**

Medication usage	Gender	Regions			P value
		Asser	Riyadh	Total	
		N (%)	N (%)	N (%)	
β2 agonist only	Male	41 (70.7)	38 (53.3)	79 (61.2)	NS
	Female	39 (70.9)	22 (47.8)	61 (60.4)	
	Total	80 (70.8)	60 (51.3)	140 (60.9)	
β2 agonist + Corticosteroid	Male	7 (12.1)	19 (26.8)	26 (20.2)	NS
	Female	7 (12.7)	15 (32.6)	22 (21.8)	
	Total	14 (12.4)	34 (29.1)	48 (20.9)	
β2 agonist +Corticosteroid + others	Male	1 (1.7)	5 (7.0)	6 (4.7)	NS
	Female	0 (00.0)	3 (6.5)	3 (3.0)	
	Total	1 (0.9)	8 (6.8)	9 (3.9)	
β2 agonist + other (Non-Corticosteroid )	Male	7 (12.1)	7 (9.9)	14 (10.9)	NS
	Female	5 (9.1)	3 (6.5)	8 (7.9)	
	Total	12 (10.6)	10 (8.5)	22 (9.6)	
Corticosteroid only	Male	2 (3.4)	2 (2.8)	4 (3.1)	NS
	Female	2 (3.6)	3 (6.5)	5 (5.0)	
	Total	4 (3.5)	5 (4.3)	9 (3.9)	
Corticosteroid + other (non β2 agonist)	Male	0 (00.0)	0 (00.0)	0 (00.0)	NS
	Female	2 (3.6)	0 (00.0)	2 (2.0)	
	Total	2 (1.8)	0 (00.0)	2 (0.9)	

**Table E 8 Inhaled corticosteroid (ICS)**

Region	Gender	Inhaled steroid			
		Yes	No	I do not know	Total
		N (%)	N (%)	N (%)	N (%)
Asser	Male	12(20.7)	39(67.2)	7(12.1)	58(100.0)
	Female	10(18.2)	41(74.5)	4(7.3)	55(100.0)
	Total	22(19.5)	80(70.8)	11(9.7)	113(100.0)
Riyadh	Male	32(45.1)	27(38.0)	12(16.9)	71(100.0)
	Female	26(56.5)	14(30.4)	6(13.4)	46(100.0)
	Total	58(49.6)	41(35.0)	18(15.4)	117(100.0)
Total	Male	44(34.1)	66(51.2)	19(14.7)	129(100.0)
	Female	36(35.6)	55(54.5)	10(9.9)	101(100.0)
	Total	80(34.8)	121(52.6)	29(12.6)	230(100.0)
Difference in Gender p value		NS			

**Table E 9 Patients' adherence to ICS daily usage**

Inhaled corticosteroid frequency	Region	Asser N=22	Riyadh N=58	Total N=80	P value
	Gender	N (%)	N (%)	N (%)	
Inhaled steroids every day.	Male	6(27.3)	9(15.5)	15(18.8)	NS
	Female	3(13.6)	6(10.3)	9(11.3)	
	Total	9(40.9)	15(25.9)	24(30.0)	
Inhaled steroids less often.	Male	3(13.6)	8(13.8)	11(13.8)	
	Female	2(9.1)	2(3.4)	4(5.0)	
	Total	5(22.7)	10(17.2)	15(18.8)	
Inhaled steroids several times a week.	Male	0(0.0)	2(3.4)	2(2.5)	
	Female	1(4.5)	3(5.2)	4(5.0)	
	Total	1(4.5)	5(8.6)	6(7.5)	
Inhaled steroids when having asthma symptoms.	Male	3(13.6)	13(22.4)	16(20.0)	
	Female	4(18.2)	15(25.9)	19(23.8)	
	Total	7(31.8)	28(48.3)	35(43.8)	

**Table E 10 Self-reported side effects**

Side adverse	Response option	Gender	Asser N=112 N (%)	Riyadh N=116 N (%)	Total N= 228 N (%)	P value
A. Weight gain	Yes	Male	5(8.8)	16(22.9)	21(16.5)	NS
		Female	10(18.2)	8(17.4)	18(17.8)	
		Total	15(13.4)	24(20.7)	39(17.1)	
	No	Male	52(91.2)	54(77.1)	106(83.5)	
		Female	45(81.8)	38(82.6)	83(82.2)	
		Total	97(86.6)	92(79.30)	189(82.9)	
B. Change of mood	Yes	Male	13(22.4)	27(38.6)	40(31.3)	NS
		Female	23(41.8)	20(44.4)	43(43.0)	
		Total	36(31.9)	47(40.9)	83(36.4)	
	No	Male	88(38.6)	43(61.4)	88(68.8)	
		Female	57(25.0)	25(55.6)	57(57.0)	
		Total	145(63.6)	68(59.1)	145(63.6)	
C. Diabetes	Yes	Male	1(1.8)	1(1.4)	2(1.6)	NS
		Female	0(0.0)	0(0.00)	0(0.0)	
		Total	1(0.9)	1(0.9)	2(0.9)	
	No	Male	56(98.2)	68(98.6)	124(98.4)	
		Female	54(100.0)	46(100.0)	100(100.0)	
		Total	110(99.1)	114(99.1)	224(99.1)	
D. Slowed growth rate	Yes	Male	11(19.3)	17(24.3)	28(22.0)	NS
		Female	10(18.2)	8(17.4)	18(17.8)	
		Total	21(18.8)	25(21.6)	46(20.2)	
	No	Male	46(80.7)	53(75.7)	99(78.0)	
		Female	45(81.8)	38(82.6)	83(82.2)	
		Total	91(81.3)	91(78.4)	182(79.8)	

**Table E 11 Number of patients admitted to hospital or attending ER.**

Patients admitted to hospital or attending ER	Gender	Asser N=113 N (%)	Riyadh N=117 N (%)	Total N= 230 N (%)	P value
Yes	Male	21(36.2)	26 (36.6)	47 (36.4)	NS
	Female	13 (23.6)	19 (41.3)	32 (31.7)	
	Total	34 (30.1)	45 (38.5)	79 (34.3)	
No	Male	37(63.8)	45 (63.4)	82 (63.6)	
	Female	42(76.4)	27 (58.7)	69 (68.3)	
	Total	79 (69.9)	72 (61.5)	151 (65.7)	

**Table E 12 Number of patients with written instructions (AAPs)**

AAP availability, on what to do when having an asthma attack	Gender	Asser* N= <b>105</b> N (%)	Riyadh** N= <b>111</b> N (%)	Total*** N= 216 N (%)	P value
Yes	Male	49 (94.2)	50 (75.8)	99 (83.9)	NS
	Female	49 (92.5)	36 (80.0)	85 (86.7)	
	Total	98 (93.3)	86 (77.5)	184(85.2)	
No	Male	3 (5.8)	16 (24.2)	19 (16.1)	
	Female	4 (7.5)	9 (20.0)	13 (13.3)	
	Total	7(6.7)	25 (22.5)	32 (14.8)	

\*Eight data missing

\*\*Six data missing

\*\*\* Fourteen data missing

**Table E 13 Respondents' taking of medicine(s) on days when not having an asthma attack.**

AAP availability, on how to take medicine when having an asthma attack	Gender	Asser	Riyadh*	Total**	P value
		N=113	N=115	N= 228	
		N (%)	N (%)	N (%)	
Yes	Male	47(81.0)	50(71.4)	97(75.8)	NS
	Female	44(80.0)	30(66.6)	74(74)	
	Total	91(80.5)	80(69.6)	171(75.0)	
No	Male	5(8.6)	16(22.9)	21(16.4)	
	Female	6(10.9)	7(15.6)	13(13)	
	Total	11(9.7)	23(20.0)	34(14.9)	
Unsure	Male	6(10.4)	4(5.7)	10(7.8)	
	Female	5(9.1)	8(17.8)	13(13)	
	Total	11(9.7)	12(10.4)	23(10.1)	

\*Two data missing

\*\*Two data missing

**Table E 14 Respondents' understanding of AAP instructions on how to use their medications when not having a severe asthma attack**

Level of AAP understanding on how to take asthma medicine	Gender	Asser	Riyadh	Total	P value
		N=113	N= 117	N=230	
		N (%)	N (%)	N (%)	NS
1. Yes, and completely understood	Male	41(70.7)	53(74.7)	94(72.8)	NS
	Female	37(67.3)	31(67.4)	68(67.3)	
	Total	78(69.0)	84(71.8)	162(70.4)	
2. Yes, well understood	Male	14(24.1)	11(15.5)	25(19.4)	
	Female	15(27.3)	8(17.4)	23(22.8)	
	Total	29(25.7)	19(16.2)	48(20.9)	
3. Yes, confused	Male	1(1.7)	3(4.2)	4(3.1)	
	Female	2(3.6)	1(2.2)	3(3.0)	
	Total	3(2.7)	4(3.4)	7(3.0)	
4. No, not at all	Male	2(3.5)	4(5.6)	6(4.7)	
	Female	1(1.8)	6(13.0)	7(6.9)	
	Total	3(2.7)	10(8.5)	13(5.7)	

**Table E 15 Respondents' understanding of AAP instructions on how to use their medications when having a severe asthma attack**

Level of AAP understanding on what to do when having a severe asthma attack	Gender	Asser N=113	Riyadh N=117	Total N=230	P value
		N (%)	N (%)	N (%)	
1. Yes, and completely understood	Male	39(67.3)	47(66.2)	86(66.7)	NS
	Female	42(76.4)	29(63.0)	71(70.3)	
	Total	81(71.7)	76(65.0)	157(68.3)	
2. Yes, well understood	Male	14(24.1)	11(15.5)	25(19.4)	
	Female	12(21.8)	7(15.2)	19(18.8)	
	Total	26(23.0)	18(15.4)	44(19.1)	
3. Yes, confused	Male	0(0.0)	3(4.2)	3(2.3)	
	Female	1(1.8)	1(2.2)	2(2.0)	
	Total	1(0.9)	4(3.4)	5(2.2)	
4. No, not at all	Male	5(8.6)	10(14.1)	15(11.6)	
	Female	0(0.0)	9(19.6)	9(8.9)	
	Total	5(4.4)	19(16.2)	24(10.4)	

**Table E 16 Number of patients with a peak flow meter**

PFM availability and usage frequency	Gender	Asser N= 113	Riyadh N=117	Total N=230	p value
		N (%)	N (%)	N (%)	
No	Male	52(89.7)	51(71.8)	103(79.8)	NS
	Female	49(89.0)	32(69.6)	81(80.2)	
	Total	101(89.4)	83(70.9)	184(80.0)	
Yes and uses it regularly.	Male	0(0.0)	9(12.7)	9(7.0)	NS
	Female	3(5.5)	7(15.2)	10(9.9)	
	Total	3(2.7)	16(13.7)	19(8.3)	
Yes, but almost never used	Male	6(10.3)	11(15.5)	17(13.2)	
	Female	3(5.5)	7(15.2)	10(4.3)	
	Total	9(8.0)	18(15.4)	27(11.7)	

**Table E 17 Number of patients using a spacer when taking medication.**

Spacer accessibility	Gender	Asser*	Riyadh**	Total***	p value
		N=112	N=115	N=227	
		N (%)	N (%)	N (%)	
Yes	Male	13(22.4)	34(48.6)	47(36.7)	NS
	Female	14(25.9)	21(46.7)	35(35.4)	
	Total	27(24.1)	55(47.8)	82(36.1)	
No	Male	45(77.6)	36(51.4)	81(63.3)	
	Female	40(74.1)	24(53.3)	64(64.6)	
	Total	85(75.9)	60(52.2)	145(63.9)	

\*One data missing

\*\*Two data missing

\*\*\* Three data missing

**Table E 18 Accessibility of information across gender and region**

Access to adequate asthma management information	Gender	Asser*	Riyadh**	Total***	p value
		N=112	N=115	N=227	
		N (%)	N (%)	N (%)	
Yes	Male	46(79.3)	48(67.6)	94(72.9)	NS
	Female	42(77.8)	27(61.3)	69(70.4)	
	Total	88(78.6)	75(65.2)	163(71.8)	
No	Male	7(12.1)	13(18.3)	20(15.5)	
	Female	6(11.1)	12(27.2)	18(18.4)	
	Total	13(11.6)	25(21.7)	38(16.7)	
Unsure	Male	5(8.6)	10(14.1)	15(11.6)	
	Female	6(11.1)	5(11.4)	11(11.2)	
	Total	11(9.8)	15(13.0)	26(11.5)	

\*One data missing

\*\*Two data missing

\*\*\* Three data missing

**Table E 19 Respondents' inhaler usage education**

Correct inhaler use demonstrated by health care providers	Gender	Asser*	Riyadh**	Total***	p value
		N=111	N=116	N=227	
		No N (%)	N (%)	N (%)	
Yes	Male	42(72.4)	47(67.1)	89(69.5)	NS
	Female	33(62.3)	29(63.0)	62(62.6)	
	Total	75(67.6)	76(65.5)	151(66.5)	
No	Male	16(27.6)	23(32.9)	39(30.5)	
	Female	20(37.7)	17(37.0)	37(37.4)	
	Total	36(32.4)	40(34.5)	76(33.5)	

\*Two data missing

\*\*One data missing

\*\*\* Three data missing

**Table E 20 Education level of respondents provided with asthma management**

Education level	Gender	Regions			P value
		Asser*	Riyadh *	Total	
		N (%)	N (%)	N (%)	
Fair	Male	6 (10.3)	17 (24.0)	23 (17.9)	NS
	Female	2 (3.7)	8 (17.8)	10 (10.1)	
	Total	8 (7.1)	25 (21.6)	33 (14.5)	
Good	Male	28 (48.3)	26 (36.6)	54 (41.9)	NS
	Female	30 (55.6)	23 (51.1)	53 (53.5)	
	Total	58 (51.8)	49 (42.2)	107 (46.9)	
Very Good	Male	17 (29.3)	18 (25.4)	35 (27.1)	NS
	Female	16 (29.6)	6 (13.3)	22 (22.2)	
	Total	33 (29.5)	24 (20.7)	57 (25.0)	
Excellent	Male	7 (12.1)	10 (14.1)	17 (13.2)	NS
	Female	6 (11.1)	8 (17.8)	14 (14.1)	
	Total	13 (11.6)	18 (15.5)	31 (13.6)	

\*One datum missing

**Table E 21 Patients' involvement in treatment across gender and region**

Involvement in asthma treatment decisions with medical provider.	Gender	Asser N= 113	Riyadh N=117	Total N=230	p value
		N (%)	N (%)	N (%)	
Yes	Male	47(81.0)	49(69.0)	96(74.4)	NS
	Female	36(65.5)	34(73.9)	70(69.3)	
	Total	83(73.5)	83(70.9)	166(72.2)	
No	Male	4(6.9)	18(25.4)	22(17.0)	
	Female	12(21.8)	11(23.9)	23(22.8)	
	Total	16(14.2)	29(24.8)	45(19.6)	
Unsure	Male	7(12.1)	4(5.6)	11(0.8)	
	Female	7(12.7)	1(2.2)	8(7.9)	
	Total	14(12.4)	5(4.3)	19(8.3)	

**Table E 22 Level of health care provider's attention to patient concerns**

Level of health care provider attention to patient concern	Gender	Regions			P value
		Asser*	Riyadh *	Total**	
		N (%)	N (%)	N (%)	
Fair	Male	4 (7.2)	11 (15.5)	15 (11.8)	NS
	Female	4 (7.4)	6 (14.0)	10 (10.3)	
	Total	8 (7.3)	17 (14.9)	25 (11.2)	
Good	Male	21 (37.5)	20 (28.2)	41 (32.3)	
	Female	24 (44.4)	23 (53.5)	47 (48.5)	
	Total	45 (40.9)	43 (37.7)	88 (39.3)	
Very good	Male	16 (28.6)	18 (25.4)	34 (26.8)	
	Female	15 (27.8)	5 (11.6)	20 (20.6)	
	Total	31 (28.2)	23 (20.2)	54 (24.1)	
Excellent	Male	15 (26.8)	22 (31.0)	37 (29.1)	
	Female	11 (20.4)	9 (20.9)	20 (20.6)	
	Total	26 (23.6)	31 (27.2)	57 (25.4)	

\*Three data missing

\*\*Six data \*missing

**Table E 23 Patients' perceptions of physicians' medication recommendations**

Physician's attentiveness to patient's medication preference	Gender	Asser N=113	Riyadh N=117	Total N=230	P value
		No N (%)	N (%)	N (%)	
Yes	Male	47(81.0)	55(77.5)	102(79.1)	NS
	Female	49(89.1)	37(80.4)	86(85.1)	
	Total	96(85.0)	92(78.6)	188(81.7)	
No	Male	2(3.5)	8(11.2)	10(7.8)	
	Female	4(7.3)	5(10.9)	9(9.0)	
	Total	6(5.3)	13(11.1)	19(8.3)	
Unsure	Male	9(15.5)	8(11.2)	17(7.4)	
	Female	2(3.6)	4(8.7)	6(5.9)	
	Total	11(9.7)	12(10.3)	23(10.0)	

**Table E 24 Number of respondents coached about medication usage over the past 12 months**

Medication usage follow up	Gender	Asser N=113	Riyadh N= 117	Total N=230	p value
		N (%)	N (%)	N (%)	
Yes	Male	52(89.6)	56(78.9)	108(83.7)	NS
	Female	52(94.5)	34(73.9)	86(85.1)	
	Total	104(92.0)	90(76.9)	194(84.3)	
No	Male	3(5.2)	14(19.7)	17(13.2)	
	Female	3(5.5)	8(17.4)	11(10.9)	
	Total	6(5.3)	22(18.8)	28(12.2)	
Unsure	Male	3(5.2)	1(1.4)	4(3.1)	
	Female	0(0.0)	4(8.7)	4(4.0)	
	Total	3(2.7)	5(4.3)	8(3.5)	

**Table E 25 Number of respondents observed by their health care providers while using their inhaler**

Inhaler observation by health care provider	Gender	Asser*	Riyadh**	Total**	p value
		N=110	N= 116	N=226	
		N (%)	N (%)	N (%)	
Yes	Male	39(67.2)	46(64.8)	85(65.9)	NS
	Female	30(57.7)	32(71.1)	62(63.9)	
	Total	69(62.7)	78(67.2)	147(65.0)	
No	Male	19(32.8)	25(35.2)	44(34.1)	
	Female	22(42.3)	13(28.9)	35(36.1)	
	Total	41(37.3)	38(32.8)	79(35.0)	

\*Three data missing

\*\*One data missing

\*\*\* Four data missing

**Table E 26 Number of patients able to administer medicine as directed**

Patients believe they can administer their medication as directed	Gender	Asser	Riyadh	Total	p value
		N= 113	N=117	N= 230	
		N (%)	N (%)	N (%)	
yes	Male	52(89.6)	61(85.9)	113(87.5)	NS
	Female	51(92.7)	36(78.3)	87(86.1)	
	Total	103(91.2)	97(82.9)	200(87.0)	
No	Male	3(5.2)	7(9.9)	10(7.8)	
	Female	1(1.8)	8(17.4)	9(8.9)	
	Total	4(3.5)	15(12.8)	19(8.3)	
unsure	Male	3(5.2)	3(4.2)	6(4.7)	
	Female	3(5.5)	2(4.3)	5(5.0)	
	Total	6(5.3)	5(4.3)	11(4.8)	

**Table E 27 Respondents' perceptions about medication effectiveness**

Medicine(s) usefulness: patients' beliefs	Gender	Asser	Riyadh*	Total*	p value
		N=113	N=115	N=228	
		N (%)	N (%)	N (%)	NS
Yes	Male	36(62.1)	40(57.1)	76(59.3)	
	Female	45(81.8)	29(64.5)	74(74.0)	
	Total	81(71.7)	69(60.0)	150(65.8)	
No	Male	5(8.6)	11(15.7)	16(12.5)	
	Female	3(5.5)	6(13.3)	9(9.0)	
	Total	8(7.1)	17(14.8)	25(11.0)	
Unsure	Male	17(29.3)	19(27.2)	36(28.2)	
	Female	7(12.7)	10(22.2)	17(17.0)	
	Total	24(21.2)	29(25.2)	53(23.2)	

\*Two data missing

**Table E 28 Patients' and their families' self-efficacy**

Patients' and their families' self-efficacy	Gender	Regions			P value
		Asser	Riyadh	Total	
		112	114		
		N (%)	N (%)	N (%)	NS
High self-efficacy	Male	31 (53.4)	33 (47.1)	64 (50.0)	
No (%)	Female	37(68.5)	19 (43.2)	56 (57.1)	
Good	Male	17 (29.3)	18 (25.7)	35 (27.3)	
	Female	11 (20.4)	12 (27.3)	23 (23.5)	
	Total				
Low	Male	7 (12.1)	14 (20.0)	21 (16.4)	
	Female	4 (7.4)	8 (18.2)	12 (12.2)	
Poor	Male	3 (5.2)	5 (7.1)	8 (6.3)	
	Female	2 (3.7)	5 (11.4)	7 (7.1)	

\*One data missing

\*\*Three data missing

\*\*\* Four data missing

**Table E 29 Patients' and their families' behaviours/ attitudes**

Patients' and their families' behaviours/ attitudes	Gender	Asser	Riyadh	Total	P value
		N=113	N=117	N=230	
		N (%)	N (%)	N (%)	
No barrier	Male	14 (24.1)	19 (26.8)	33 (25.6)	NS
	Female	16 (29.1)	8 (17.4)	24 (23.8)	
	Total	30 (26.5)	27 (23.1)	57 (24.7)	
One barrier	Male	31 (53.4)	41 (57.7)	72 (55.8)	
	Female	33 (60.0)	26 (56.5)	59 (58.4)	
	Total	64 (56.6)	67(52.3)	131(57.0)	
Two barriers	Male	13 (22.4)	11 (15.5)	24 (18.6)	
	Female	6 (10.9)	12 (26.1)	18 (17.8)	
	Total	19(16.8)	23 (19.7)	42 (18.3)	

**Table E 30 Patients' asthma control levels**

Asthma control level	Asser		Riyadh		Total		P value
	Male (58) No (%)	Female (55) N (%)	Male (71) No (%)	Female (46) N (%)	Male (129) No (%)	Female (101) N (%)	
Well controlled	14 (24.1)	10 (18.20)	4 (5.6)	5 (10.9)	18 (14.0)	15 (14.9)	NS
One control problem	8(13.8)	11 (20.0)	8 (11.3)	5 (10.9)	16 (12.4)	16 (15.8)	
Two control problems	9 (15.5)	16 (29.1)	18 (25.4)	6 (13.0)	27 (20.9)	22 (21.8)	
Three control problems	7 (12.1)	9 (16.4)	17 (23.9)	9 (19.6)	24 (18.6)	18 (17.8)	
Four control problems	12 (20.7)	4 (7.3)	13 (18.3)	10 (21.7)	25 (19.4)	14 (13.9)	
Five control problems	4 (6.9)	2 (3.6)	5 (7.0)	8 (17.4)	9 (7.0)	10 (9.9)	
Six control problems	4 (6.9)	2 (3.6)	5 (7.0)	3 (6.5)	9 (7.0)	5 (5.0)	
Poor control	0 (0.00)	1 (0.9)	1 (1.4)	0 (0.00)	1 (0.8)	1 (1.00)	

**Table E 31 Patients' and their health care providers' communication levels**

Communication level	Asser (113)		Riyadh (115)		Total (228)		P value
	Male (58) No (%)	Female (55) N (%)	Male (70) N (%)	Female (45) N (%)	Male (128) N (%)	Female (100) N (%)	
Poor	35 (60.3)	30 (54.5)	28 (40.0)	22 (48.9)	63 (49.2)	52 (52.0)	NS
Low	9(15.5)	15 (27.3)	19 (27.1)	9 (20.0)	28 (21.9)	24 (24.0)	
Fair	6 (10.3)	6 (10.9)	9 (12.9)	5 (11.1)	15 (11.7)	11 (11.0)	
Medium	6 (10.3)	1 (1.8)	4 (5.7)	2 (4.4)	10 (7.8)	3 (3.0)	
Good	1 (1.7)	0 (0.00)	5 (7.1)	3 (6.7)	6 (4.7)	3 (3.0)	
High	1 (1.7)	3 (5.5)	5 (7.1)	4 (8.9)	6 (4.7)	7 (7.0)	

## Appendix F: Phase Two Results (Physicians)

This appendix reflects the association between asthma management's aspects and gender.

### Section 1: Patient education strategies

**Table F 1 Asthma: general information**

What is your usual approach to providing general information about asthma (e.g. structure of the respiratory system, mechanisms of asthma, inflammation, common triggers) to patients?		Asser N=43 (30 Male and 13 female)			Riyadh N=44 (26 Male and 18 female)			Total N=87 (56 Male and 31 female)		
	Gender	Asthma severity			Asthma severity			Asthma severity		
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Male	0 (0.0)	0 (0.0)	0 (0.0)	2 (7.7)	1 (3.8)	1 (3.8)	2 (3.6)	1 (1.8)	1 (1.8)
	Female	1 (7.7)	0 (0.0)	1 (7.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.2)	0 (0.0)	1 (3.2)
	Total	1 (2.3)	0 (0.0)	1 (2.3)	2 (4.5)	1 (2.3)	1 (2.3%)	3 (3.4)	1 (1.1)	2 (2.3)
I provide this information only if the patient asks	Male	7 (23.3)	4 (13.3)	1 (3.3)	2 (7.7)	2 (7.7)	0 (0.0)	9 (16.1)	6 (10.7)	1 (1.8)
	Female	3 (23.1)	1 (7.7)	0 (0.0)	9 (50.0)	4 (22.2)	3 (16.7)	12 (38.7)	5 (16.1)	3 (9.7)

	Total	10 (23.3)	5 (11.6)	1 (2.3)	11 (25.0)	6 (13.6)	3 (6.8)	21 (24.1)	11 (12.6)	4 (4.6)
I provide this information without waiting for the patient to ask.	Male	23 (76.7)	26 (86.7)	29 (96.7)	22 (84.6)	23 (88.5)	25 (96.2)	45 (80.4)	49 (87.5)	54 (96.4)
	Female	9 (69.2)	12 (92.3)	12 (92.3)	9 (50.0)	14 (77.8)	15 (83.3)	18 (58.1)	26 (83.9)	27 (87.1)
	Total	32 (74.4%)	38 (88.4)	41 (95.4)	31 (70.5)	37 (84.1)	40 (90.9)	63 (72.4)	75 (86.2)	81 (93.1)
Difference between Gender p value		0.305	0.596	0.252	0.004	0.289	0.074	0.060	0.593	0.216
Difference between Region p value	----	----	----	----	----	----	----	0.825	0.579	0.606

**Table F 2 Asthma medication prescribed information**

Q		Asser N=43 (30 Male and13 female)			Riyadh N=44 (26 Male and18 female)			Total N=87 (56Male and 31 female)		
What is your usual approach to providing information about prescribed asthma medication (e.g. mode of action, proper dose, side effects) to patients?	Gender	Asthma Severity			Asthma Severity			Asthma Severity		
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Male	0 (0.0)	0 (0.0)	1 (3.3)	2 (7.7)	0 (0.0)	0 (0.0)	2 (3.6)	0 (0.0)	1 (1.8)
	Female	0 (0.0)	0 (0.0)	1 (7.7)	2 (11.1)	1(5.6)	1(5.6)	2 (6.5)	1 (1.1%)	2 (6.5)
	Total	0 (0.0)	0 (0.0)	2 (4.7)	4 (9.1)	1(2.3)	1(2.3)	4 (4.6)	1 (1.1%)	3 (3.4)
I provide this information only if the patient asks	Male	10(33.3)	5(16.7)	2 (6.7)	9(34.6)	9(34.6)	6 (23.1)	19 (33.9)	14 (16.1%)	8 (14.3)
	Female	3 (23.1)	0 (0.0)	0 (0.0)	6 (33.3)	4 (22.2)	2 (11.1)	9 (29.0)	4 (4.6%)	2 (6.5)
	Total	13 (30.3)	5 (11.6)	2 (4.7)	15 (34.1)	13 (29.5)	8 (18.2)	28 (32.2)	18 (20.7%)	10 (11.5)
I provide this information without waiting for the patient to ask.	Male	20 (66.7)	25 (83.3)	27 (90.0)	15 (57.7)	17 (65.4)	20 (76.9)	35 (62.5)	42 (48.3%)	47 (83.9)
	Female	10 (76.9)	13 (100.0)	12 (92.3)	10 (55.6)	13 (72.2)	15 (83.3)	20 (64.5)	26 (29.9%)	27 (87.1)
	Total	30 (69.7)	38 (88.4%)	39 (90.7)	25 (56.8)	30 (68.2)	35 (79.5)	55 (63.2)	68 (78.2%)	74 (85.1)
Difference in Gender p value		0.501	0.117	0.537	0.928	0.355	0.311	0.770	0.181	0.309
Difference in Region p value	----	----	----	----	----	----	----	0.101	0.064	0.126

**Table F 3 Demonstrating the proper use of inhalation devices**

Q		Asser N=43 (30 Male and13 female)			Riyadh N=44 (26 Male and18 female)			Total N=87 (56 Male and31 female)		
What is your usual approach to demonstrating the proper use of inhalational device (e.g. metered dose inhaler, spacer device, turbuhaler) to patients?	Gender	Asthma Severity			Asthma Severity			Asthma Severity		
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Male	1 (3.3)	0 (0.0)	1 (3.3)	1(3.8)	0 (0.0)	0 (0.0)	2 (3.6)	0 (0.0)	1 (1.8)
	Female	1 (7.7)	0 (0.0)	1 (7.7)	1(5.6)	1(5.6)	1(5.6)	2 (6.5)	1 (3.2)	2 (6.5)
	Total	2 (4.7%)	0 (0.0)	2 (4.7)	2 (4.5)	1(2.3)	1(2.3)	4 (4.6)	1 (1.1)	3 (3.4)
I provide this information only if the patient asks	Male	2 (6.7)	1 (3.3)	2 (6.7)	6 (23.1)	4 (15.4)	2 (7.7)	8 (14.3)	5 (8.9)	4 (7.1)
	Female	3 (23.1)	2 (15.4)	1 (7.7)	5 (27.8)	2 (11.1)	2 (11.1)	8 (25.8)	4 (12.9)	3 (9.7)
	Total	5(11.6)	3 (7.0)	3 (7.0)	11 (25.0)	6 (13.6)	4 (9.1)	16 (18.4)	9 (10.3)	7 (8.0)
I provide this information without waiting for the patient to ask.	Male	27 (90.0)	29 (96.7)	27 (90.0)	19 (73.1)	22 (84.6)	24 (92.3)	46 (82.1)	51 (91.1)	51 (91.1)
	Female	9 (69.2)	11 (84.6)	11 (84.6)	12 (66.7)	15 (83.3)	15 (83.3)	21 (67.7)	26 (83.9)	26 (83.9)
	Total	36 (83.7)	40 (93.0)	38 (88.3)	31 (70.5)	37 (84.1)	39 (88.6)	67 (77.0)	77 (88.5)	77 (88.5)
Difference in Gender p value		0.230	0.154	0.813	0.894	0.452	0.432	0.311	0.328	0.464
Difference in Region p value		----	----	----	----	----	----	0.271	0.349	0.788

**Table F 4 Information about asthma triggers**

Q		Asser N=43 (30 Male and13 female)			Riyadh N=44 (26 Male and18 female)			Total N=87 (56 Male and31 female)		
What is your usual approach to providing information on avoidance of asthma triggers and environmental control (e.g. control of house dust mites, mould, etc.....) to patients?	Gender	Asthma Severity			Asthma Severity			Asthma Severity		
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Male	0 (0.0)	0 (0.0)	1 (3.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.8)
	Female	0 (0.0)	0 (0.0)	1 (7.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.2)
	Total	0 (0.0)	0 (0.0)	2 (4.7%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (2.3%)
I provide this information only if the patient asks	Male	2 (6.7)	2 (6.7)	0 (0.0)	2 (7.7)	3 (11.5)	2 (7.7)	4 (7.1)	5 (8.9)	2 (3.6)
	Female	1 (7.7)	0 (0.0)	0 (0.0)	2 (11.1)	1(5.6)	1(5.6)	3 (9.7)	1 (3.2)	1 (3.2)
	Total	3 (7.0)	2 (4.7)	0 (0.0)	4 (9.1)	4 (9.1)	3 (6.8)	7 (8.0)	6 (6.9)	3 (3.4)
I provide this information without waiting for the patient to ask	Male	28 (93.3)	28 (93.3)	29 (96.7)	24 (92.3)	23 (88.5)	24 (92.3)	52 (92.9)	51 (91.1)	53 (94.6)
	Female	12 (92.3)	13 (100.0)	12 (92.3)	16 (88.9)	17 (94.4)	17 (94.4)	28 (60.3)	30 (96.8)	29 (93.5)
	Total	40 (93.0)	41 (95.3)	41 (95.3)	40 (90.9)	40 (90.9)	41 (93.2)	80 (92.0)	81 (93.1)	82 (94.3)
Difference in Gender p value		0.903	0.340	0.533	0.698	0.497	0.782	0.677	0.316	0.910
Difference in Region p value		----	----	----	----	----	----	0.717	0.414	0.083

**Table F 5 Asthma warning sign information**

Q		Asser N=43 (30 Male and13 female)			Riyadh N=44 (26 Male and18 female)			Total N=87 (56 Male and31 female)		
What is your usual approach to providing information on the warning signs of worsening or uncontrolled asthma to patients?	Gender	Asthma Severity			Asthma Severity			Asthma Severity		
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Male	1 (3.3)	0 (0.0)	0 (0.0)	5 (19.2)	1(3.8)	1(3.8)	6 (10.7)	1 (1.8)	1 (1.8)
	Female	0 (0.0)	0 (0.0)	0 (0.0)	4 (22.2)	5 (27.7)	4 (22.2)	4 (12.9)	5 (16.1)	4 (12.9)
	Total	1 (2.3)	0 (0.0)	0 (0.0)	9 (20.5%)	6 (13.6)	5 (11.4%)	10 (11.5)	6 (6.9)	5 (5.7)
I provide this information only if the patient asks	Male	10 (33.3)	5(16.7)	0 (0.0)	4 (15.4)	3 (11.5)	2 (7.7)	14 (25.0)	8 (14.3)	2 (3.6)
	Female	3 (23.1)	0 (0.0)	1 (7.7)	6 (33.3)	1(5.6)	0 (0.0)	9 (29.0)	1 (3.2)	1 (3.2)
	Total	13 (30.2)	5(11.6)	1 (2.3)	10 (22.7)	4 (9.1)	2 (4.5)	23 (26.4)	9 (10.3)	3 (3.4)
I provide this information without waiting for the patient to ask.	Male	19 (63.3)	25 (83.3)	30 (100.0)	17 (65.4)	22 (84.6)	23 (88.5)	36 (64.3)	47 (83.9)	53 (94.6)
	Female	10 (76.9)	13 (100.0)	12 (92.3)	8 (44.4)	12 (66.7)	14 (77.8)	18 (58.1)	25 (80.6)	26 (83.9)
	Total	29 (67.4)	38 (88.4)	42 (97.7)	25 (56.8)	34 (77.3)	37(84.1)	54 (62.1)	72 (82.8)	79 (90.8)
Difference in Gender p value		0.607	0.117	0.124	0.305	0.070	0.096	0.848	0.015	0.103
Difference in Region p value		----	----	----	----	----	----	0.029	0.042	0.060

**Table F 6 Asthma action plans based upon symptom information**

What is your usual approach to providing an asthma action plan based upon symptoms (e.g. written plan that outlines steps to control/regain control of asthma including changing dose of drug)?	**Asser N=43 (30 male and 13 female)			Riyadh N=44 (26 male and 18 female)			*Total N=87 (56 male and 31 female)			
	Gender	Asthma Severity			Asthma Severity			Asthma Severity		
		Mild N (%)	Moderate N (%) *N=42	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%) *	Mild N (%)	Moderate N (%) N=86*	Severe N (%)
I do not provide this information	Male	4 (13.3)	2 (6.7)	2 (6.7)	10 (38.5)	5 (19.2)	3 (11.5)	14 (25.0)	7 (12.5)	5 (8.9)
	Female	2 (15.4)	1 (8.3)	2 (15.4)	9 (50.0)	7 (38.9)	6 (33.3)	11 (35.5)	8 (26.7)	8 (25.8)
	Total	6 (14.0%)	3 (7.1%)	4 (9.3%)	19 (43.2%)	12 (27.3%)	9 (20.5%)	25 (28.7)	15 (17.4)	13 (14.9)
I provide this information only if the patient asks	Male	14 (46.7)	7 (23.3)	4 (13.3)	7 (29.9)	9 (43.6)	8 (30.8)	21 (37.5)	16 (28.6)	12 (21.4)
	Female	7 (53.3)	4 (33.3)	2 (15.4)	2 (11.1)	3 (16.7)	0 (0.0%)	9 (29.0)	7 (23.3%)	2 (6.5)
	Total	21 (48.8)	11 (26.2)	6 (14.0)	9 (20.5)	12 (27.3)	8 (18.2)	30 (34.5%)	23 (26.7%)	14 (16.1%)
I provide this information without waiting for the patient to ask.	Male	12 (40)	21 (70.0)	24 (80.0)	9 (34.6)	12 (46.2)	15 (57.7)	21 (37.5)	33 (58.9)	39 (69.6)
	Female	4 (30.8)	7 (58.3)	9 (69.2)	7 (38.9)	8 (44.4)	12 (66.7)	11 (35.5)	15 (50.0)	21 (67.7)
	Total	16 (37.2)	28 (66.7)	33 (76.7)	16 (36.4)	20 (45.5)	27 (61.4)	32 (36.8%)	48 (55.8%)	60 (69.0%)
Difference in Gender p value		0.848	0.765	0.636	0.431	0.250	0.017	0.549	0.256	0.037
Difference in Region p value	----	----	----	----	----	----	----	0.003	0.034	0.247

\* One datum missing (Asser Moderate)

**Table F 7 Peak flow monitoring**

Q		Asser N=43(30 Male and13 female)			Riyadh N=44 (26 Male and18 female)			Total N=87(56 Male and31 female)			
What is your usual approach to providing information about monitoring peak flow rates (e.g. purpose, purpose use of peak flow meters and proper recording of peak flow rates) to patients?	Gender	Asthma Severity			Asthma Severity			Asthma Severity			
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	
I do not provide this information	Male	6 (20.0)	4 (13.3)	3 (10.0)	8 (30.8)	7 (26.9)	6 (23.1)	14 (25.0)	11 (19.6)	9 (16.1)	
	Female	3 (23.1)	1 (7.7)	1 (7.7)	11 (61.1)	7 (38.9)	6 (33.3)	14 (45.2)	8 (25.8)	7 (22.6)	
	Total	9 (20.9)	5(11.6)	4 (9.3)	19 (43.2)	14 (31.8)	12 (27.3)	28 (32.2)	19 (21.8)	16 (18.4)	
I provide this information only if the patient asks	Male	11 (36.7)	3 (10.0)	4 (13.3)	9 (34.6)	6 (23.1)	4 (15.4)	20 (35.7)	9 (16.1)	8 (14.3)	
	Female	4 (30.8)	3 (23.1)	3 (23.1)	4 (22.2)	8 (44.4)	6 (33.3)	8 (25.8)	11 (35.5)	9 (29.0)	
	Total	15 (34.9)	6 (14.0)	7 (16.3)	13 (29.5)	14 (31.8)	10 (22.7)	28 (32.2)	20 (23.0)	17 (19.5)	
I provide this information without waiting for the patient to ask.	Male	13 (43.3)	23 (76.7)	23 (76.7)	9 (34.6)	13 (50.0)	16 (61.5)	22 (39.3)	36 (64.3)	39 (69.6)	
	Female	6 (46.2)	9 (69.2)	9 (69.2)	3 (16.7)	3 (16.7)	6 (33.3)	9 (29.0)	12 (38.7)	15 (48.4)	
	Total	19 (44.2)	32 (74.4)	32 (74.4)	12 (27.3)	16 (36.4)	22 (50.0)	31(35.6)	48 (55.2)	54 (62.1)	
Difference in Gender p value			0.929	0.490	0.723	0.130	0.072	0.164	0.156	0.050	0.127
Difference in Region p value		_ ----	----	----	----	----	----	----	0.071	0.002	0.041

**Table F 8 Asthma action plan based upon peak exploratory flow rates in conjunction with symptoms**

What is your usual approach to providing an asthma action plan that is based upon peak exploratory flow rates in conjunction with symptoms (e.g. written plan that outlines steps to control asthma) to patients?		Asser N=43 (30 Male and13 female)			Riyadh N=44 (26 Male and18 female)			Total N=87 (56Male and 31 female)		
	Gender	Asthma Severity			Asthma Severity			Asthma Severity		
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%) *	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%) N=86
I do not provide this information	Male	7 (23.3)	7 (23.3)	7 (23.3)	11 (42.3)	6 (23.1)	4 (15.4)	18 (32.1)	13 (23.2)	11 (19.6)
	Female	2 (15.4)	1 (7.7)	2 (15.4)	12 (66.7)	11 (61.1)	10 (58.8)	14 (45.2)	12 (38.7)	12 (40.0)
	Total	9 (20.9)	8 (18.6)	9 (20.9)	23 (52.3)	17 (38.6)	14 (32.6)	32 (36.8)	25 (28.7)	23 (26.7)
I provide this information only if the patient asks	Male	11 (36.7)	5(16.7)	3 (10.0)	6 (23.1)	10 (38.5)	7 (26.9)	17 (30.4)	15 (26.8)	10 (17.9)
	Female	4 (30.8)	3 (23.1)	2 (15.4)	5 (27.8)	3 (16.7)	2 (11.8)	9 (29.0)	6 (19.4)	4 (13.3)
	Total	15 (34.9)	8 (18.6)	5(11.6)	11 (25.0)	13 (29.5)	9 (20.9)	26 (29.9)	21( 24.1)	14 (16.3)
I provide this information without waiting for the patient to ask.	Male	12 (40.0)	18 (60.0)	20 (66.7)	9 (34.6)	10 (38.5)	15 (57.7)	21( 37.5)	28 (50.0)	35 (62.5)
	Female	7 (53.8)	9 (69.2)	9 (69.2)	1(5.6)	4 (22.2)	5 (29.4)	8 (25.8)	13 (41.9)	14 (46.6)
	Total	19 (44.2)	27 (62.8)	29 (67.4)	10 (22.7)	14 (31.8)	20 (46.5)	29 (33.3%)	41 (47.1%)	49 (57.0%)
Difference in Gender p value		0.685	0.469	0.775	0.072	0.037	0.012	0.417	.301	0.127
Difference in Region p value	----	----	----	----	----	----		0.009	0.041	0.143

\* One datum missing (Riyadh severe )

**Table F 9 Information about community non-profit organizations**

Q		Asser N=43 (30 Male and13 female)			Riyadh N=44 (26 Male and18 female)			Total N=87 (56 Male and31 female)		
What is your usual approach to providing information about community non-profit organizations that provide further information about asthma (e.g. The National Scientific Committee of Bronchial Asthma ) to patients?	Gender	Asthma Severity			Asthma Severity			Asthma Severity		
		Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)	Mild N (%)	Moderate N (%)	Severe N (%)
I do not provide this information	Male	8 (26.7)	7 (23.3)	7 (23.3)	12 (46.2)	9 (34.6)	7 (26.9)	20 (35.7)	16 (28.6)	14 (25.0)
	Female	3 (23.1)	2 (15.4)	2 (15.4)	11 (61.1)	10 (55.6)	10(55.6)	14 (45.2)	12 (38.7)	12 (38.7)
	Total	11 (25.6)	9 (20.9)	9 (20.9)	23 (52.3)	19 (43.2)	17 (38.6)	34 (39.1)	28 (32.2)	26 (29.9)
I provide this information only if the patient asks	Male	17 (56.7)	16 (53.3)	12 (40.0)	8 (30.8)	7 (26.9)	8 (30.8)	25 (44.6)	23 (41.1)	20 (35.7)
	Female	3 (23.1)	4 (30.8)	3 (23.1)	4 (22.2)	2 (11.1)	1(5.6)	7 (22.6)	6 (19.4)	4 (12.9)
	Total	20 (46.5)	20 (46.5)	15 (34.9)	12 (27.3)	9 (20.5)	9 (20.5)	32 (36.8)	29 (33.3)	24 (27.6)
I provide this information without waiting for the patient to ask.	Male	5(16.7)	7 (23.3)	11 (36.7)	6 (23.1)	10 (38.5)	11 (42.3)	11 (19.6)	17 (30.4)	22 (39.3)
	Female	7 (53.8)	7 (53.8)	8 (61.5)	3 (16.7)	6 (33.3)	7 (38.9)	10 (32.3)	13 (41.9)	15 (48.4)
	Total	12 (27.9)	14 (32.6)	19 (44.2)	9 (20.5)	16 (36.4)	18 (40.9)	21( 24.1)	30 (34.5)	37 (42.5)
Difference in Gender p value		0.034	0.145	0.319	0.621	0.293	0.061	0.110	0.120	0.067
Difference in Region p value		- ----	----	----	----	----	----	0.036	0.020	0.137

## Section 2: Treatment

**Table F 10 Vignette A**

Potential action	Female N =31		Male N=56		Total N=87		p value
	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	
Start an inhaled $\beta_2$ agonist	1(3.2)	30(96.8)	8(14.3)	48(85.7)	9(10.3)	78(89.7)	0.105
Start inhaled Atrovent (ipratropium bromide)	28(90.3)	3(9.7)	49(87.5)	7(12.5)	10(11.5)	10(11.5)	0.693
Start an inhaled corticosteroid	23(74.2)	8(25.8)	50(89.3)	6(10.7)	73(83.9)	14(16.1)	0.067
Add a non-steroid anti- inflammatory	25(80.6)	6(19.4)	44(78.6)	12(21.4)	69(79.30)	18(20.7)	0.819
Start an oral theophylline	29(93.5)	2(6.5)	51(91.1)	5(8.9)	80(92.0)	7(8.0)	0.684
Start oral corticosteroid	30(96.8)	1(3.2)	53(94.6)	3(5.4)	83(95.4)	4(4.6)	0.649
Wait and see (no medication needed at this time)	22(71.0)	9(29.0)	46(82.1)	10(17.9)	68(78.2)	19(21.8)	0.227
Outpatient visit (e.g. same day office visit or refer to Emergency Department)	21(67.7)	10(32.3)	49(87.5)	7(12.5)	70(80.5)	17(19.5)	0.026

**Table F 11 Vignette B**

Potential action	Female N =31		Male N=56		Total N=87		p value
	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	13(42)	18(58)	28(50.0)	28(50.0)	41(47.1)	46(52.9)	NS
Start inhaled Atrovent (ipratropium bromide)	22(71.0)	9(29.0)	39(69.6)	17(30.4)	61(70.1)	26(29.9)	NS
Start an inhaled corticosteroid	5(16.1)	26(83.9)	16(28.6)	40(71.4)	21(24.1)	66(75.9)	NS
Add a non- steroid anti- inflammatory	27(87.1)	4(12.9)	48(85.7)	8(14.3)	75(86.2)	12(13.8)	NS
Start an oral theophylline	29(93.5)	2(6.5)	49(87.5)	7(12.5)	78(89.7)	9(10.3)	NS
Start oral corticosteroid	28(90.3)	3(9.7)	50(89.3)	6(10.7)	78(89.7)	9(10.3)	NS
Wait and see (no medication needed at this time)	25(80.6)	6(19.4)	51(91.1)	5(8.9)	76(87.4)	11(12.6)	NS
Outpatient visit (e.g. same day office visit or refer to Emergency Department)	16(51.6)	15(48.4)	41(73.2)	15(26.8)	57(65.5)	30(34.5)	0.042

**Table F 12 Vignette C**

Potential action	Female N =31		Male N=56		Total N=87		p value
	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	23(74.2)	8(25.8)	38(67.9)	18(32.1)	61(70.1)	26(29.9)	Ns
Start inhaled Atrovent (ipratropium bromide)	13(41.9)	18(58.1)	26(46.4)	30(53.6)	39(44.8)	48(55.2)	Ns
Start an inhaled corticosteroid	1(3.2)	30(96.8)	9(16.1)	47(83.9)	10(11.5)	77(88.5)	0.072
Add a non-steroid anti-inflammatory	22(71.0)	9(29.0)	44(78.6)	12(21.4)	66(75.9)	21(24.1)	Ns
Start an oral theophylline	23(74.2)	8(25.8)	35(62.5)	21(37.5)	58(66.7)	29(33.3)	Ns
Start oral corticosteroid	20(64.5)	11(35.5)	35(62.5)	21(37.5)	55(63.2)	32(36.8)	Ns
Wait and see (no medication needed at this time)	28(90.3)	3(9.7)	53(94.6)	3(5.4)	81(93.1)	6(6.9)	Ns
Outpatient visit (e.g. same day office visit or refer to Emergency Department)	10(32.3)	21(67.7)	25(44.6)	31(55.4)	35(40.2)	52(59.8)	Ns

**Table F 13 Vignette D**

Potential action	Female N =31		Male N=56		Total N=87		p value
	Not recommend N(%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	13(41.9)	18(58.1)	25(44.6)	31(55.4)	38(43.7)	49(56.3)	NS
Start inhaled Atrovent (ipratropium bromide)	12(38.7)	19(61.3)	18(32.1)	38(67.9)	30(34.5)	57(65.5)	NS
Start an inhaled corticosteroid	5(16.1)	26(83.9)	14(25.0)	42(75.0)	19(21.8)	68(78.2)	NS
Add a non- steroid anti- inflammatory	26(83.9)	5(16.1)	47(83.9)	9(16.1)	73(83.9)	14(16.1)	NS
Start an oral theophylline	24(77.4)	7(22.6)	37(66.1)	19(33.9)	61(70.1)	26(29.9)	NS
Start oral corticosteroid	8(25.8)	23(74.2)	28(50.0)	28(50.0)	36(41.4)	51(58.6)	0.028
Wait and see (no medication needed at this time)	30(96.8)	1(3.2)	52(92.9)	4(7.1)	82(94.3)	5(5.7)	NS
Outpatient visit (e.g. Same day office visit or refer to Emergency Department)	8(25.8)	23(74.2)	11(19.6)	45(80.4)	19(21.8)	68(78.2)	NS

**Table F 14 Vignette E**

Potential action	Female N =31		Male N=56		Total N=87		p value
	Not recommend N(%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	16(51.6)	15(48.4)	22(39.3)	34(60.7)	38(43.7)	49(56.3)	NS
Start inhaled Atrovent (ipratropium bromide)	17(54.8)	14(45.2)	25(44.6)	31(55.4)	42(48.3)	45(51.7)	NS
Increase an inhaled corticosteroid	11(35.5)	20(64.5)	21(37.5)	35(62.5)	32(36.8)	55(63.2)	NS
Add a non- steroid anti- inflammatory	20(64.5)	11(35.5)	37(66.1)	19(33.9)	57(65.5)	30(34.5)	NS
Start an oral theophylline	25(80.6)	6(19.4)	35(62.5)	21(37.5)	60(69.0)	27(31.0)	0.080
Start oral corticosteroid	18(58.1)	13(41.9)	33(58.9)	23(41.1)	51(58.6)	36(41.4)	NS
Wait and see no medication needed at this time)	27(87.1)	4(12.9)	48(85.7)	8(14.3)	75(86.2)	12(13.8)	NS
Outpatient visit (e.g. same day office visit or refer to Emergency Department)	22(71.0)	9(29.0)	28(50.0)	28(50.0)	50(57.5)	37(42.5)	0.058

**Table F 15 Vignette F**

Potential action	Female N =31		Male N=56		Total N=87		p value
	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	Not recommend N (%)	Recommend N (%)	
Increase current use of the inhaled $\beta_2$ agonist	15(48.4)	16(51.6)	31(55.4)	25(44.6)	46(52.9)	41(47.1)	NS
Start inhaled Atrovent (ipratropium bromide)	21(67.7)	10(32.3)	34(60.7)	22(39.3)	55(63.2)	32(36.8)	NS
Increase an inhaled corticosteroid	12(38.7)	19(61.3)	30(53.6)	26(46.4)	42(48.3)	45(51.7)	NS
Add a non-steroid anti- inflammatory	21(67.7)	10(32.3)	37(66.1)	19(33.9)	58(66.7)	29(33.3)	NS
Start an oral theophylline	26(83.9)	5(16.1)	42(75.0)	14(25.0)	68(78.2)	19(21.8)	NS
Start oral corticosteroid	26(83.9)	5(16.1)	49(87.5)	7(12.5)	75(86.2)	12(13.8)	NS
Antibiotics	19(61.3)	12(38.7)	38(67.9)	18(32.1)	57(65.5)	30(34.5)	NS
Wait and see (no medication needed at this time)	25(80.6)	6(19.4)	49(87.5)	7(12.5)	74(85.1)	13(14.9)	NS
Outpatient visit (e.g. same day office visit or refer to Emergency Department )	19(61.3)	12(38.7)	40(71.4)	16(28.6)	59(67.8)	28(32.2)	NS

### Section 3: Patients'/ carers' involvement

**Table F 16 Usual practices regarding patients' involvement in decision-making**

Region	Asser			Riyadh			Total		
Gender	Male N=30	Female N=13	Total N=43	Male N=26	Female N=18	Total N=44	Male N=56	Female N=31	Total N=87
Usually, in your practice, to what extent does the average patient with asthma get involved with the management decisions about his/her disease?	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
I make the decisions using all that is known about the treatment	12(40)	3(23)	15 (34.9)	13 (50%)	5(27)	18(40.9)	25(44.4)	8(25.8)	33(37.9)
I make the decisions, but strongly consider the patient's opinion	15(10.5)	8(61.5)	23 (53.5)	11 (43.3)	8(44.4)	19(43.2)	26(46.4)	16(51.6)	42(48.3)
The patient and I make the decisions together on an equal basis	1(3.3)	1(7.7)	2 (4.7)	2 (7.7)	3(16.7)	5(11.4)	3(5.4)	4(12.9)	7(8.0)
The patient makes the decisions, but strongly considers my opinion	2(6.7)	0(0.0)	2(4.7)	0(0.0)	2(11.1)	2(4.5)	2(3.6)	2(6.5)	4(4.6)
The patient makes the decisions using all the information he/she knows about the treatments	0(0.0)	1(7.7)	1(2.3)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(3.2)	1(1.1)
Difference in Gender p value	0.341			0.176			0.235		
Difference in Region p value	----			----			0.570		

**Table F 17 Ideal practices regarding patients' involvement in decision making**

Region	Asser			Riyadh			Total		
Gender	Male N=30	Female N=13	Total N=43	Male N=26	Female N=18	Total N=44	Male N=56	Female N=31	Total N=87
Ideally, in your practice, to what extent does the average patient with asthma get involved with the management decisions about his/her disease?	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
I make the decisions using all that is known about the treatment	11(36.7)	6(46.2)	17(39.5)	13(50)	4(22.2)	17(38.6)	24(42.9)	10(32.3)	34(39.1)
I make the decisions, but strongly consider the patient's opinion	15(10.5)	5(38.5)	20(46.5)	11(43.3)	9(50.0)	20(45.5)	26(46.4)	14(45.2)	40(46.0)
The patient and I make the decisions together on an equal basis	3(10.0)	2(15.4)	5(11.6)	1(3.8)	4(22.2)	5(11.4)	4(7.1)	6(19.4)	10(11.5)
The patient makes the decisions, but strongly considers my opinion	1(3.3)	0(0.0)	1(2.3)	1(3.8)	1(5.6)	2(4.5)	2(3.6)	1(3.2)	3(3.4)
The patient makes the decisions using all the information he/she knows about the treatments	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0%)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Difference in Gender p value	0.771			0.139			0.395		
Difference in Region p value	----			----			0.956		

## Appendix G: Phase Three Results

### Section 1: IMS Barriers

**Table G 1 Relationship between IMS barriers and both patients' gender and possession of health insurance**

IMS total scores and factors	Gender					Health insurance				
	Male (90)		Female (87)		P	Yes (38)		No (139)		P
	mean	SD	mean	SD		mean	SD	mean	SD	
Total barriers scores	2.24	.43	2.26	.44	0.76	2.32	.47	2.24	.43	0.34
Medication issues factor	1.97	.46	1.98	.49	0.93	2.09	.43	1.94	.48	0.09
Doctor and other relationship factor	1.66	.45	1.70	.44	0.63	1.61	.48	1.69	.43	0.28
Adherence influences factor	2.09	.48	2.01	.46	0.26	2.10	.47	2.04	.47	0.53
Self-efficacy factor	1.75	.53	1.78	.50	0.68	1.94	.45	1.72	.52	0.02
Negativity factor	1.68	.49	1.69	.52	0.90	1.76	.52	1.67	.50	0.30

**Table G 2 Relationship between IMS barriers and possession of both AAP and PFM**

IMS total scores and factors	Possession AAP					Possession PFM					Adherence to PFM use				
	Yes N =56		No / unsure N = 121		P value	Yes N =28		No or unsure N=149		P value	Yes regularly N =8		yes irregularly N =20		P value
	mean	SD	mean	SD		mean	SD	mean	SD		mean	SD			
Total barriers	2.25	.44	2.26	.44	0.93	2.40	.50	2.23	.42	0.07	2.63	.52	2.30	.47	0.12
Medication issues factor	1.96	.46	1.98	.48	0.80	2.01	.54	1.97	.46	0.69	2.00	.53	2.00	.56	0.97
Doctor and other relationship factor	1.57	.44	1.73	.44	0.02	1.78	.37	1.66	.45	0.19	1.64	.43	1.83	.35	0.24
Adherences influences factor	2.10	.50	2.03	.46	0.36	2.15	.46	2.03	.47	0.22	2.33	.52	2.08	.43	0.20
Self-efficacy factor	1.71	.51	1.8	.50	0.03	1.90	.48	1.74	.51	0.117	1.97	.59	1.88	.45	0.7
Negativity factor	1.67	.55	1.70	.49	0.69	1.81	.30	1.66	.49	0.16	2.25	.67	1.64	.48	0.01

**Table G 3 Relationship between IMS barriers and inhaled ICS**

IMS total scores and factors	Inhaled ICS					Adherence to ICS use				
	Yes N =118		No / unsure N = 59		P value	Daily use N =36		Irregular use N =82		P value
	mean	SD	mean	SD		mean	SD	mean	SD	
Total barriers	2.20	.40	2.36	.48	0.04	2.08	.28	2.26	.44	0.01
Medication issues factor	2.02	.46	1.87	.48	0.04	1.81	.43	2.11	.45	0.001
Doctor and other relationship factor	1.62	.44	1.78	.44	0.02	1.48	.44	1.68	.42	0.02
Adherences influences factor	2.06	.45	2.05	.50	0.87	2.12	.50	2.03	.43	0.39
Self-efficacy factor	1.75	.53	1.79	.47	0.59	1.66	.54	1.79	.52	0.23
Negativity factor	1.68	.49	1.70	.54	0.83	1.63	.49	1.70	.49	0.46

**Table G 4 Relationship between IMS barriers and patient's/ carers' beliefs**

IMS total scores and factors	Medications useful					Decision making involvement					Adequate of information				
	Yes N =109		No / unsure N= 68		P	Yes N =99		No / unsure N = 78		P	Yes N =66		No / unsure N = 111		P
	mean	SD	mean	SD		mean	SD	mean	SD		mean	SD	mean	SD	
Total barriers	2.17	.38	2.38	.49	0.003	2.18	.39	2.35	.48	0.02	2.24	.43	2.26	.44	0.78
Medication issues factor	1.86	.47	2.14	.42	0.000	1.90	.45	2.07	.48	0.02	1.86	.51	2.04	.44	0.01
Doctor and other relationship factor	1.60	.43	1.8	.43	0.005	1.56	.46	1.82	.37	0.000	1.55	.47	1.75	.41	0.002
Adherences Influences factor	2.02	.48	2.12	.45	0.16	2.10	.47	1.99	.47	0.15	2.02	.51	2.08	.44	0.40
Self-efficacy factor	1.69	.48	1.88	.54	0.02	1.74	.50	1.79	.53	0.60	1.73	.47	1.78	.54	0.58
Negativity factor	1.61	.51	1.81	.48	0.01	1.62	.48	1.78	.53	0.03	1.58	.52	1.75	.49	0.02

**Table G 5 Relationship between IMS barriers and both age groups and household income**

IMS total scores and factors	Age group N=177					Household monthly income N=177				
	Responses	N	Mean	Std. Dev	P	Responses	N	Mean	Std. Dev	P
IMS Total barriers score	5 to less than 10 years	50	53.96	7.84	.76	Less than 5000 SR	80	53.49	7.34	.85
	10 to less than 15 years	43	52.81	7.46		5001- 10000 SR	54	53.09	7.14	
	15 years to less than 18	84	53.55	7.21		10001- 20000 SR	43	53.98	8.04	
Factor a1 Medication issues factor	5 to less than 10 years	50	1.97	.47	.89	Less than 5000 SR	80	1.92	.46	.40
	10 to less than 15 years	43	1.95	.47		5001- 10000 SR	54	2.00	.45	
	15 years to less than 18	84	1.99	.48		10001- 20000 SR	43	2.03	.52	
Factor a2 Doctor and other relationship factor	5 to less than 10 years	50	1.74	.49	.44	Less than 5000 SR	80	1.69	.46	.91
	10 to less than 15 years	43	1.63	.44		5001- 10000 SR	54	1.66	.45	
	15 years to less than 18	84	1.66	.41		10001- 20000 SR	43	1.67	.42	
Factor a3 Adherences influences factor	5 to less than 10 years	50	2.02	.47	.63	Less than 5000 SR	80	2.04	.47	.93
	10 to less than 15 years	43	2.11	.45		5001- 10000 SR	54	2.07	.47	
	15 years to less than 18	84	2.04	.48		10001- 20000 SR	43	2.06	.48	
Factor a4 Self-efficacy factor	5 to less than 10 years	50	1.800	.52	.48	Less than 5000 SR	80	1.75	.53	.31
	10 to less than 15 years	43	1.68	.42		5001- 10000 SR	54	1.70	.53	
	15 years to less than 18	84	1.79	.55		10001- 20000 SR	43	1.86	.45	
factor a5 Negativity factor	5 to less than 10 years	50	1.73	.49	.66	Less than 5000 SR	80	1.74	.51	.33
	10 to less than 15 years	43	1.63	.54		5001- 10000 SR	54	1.61	.45	
	15 years to less than 18	84	1.69	.50		10001- 20000 SR	43	1.68	.56	

**Table G 6 Relationship between IMS barriers and both patients' and parents' education level**

IMS total scores and factors	Responses	Patients' education level N=177				Parents' education level N=1774			
		N	Mean	Std. Dev	P	N	Mean	Std. Dev	P
IMS Total barriers score	Primary school or less	65	53.17	7.75	.87	33	52.82	7.57	.64
	Secondary school	52	53.44	7.68		34	54.44	6.95	
	High school or higher	60	53.87	6.92		107	53.27	7.50	
Factor a1 Medication issues factor	Primary school or less	65	1.96	.49	.62	33	1.89	.56	.59
	Secondary school	52	1.93	.51		34	1.99	.34	
	High school or higher	60	2.027	.42		107	1.99	.48	
Factor a2 Doctor and other relationship factor	Primary school or less	65	1.71	.45	.68	33	1.62	.44	.32
	Secondary school	52	1.63	.43		34	1.77	.43	
	High school or higher	60	1.67	.45		107	1.66	.44	
Factor a3 Adherences Influences factor	Primary school or less	65	2.01	.48	.57	33	2.02	.51	.80
	Secondary school	52	2.07	.46		34	2.02	.47	
	High school or higher	60	2.09	.47		107	2.07	.45	
Factor a4 Self-efficacy factor	Primary school or less	65	1.73	.51	.22	33	1.92	.44	.15
	Secondary school	52	1.87	.50		34	1.76	.62	
	High school or higher	60	1.70	.52		107	1.73	.49	
Factor a5 Negativity factor	Primary school or less	65	1.70	.51	.92	33	1.64	.51	.68
	Secondary school	52	1.66	.49		34	1.74	.467	
	High school or higher	60	1.70	.52		107	1.68	.51	

**Table G 7 (A) Relationship between IMS barriers and asthma severity**

IMS total scores and factors	Asthma severity (self-report) N=177					Average times asthma awakens patients at night (self-report) N =17				
	Responses	N	Mean	Std. Deviation	P	Responses	N	Mean	Std. Deviation	P
IMS Total barriers score	Very Mild	12	53.58	7.56	.55	Not at all	51	52.08	7.21	.30
	Mild	33	53.00	7.45		Less than once a week	65	53.80	7.99	
	Moderate	93	53.01	7.68		Once or twice a week	38	53.53	6.91	
	Severe	39	55.00	6.76		Three or more times a week	21	55.67	7.16	
Factor a1 Medication issues factor	Very Mild	12	1.88	.55	.04	Not at all	51	1.87	.47	.03
	Mild	33	1.87	.40		Less than once a week	65	1.93	.50	
	Moderate	93	1.94	.50		Once or twice a week	38	2.06	.44	
	Severe	39	2.15	.41		Three or more times a week	21	2.21	.47	
Factor a2 Doctor and other relationship	Very Mild	12	1.85	.57	.49	Not at all	51	1.73	.40	.76
	Mild	33	1.70	.43		Less than once a week	65	1.66	.48	
	Moderate	93	1.64	.45		Once or twice a week	38	1.64	.46	
	Severe	39	1.68	.39		Three or more times a week	21	1.64	.41	
Factor a3 Adherences influences factor	Very Mild	12	1.96	.38	.43	Not at all	51	1.84	.43	.001
	Mild	33	1.98	.53		Less than once a week	65	2.18	.49	
	Moderate	93	2.05	.48		Once or twice a week	38	2.11	.45	
	Severe	39	2.15	.41		Three or more times a week	21	2.11	.39	
Factor a4 Self-efficacy factor	Very Mild	12	1.90	.45	.49	Not at all	51	1.74	.50	.59
	Mild	33	1.80	.47		Less than once a week	65	1.79	.50	
	Moderate	93	1.78	.53		Once or twice a week	38	1.68	.48	
	Severe	39	1.67	.51		Three or more times a week	21	1.84	.57	
Factor a5 Negativity factor	Very Mild	12	1.65	.45	.47	Not at all	51	1.76	.52	.66
	Mild	33	1.67	.569		Less than once a week	65	1.65	.52	
	Moderate	93	1.69	.52		Once or twice a week	38	1.64	.52	
	Severe	39	1.72	.45		Three or more times a week	21	1.70	.40	

**Table G 7 (B) Relationship between IMS barriers and asthma severity**

IMS total scores and factors	Asthma symptoms (self-report) N=177					Patients miss school or are unable to do normal daily activities (self-report) N=174				
	Responses	N	Mean	Std. Deviation	P	Responses	N	Mean	Std. Deviation	P
IMS Total barriers score	Once per month or less	76	52.96	7.44659	.68	Once per month or less	93	52.69	7.74	.10
	Once per week	58	53.29	7.68916		Once per week	52	53.23	7.70	
	Twice per week	26	54.81	5.89250		Twice per week	18	57.39	5.62	
	Daily	17	54.47	8.71147		More than twice per week	11	54.73	5.10	
Factor a1 Medication issues factor	Once per month or less	76	1.85	.46025	.003	Once per month or less	93	1.86	.46	.001
	Once per week	58	1.97	.45612		Once per week	52	2.02	.48	
	Twice per week	26	2.21	.34499		Twice per week	18	2.20	.41	
	Daily	17	2.15	.58000		More than twice per week	11	2.33	.43	
Factor a2 Doctor and other relationship	Once per month or less	76	1.73	.44114	.52	Once per month or less	93	1.69	.45	.65
	Once per week	58	1.63	.46422		Once per week	52	1.62	.45	
	Twice per week	26	1.62	.41555		Twice per week	18	1.75	.41	
	Daily	17	1.68	.40573		More than twice per week	11	1.68	.43	
Factor a3 Adherences influences factor	Once per month or less	76	1.99	.49174	.39	Once per month or less	93	2.01	.48	.32
	Once per week	58	2.10	.49267		Once per week	52	2.09	.50	
	Twice per week	26	2.15	.34616		Twice per week	18	2.20	.39	
	Daily	17	2.02	.44050		More than twice per week	11	1.94	.27	
Factor a4 Self-efficacy factor	Once per month or less	76	1.73	.46068	.77	Once per month or less	93	1.74	.491	.96
	Once per week	58	1.81	.56644		Once per week	52	1.77	.53838	
	Twice per week	26	1.79	.56		Twice per week	18	1.79	.52	
	Daily	17	1.69	.48		More than twice per week	11	1.73	.52	
Factor a5 Negativity factor	Once per month or less	76	1.71	.55	.61	Once per month or less	93	1.67	.539	.57
	Once per week	58	1.67	.50		Once per week	52	1.68	.53	
	Twice per week	26	1.59	.40		Twice per week	18	1.85	.46	
	Daily	17	1.78	.48		More than twice per week	11	1.64	.26	

## Section 2: ICS Barriers

**Table G 8 Relationship between ICS barriers and both patients' gender and possession of health insurance**

Total ICS scores and factors	Gender					Health insurance				
	Male (90)		Female (87)		P	Yes (38)		No (139)		P
	mean	SD	mean	SD		mean	SD	mean	SD	
Total barriers	38.67	7.97	37.05	8.40	0.2	39.13	7.39	37.53	8.40	0.25
Factor 1 Health and medication literacy	.0030	.97	.0031	1.04	0.97	.065	.56	-.018	1.09	0.66
Factor 2 Patients' concerns and fears	.085	.93	.088	1.07	0.25	.27	.83	-.08	1.03	0.056
Factor 3' Peer influence and personal beliefs	.049	.90	.051	1.10	0.51	-.011	.90	.003	1.03	0.94
Factor 4 Treatment cost, convenience and need	.022	1.04	.022	.96	0.77	-.19	.89	.051	1.03	0.16

**Table G 9 Relationship between ICS barriers and possession of both AAP and PFM**

Total ICS scores and factors	Possession of AAP					Possession of PFM					Adherence to PFM use				
	Yes N =56		No / unsure N = 121		P	Yes N =28		No / unsure N =149		P	Yes regularly N =8		yes irregularly N =20		P
	mean	SD	mean	SD		mean	SD	mean	SD		mean	SD			
Total barriers	36.82	9.03	38.36	7.77	0.25	37.75	6.93	37.89	8.44	0.92	37.25	8.53	37.95	6.42	0.84
Factor 1 Health and medication literacy	-.26	1.04	.12	.96	0.021	.16	.87	-.03	1.02	0.31	.40	.94	.064	.84	0.40
Factor 2 Patients' concerns and fears	.16	.87	-.08	1.05	0.12	-.27	1.18	.05	.96	0.18	-.65	1.07	-.12	1.21	0.27
Factor 3 Peer influence and personal beliefs	.12	1.04	-.06	.98	0.29	-.04	.87	.010	1.03	0.82	.05	.78	-.07	.92	0.75
Factor 4 Treatment cost, convenience and need	-.24	1.02	.11	.98	0.030	-.10	.79	.02	1.04	0.51	-.08	.82	-.10	.80	0.94

**Table G 10 Relationship between ICS barriers and Inhaled ICS**

Total ICS scores and factors	Inhaled ICS					Adherence to ICS use				
	Yes N =118		No / unsure N = 59		P	Daily use N =36		Irregular use N =82		P
	mean	SD	mean	SD		mean	SD	mean	SD	
Total barriers	37.88	8.07	37.85	8.51	0.98	38.03	7.91	37.82	8.19	0.89
Factor 1 Health and medication literacy	-.021	1.01	.04	1.00	0.69	.26	.95	-.12	1.04	0.038
Factor 2 Patients' concerns and fears	.07	1.00	-.14	1.00	0.19	-.13	1.05	.16	.97	0.17
Factor 3 Peer influence and personal beliefs	.03	.97	-.06	1.06	0.57	.07	.97	.01	.98	0.78
Factor 4 Treatment cost, convenience and need	-.06	.99	.12	1.01	0.28	-.20	.91	.00	1.03	0.30

**Table G 11 Relationship between ICS barriers and patients'/ carer's beliefs**

Total ICS scores and factors	Medications useful					Decision making involvement					Adequacy of information				
	Yes N =109		No / unsure N = 68		P	Yes N =99		No / unsure N = 78		P	Yes N =66		No / unsure N = 111		P
	mean	SD	mean	SD		mean	SD	mean	SD		mean	SD			
Total barriers	36.68	8.0	39.78	8.22	0.015	37.42	8.23	38.44	8.18	0.42	35.56	8.29	39.24	7.86	0.004
Factor 1 Health and medication literacy	-.058	1.04	.09	.93	0.32	-.07	.95	.09	1.05	0.29	-.17	1.08	.10	.94	0.094
Factor 2 Patients' concerns and fears	-.16	.96	.26	1.01	0.007	.14	.93	.18	1.07	0.036	-.12	.97	.20	1.02	0.038
Factor 3 Peer influence and personal beliefs	-.17	.98	.28	.98	0.003	-.15	.90	.12	1.09	0.033	-.12	0.97	.20	1.02	0.040
Factor 4 Treatment cost, convenience and need	-.04	1.04	.07	.93	0.18	-.09	.99	.11	1.00	0.18	-.21	1.02	.12	.97	0.036

**Table G 12 Relationship between ICS barriers and both age group and household income**

Total ICS scores and factors	Age group N=177					Household's monthly income N=177				
	Responses	N	Mean	Std. Dev	P	Responses	N	Mean	Std. Dev	P
IMS Total barriers score	5 to less than 10 years	50	39.70	8.38	0.18	Less than 5000 SR	80	38.49	9.34	0.60
	10 to less than 15 years	43	37.02	7.44		5001- 10000 SR	54	37.03	7.25	
	15 years to less than 18	84	37.21	8.38		10001- 20000 SR	43	37.77	7.03	
Factor 1- Health and medication literacy	5 to less than 10 years	50	.18	1.002	0.29	Less than 5000 SR	80	.065	1.21	0.57
	10 to less than 15 years	43	-.06	.85		5001- 10000 SR	54	-.015	.75	
	15 years to less than 18	84	-.08	1.07		10001- 20000 SR	43	-.10	.85	
Factor 2 Patients' concerns and fears	5 to less than 10 years	50	-.005	.93	0.98	Less than 5000 SR	80	-.04	1.11	0.81
	10 to less than 15 years	43	.021	.95		5001- 10000 SR	54	-.01	.86	
	15 years to less than 18	84	-.01	1.07		10001- 20000 SR	43	.08	.95	
Factor 3 Peer influence and personal beliefs	5 to less than 10 years	50	.03	1.05	0.91	Less than 5000 SR	80	.09	1.11	0.49
	10 to less than 15 years	43	-.06	.88		5001- 10000 SR	54	-.12	.96	
	15 years to less than 18	84	.015	1.03		10001- 20000 SR	43	-.003	.83	
Factor 4 Treatment cost, convenience and need	5 to less than 10 years	50	.15	.86	0.077	Less than 5000 SR	80	.07	1.00	0.67
	10 to less than 15 years	43	-.29	1.02		5001- 10000 SR	54	-.08	1.01	
	15 years to less than 18	84	.06	1.05		10001- 20000 SR	43	-.03	.92	

**Table G 13 Relationship between ICS barriers and both patients' and parents' education level**

Total ICS scores and factors	Patients' education level N=177					Parents' education level N=1774				
	Responses	N	Mean	Std. Deviation	P	N	Mean	Std. Deviation	P	
IMS Total barriers score	Primary school or less	65	39.69	8.02	0.078	33	39.42	9.23	0.22	
	Secondary school	52	36.75	8.50		34	38.85	7.95		
	High school or higher	60	36.87	7.92		107	36.95	7.89		
Factor 1 Health and medication literacy	Primary school or less	65	.23	1.06	0.032	33	.27	1.24	0.24	
	Secondary school	52	-.01	.92		34	.00	.98		
	High school or higher	60	-.24	.96		107	-.07	.91		
Factor 2 Patients' concerns and fears	Primary school or less	65	.13	.93	0.24	33	.00	1.09	0.042	
	Secondary school	52	-.18	1.04		34	.35	.99		
	High school or higher	60	.01	1.03		107	-.13	.99		
Factor 3 Peer influence and personal beliefs	Primary school or less	65	-.05	1.15	0.40	33	-.00	1.12	0.034	
	Secondary school	52	-.10	.83		34	.37	1.00		
	High school or higher	60	.14	.96		107	-.14	.93		
Factor 4 Treatment cost, convenience and need	Primary school or less	65	-.02	.95	0.78	33	-.074	1.25	0.80	
	Secondary school	52	-.03	1.03		34	.09	.97		
	High school or higher	60	.07	1.04		107	-.02	.91		

**Table G 14 (A) Relationship between ICS barriers and asthma severity**

Total ICS scores and factors	Asthma severity (self-report) N=177					Average times asthma awakens patients at night (self-report) N=175				
	Responses	N	Mean	Std. Dev	P	Responses	N	Mean	Std. Devi	P
IMS Total barriers score	Very Mild	12	38.42	9.26	.80	Not at all	51	38.06	8.38	.70
	Mild	33	36.67	8.76		Less than once a week	65	36.98	8.68	
	Moderate	93	37.96	8.27		Once or twice a week	38	38.42	7.28	
	Severe	39	38.51	7.38		Three or more times a week	21	39.10	7.50	
Factor 1 Health and medication literacy	Very Mild	12	-.01	1.02	.42	Not at all	51	.14	.92	.18
	Mild	33	.07	1.09		Less than once a week	65	-.17	.99	
	Moderate	93	-.11	.88		Once or twice a week	38	-.06	.97	
	Severe	39	.20	1.19		Three or more times a week	21	.31	1.24	
Factor 2 Patients' concerns and fears	Very Mild	12	-.17	1.12	.90	Not at all	51	-.17	.88	.43
	Mild	33	-.05	.99		Less than once a week	65	.02	1.07	
	Moderate	93	.004	.94		Once or twice a week	38	.11	.93	
	Severe	39	.08	1.13		Three or more times a week	21	.19	1.15	
Factor 3 Peer influence and personal beliefs	Very Mild	12	.29	1.14	.63	Not at all	51	.06	1.11	.91
	Mild	33	-.10	1.1		Less than once a week	65	-.02	1.03	
	Moderate	93	.04	.95		Once or twice a week	38	-.00	.79	
	Severe	39	-.09	.99		Three or more times a week	21	-.13	.98	
Factor 4 Treatment cost, convenience and need	Very Mild	12	.10	1.23	.40	Not at all	51	-.05	1.05	.96
	Mild	33	-.27	1.03		Less than once a week	65	-.00	.96	
	Moderate	93	.06	.90		Once or twice a week	38	.06	1.06	
	Severe	39	.05	1.13		Three or more times a week	21	.03	.92	

**Table G 14 (B) Relationship between ICS barriers and asthma severity**

Total ICS scores and factors	Asthma symptoms (self-report) N=177					Patients miss school or are unable to do normal daily activities (self-report) N=174				
	Responses	N	Mean	Std. Dev	P	Responses	N	Mean	Std. Dev	P
IMS Total Barriers score	Once per month or less	76	37.38	8.33	.61	Once per month or less	93	37.48	8.03	.55
	Once per week	58	37.74	8.34		Once per week	52	37.85	9.24	
	Twice per week	26	39.85	7.19		Twice per week	18	37.61	6.88	
	Daily	17	37.47	8.81		More than twice per week	11	41.27	5.27	
Factor 1 Health and medication literacy	Once per month or less	76	-.02	1.01	.88	Once per month or less	93	.03	1.00	.04
	Once per week	58	-.04	.90		Once per week	52	-.16	.99	
	Twice per week	26	.03	.95		Twice per week	18	-.12	.77	
	Daily	17	.18	1.38		More than twice per week	11	.73	1.29	
Factor 2 Patients' concerns and fears	Once per month or less	76	-.08	.93	.48	Once per month or less	93	-.09	.91	.32
	Once per week	58	-.03	1.03		Once per week	52	.16	1.11	
	Twice per week	26	.26	.99		Twice per week	18	-.20	.90	
	Daily	17	.10	1.20		More than twice per week	11	.27	1.19	
Factor 3 Peer influence and personal beliefs	Once per month or less	76	.09	1.15	.17	Once per month or less	93	-.02	1.12	.54
	Once per week	58	-.08	.82		Once per week	52	.10	.82	
	Twice per week	26	.19	.75		Twice per week	18	-.03	.63	
	Daily	17	-.43	1.90		More than twice per week	11	-.38	1.15	
Factor 4 Treatment cost, convenience and need	Once per month or less	76	-.11	1.10	.56	Once per month or less	93	-.05	1.04	.04
	Once per week	58	.12	.91		Once per week	52	-.12	.87	
	Twice per week	26	.10	.97		Twice per week	18	.58	.92	
	Daily	17	-.08	.93		More than twice per week	11	.11	1.07	

## Appendix H: Phase Four Results

This appendix reflects the significant association between aspects and both gender and age groups.

### Group A: Education and AAPs

**Table H 1 Self-reported asthma symptoms**

Stage	Asthma symptoms							P value
	Wheezing during the day when not exercising Asthma symptoms							
	gender	Male (90)		Female (45)		Total (135)		
Response	N	%	N	%	N	%		
Pre- intervention N=135	None	11	12.2	8	17.8	19	14.1	0.034
	1 to 3	71	78.9	26	57.8	97	71.9	
	4 to 7	5	5.6	9	20.0	14	10.4	
	over 7	3	3.3	2	4.4	5	3.7	
	Total	90	66.7	45	33.3	135	100.0	

**Table H 2 Maximum frequency of quick reliever use in past 4 weeks**

Stage	Maximum daily use (Times of Day)							P value
	Gender	Male (69)		Female (36)		Total (105)		
	Response	N	%	N	%	N	%	
Post- intervention N=105	None	32	46.4	6	16.7	38	36.2	0.011
	1 to 2	36	52.2	29	80.6	65	61.9	
	3 to 4	1	1.4	1	2.8	2	1.9	
	5 to 6	0	00.0	0	00.0	0	00.0	
	over 6	0	00.0	0	00.0	0	00.0	
	Total	69	65.7	36	34.3	105	100.0	

**Table H 3 Number of patients using control medication**

Stage	Use of control medication							P value
	Response	Male (90)		Female (45)		Total (135)		
		N	%	N	%	N	%	
Pre- intervention N=135	Unsure	24	26.7	11	24.4	35	25.9	0.004
	No	1	1.1	7	15.6	8	5.9	
	Yes	65	72.2	27	60.0	92	68.1	
	Total	90	66.7	45	33.3	135	100.0	

**Table H 4 Peak flow meter (PFM) and spacer usage**

Stage	Spacer usage								P value	
	Age Response	5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Pre- intervention N=135	Unsure	5	11.1	2	5.7	3	5.5	10	7.4	0.005
	No	30	66.7	22	62.9	50	90.9	102	75.6	
	Yes	10	22.2	11	31.4	2	3.6	23	17.0	
	Total	45	33.3	35	25.9	55	40.1	135	100.0	
Post- intervention N=105	Unsure	7	20.0	5	17.9	3	7.1	15	14.3	0.000
	No	12	34.3	10	35.7	36	85.7	58	55.2	
	Yes	16	45.7	13	46.4	3	7.1	32	30.5	
	Total	35	33.3	28	26.7	42	40.0	105	100.0	

**Table H 5 Accessible information**

Stage	Adequate asthma management information accessibility.								P value	
	Age Response	5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Pre- intervention N=135	Unsure	12	26.7	9	25.7	20	36.4	41	30.4	0.035
	No	15	33.3	17	48.6	28	50.9	60	44.4	
	Yes	18	40.0	9	25.7	7	12.7	34	25.2	
	Total	45	33.3	35	25.9	55	40.7	135	100.0	

**Table H 6 Peak flow meter usage education**

Stage	Peak flow meter usage education							P value
	Response	Male (90)		Female (45)		Total (135)		
		N	%	N	%	N	%	
Post- intervention N=105	Unsure	1	1.4	4	11.1	5	4.8	0.031
	No	0	00.0	1	2.8	1	1.0	
	Yes	68	98.6	31	86.1	99	94.3	
	Total	69	65.7	36	34.3	105	100.0	

**Table H 7 Avoiding severe asthma attack**

Stage	Peak flow meter usage education							P value
	Response	Male (90)		Female (45)		Total (135)		
		N	%	N	%	N	%	
Post- intervention N=105	Easy	19	27.5	2	5.6	21	20.0	0.028
	Moderate	47	68.1	32	88.9	79	75.2	
	Difficult	3	4.3	2	5.6	5	4.8	
	Very difficult	0	00.0	0	00.0	0	00.0	
	Total	69	65.7	36	34.3	105	100.0	

**Table H 8 Patient knowledge domain**

Stage	Patient knowledge level								P value	
	Age Response	5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Post- intervention N=105	Patient has good knowledge	30	85.7	19	67.9	39	92.9	88	83.8	0.019
	Has a lack of knowledge	5	14.3	9	32.1	3	7.1	17	16.2	
	Total	35	33.3	28	26.7	42	40.0	105	100.0	

## Group B: Education only

**Table H 9 Quick relief medication use**

Stage	Quick relief medication use							P value
	Response	Male (82)		Female (53)		Total (135)		
		N	%	N	%	N	%	
Pre- intervention N=135	Unsure	0	00.0	5	9.4	5	3.7	0.014
	No	3	3.7	3	5.7	6	4.4	
	Yes	79	96.3	45	84.9	124	91.9	
	Total	82	60.7	53	39.3	135	100.0	

**Table H 10 Number of patients using control medication**

Stage	Age Response	Use of control medication								P value
		5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Pre- intervention N=135	Unsure	16	42.1	13	35.1	21	35.0	50	37.0	0.042
	No	9	23.7	16	43.2	11	18.3	36	16.7	
	Yes	13	34.2	8	21.6	28	46.7	49	36.3	
	Total	38	28.1	37	27.4	60	44.4	135	100.0	
Post- intervention N=99	Unsure	0	00.0	1	3.6	10	24.4	11	11.1	0.006
	No	6	20.0	3	10.7	3	7.3	12	12.1	
	Yes	24	80.0	24	85.7	28	68.3	76	76.8	
	Total	30	30.3	28	28.3	41	41.4	99	100.0	

**Table H 11 Inhaled corticosteroid (ICS)**

Stage	Age Response	Use of an inhaled corticosteroid								P value
		5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Post- intervention N=99	Don't know	0	00.0	3	10.7	13	31.7	16	16.2	0.036
	No	6	20.0	2	7.1	3	7.3	11	11.1	
	Yes	24	80.0	23	82.1	25	61.0	72	72.2	
	Total	30	30.3	28	28.2	41	41.4	99	100.0	

**Table H 12 Spacer use and gender**

Stage	Spacer use							P value
	Response	Male (82)		Female (53)		Total (135)		
		N	%	N	%	N	%	
Pre- intervention N=135	Unsure	0	00.0	5	9.4	5	3.7	0.018
	No	70	85.4	41	77.4	111	82.2	
	Yes	12	14.6	7	13.2	19	14.1	
	Total	82	60.7	53	39.3	135	100.0	

**Table H 13 Spacer use and age**

Stages	Age Response	Spacer use								P value
		5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Pre- intervention N=135	Unsure	1	2.6	1	2.7	3	5.0	5	3.7	0.006
	No	25	65.8	32	86.5	54	90.0	111	82.2	
	Yes	12	31.6	4	10.8	3	5.0	19	14.1	
	Total	38	28.1	37	27.4	60	44.4	135	100.0	
Post- intervention N=99	Unsure	2	6.7	0	00.0	1	2.4	3	3.0	0.017
	No	17	56.7	21	75.0	37	90.2	75	75.8	
	Yes	11	36.7	7	25.0	3	7.3	21	21.2	
	Total	30	30.3	28	28.3	41	41.4	99	100.0	

**Table H 14 Follow up**

Stages	Medication use followed up over the past 12 months									P value
	Age Response	5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Pre- intervention N= 135	Unsure	9	21.1	5	13.5	7	11.7	21	15.6	0.033
	No	8	21.1	15	40.5	32	53.3	55	40.7	
	Yes	21	55.3	17	45.9	21	35.0	59	43.7	
	Total	38	28.1	37	27.4	60	44.4	135	100.0	

**Table H 15 Accessibility of information**

Stage	Adequate accessible information about asthma management .									P value
	Age Response	5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Post- intervention N=99	Unsure	3	10.0	3	10.7	13	31.7	19	19.2	0.036
	No	1	3.3	0	00.0	3	7.3	4	4.0	
	Yes	26	86.7	25	89.3	25	61.0	76	76.8	
	Total	30	30.3	28	28.3	41	41.4	99	100.0	

**Table H 16 Number of patients admitted to hospital or who attended ER**

Stage	Hospital & ER visits									P value
	Age Response	5 to less than 10 yrs.		10 to less than 15 yrs.		15 to less than 18 yrs.		Total		
		N	%	N	%	N	%	N	%	
Pre- intervention N= 135	No	5	13.2	14	37.8	26	43.3	45	33.3	0.007
	Yes	33	86.6	23	62.2	34	56.7	90	66.7	
	Total	38	28.1	37	27.4	60	44.4	135	100.0	

## Appendix I: Ethics Approval

memorandum



<b>To</b>	Sultan saad Al-Thagfan 99 Forest Crescent THORNIE WA 6108
<b>From</b>	Dr Stephan Millett, Executive Officer, Human Research Ethics Committee
<b>Subject</b>	Protocol Approval HR 139/2005
<b>Date</b>	16 November 2005
<b>Copy</b>	Prof Bruce Sunderland, Mr Jeff Hughes, Pharmacy Graduate Studies Officer, Division of Health Sciences

Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9268 2764  
FACSIMILE 9268 3793  
EMAIL s.darby@curtin.edu.au

Thank you for providing the questionnaires for the project "*Pharmacotherapy indication of Synthetic Corticosteroids in Bronchial Asthma pros and cons*". Final approval is confirmed.

Approval of this project remains for the period of twelve months 20/10/2005 to 19/10/2005. The approval number for your project is HR 139/2005. *Please quote this number in any future correspondence.*

Dr Stephan Millett  
Executive Officer  
Human Research Ethics Committee

J:\OR\HREC\REC099\HR 139/2005

memorandum

<b>To</b>	Professor Bruce Sunderland, Dr Jeff Hughes, Pharmacy
<b>From</b>	A/Professor Stephan Millett, Chair, Human Research Ethics Committee
<b>Subject</b>	Protocol Approval <b>HR 152/2007</b>
<b>Date</b>	31 March 2012
<b>Copy</b>	Sultan S. Al-Thagfan Graduate Studies Officer, Faculty of Health Sciences

**Human Research Ethics Committee**

TELEPHONE 9266 2784  
FACSIMILE 9266 3793  
EMAIL hrec@curtin.edu.au

Thank you for your application submitted to the Human Research Ethics Committee (HREC) for the project titled "*Pharmacotherapy Indication of Synthetic Corticosteroids in Bronchial Asthma Pros and Cons*". Your application has been reviewed by the HREC and is **approved**.

- You are authorised to commence your research as stated in your proposal.
- The approval number for your project is **HR 152/2007**. *Please quote this number in any future correspondence.*
- Approval of this project is for a period of twelve months **11-12-2007 to 11-12-2008**. To renew this approval a completed Form B (attached) must be submitted before the expiry date **11-12-2008**.
- If you are a Higher Degree by Research student, data collection must not begin before your Application for Candidacy is approved by your Divisional Graduate Studies Committee.
- The following standard statement **must be** included in the information sheet to participants:  
*This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 152/2007). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. Its main role is to protect participants. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.*

Applicants should note the following:

It is the policy of the HREC to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report, including information on follow-up of participants.

The attached **FORM B** should be completed and returned to the Secretary, HREC, C/- Office of Research & Development:

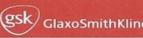
When the project has finished, or

- If at any time during the twelve months changes/amendments occur, or
- If a serious or unexpected adverse event occurs, or
- 14 days prior to the expiry date if renewal is required.
- An application for renewal may be made with a Form B three years running, after which a new application form (Form A), providing comprehensive details, must be submitted.

Regards,

A/Professor Stephan Millett  
Chair  
Human Research Ethics Committee

## Appendix J: Colour Handout of Medication Labels

<p><b>Seretide® 250 Evohaler®</b></p> <p>250 micrograms fluticasone propionate 25 micrograms salmeterol (as xinafoate)</p> <p>120 metered actuations</p> 	<p><b>Flixotide® Evohaler®</b></p> <p>50 micrograms Fluticasone propionate</p> <p>120 metered actuations</p> 	<p><b>Flixotide® Evohaler®</b></p> <p>250 micrograms Fluticasone propionate</p> <p>120 metered actuations</p> 	<p><b>Becotide</b> Trade mark</p> <p><b>inhaler</b></p> <p>Contains 50 micrograms Beclomethasone Dipropionate BP per inhalation 200 metered inhalations</p> 	<p><i>budesonide</i> <b>Pulmicort</b> 0.5 mg/ml</p> <p>5 x 2 ml</p> <p><i>Astrazeneca</i></p> <p>1 ml contains Budesonide 0.5 mg, disodium edetate, sodium chloride, polyethylene glycol, and water. Single-dose units Suspension for inhalation AstraZeneca AB, Södertälje, Sweden</p>
<p> GlaxoSmithKline</p> <p><b>Serevent® Inhaler</b></p> <p>Contains 25 micrograms salmeterol (as xinafoate) per actuation</p> <p>60 metered actuations</p>	<p>200 doses</p> <p><i>budesonide</i> <b>Pulmicort®</b> Turbuhaler®</p> <p><b>200 µg/dose</b></p> <p>Inhalation powder</p> 	<p>60 doses</p> <p><i>formoterol</i> <b>Oxis®</b> Turbuhaler®</p> <p><b>9 µg/dose</b></p> <p>Inhalation powder</p> 	<p>120 doses</p> <p><b>SYMBICORT</b> TURBUHALER</p> <p><b>160/4.5 µg/dose</b></p> <p>Inhalation powder</p> 	

<p><b>Atrovent®</b> 720011 20 microgramos solución para inhalación</p> <p>Bromuro de Ipratropio</p> <p>10 ml = 200 pulverizaciones</p> <p>Vía Inhalatoria</p> 	<p><b>Ventolin® Diskus®</b></p> <p>Powder for inhalation Each inhalation contains 200 micrograms of salbutamol (as sulphate)</p> <p>1 Diskus 60 inhalations</p> <p>© 2005 GlaxoSmithKline group of companies</p> 	<p><b>Intal® 5 Inhaler</b></p> <p>sodium cromoglycate B.P. 5 mg 112 inhalations</p> <p> <b>FISONS</b> Pharmaceuticals</p>	<p><b>Alupent®</b> 10 mg/5 ml</p> <p>125 ml syrup</p> <p></p>	<p><b>Ventolin® Evohaler®</b></p> <p>100 micrograms Ventolin (Salbutamol) as Sulphate (Sulphate Free) Evohaler 100 micrograms per actuation</p> <p>© 2005 GlaxoSmithKline group of companies</p> <p>200 metered actuations</p> 	<p> <b>NOVARTIS</b></p> <p><b>Zaditen®</b> Ketotifen.</p> <p>1 mg / 5 ml 100 ml Syrup</p> 
<p>100 ml</p> <p><b>Bricanyl®</b> 0.3 mg/ml</p> <p>Syrup/Elixir</p> 	<p><b>THEOPED® SR</b></p> <p>Theophylline 300 MG Sustained Released Tablets</p> <p> <b>RIYADH PHARMA</b> 30 tablets</p>	<p>200 tablets</p> <p><b>BUTALIN</b></p> <p>2mg Salbutamol Bronchodilator</p> <p>Produced by <b>mylphar</b> Gulf Pharmaceutical Industries, P.O. Box 41, Khaima, U.A.E.</p>	<p>20 Tablets Calendar Pack</p> <p><b>SINGULAR</b></p> <p>10 mg tablets</p> <p></p>	<p><b>Foradil®</b></p> <p>Each capsule contains 12 µg formoterol fumarate as a dry powder for inhalation Jede Kapsel enthält 12 µg Formoterol Fumarat als Trockenpulver zur Inhalation</p> 	<p> <b>NOVARTIS</b></p> <p>Bronchodilator, β<sub>2</sub>-adrenergic stimulant Bronchodilator, adrenergic β<sub>2</sub>-stimulator</p> <p>30 capsules of 12 µg 1 Inhaler 30 Kapseln zu 12 µg 1 Inhalator</p>

# Appendix K: Education Program

## Education program

### الربو Asthma

#### Education program

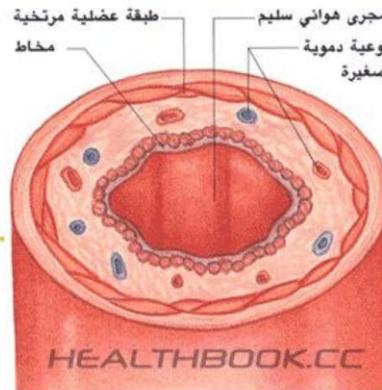
##### Summary of program content in English

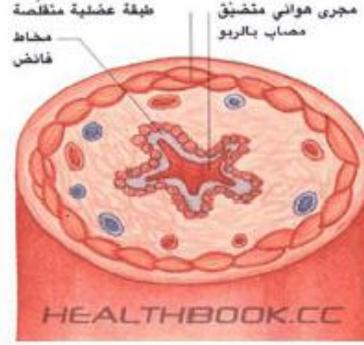
- Disease pathophysiology: definition, symptoms, structure and function of lung, classification of asthma,
- Trigger and how to avoid.
- Treatment regimes; role and goal of medication (reliever and preventer or control), side effect, compliances and adherences with treatment regime.
- Advice type and use (inhaler and PFM),
- Management skill: such as asthma Action plan
- Barriers could be affecting asthma management such as the lack of knowledge and information sources. Important of this skill in asthma managements asking discussion and sharing professionals
- Dairy: to report that daily symptoms, school absences, PFM, hospitals or ER visit

الربو مرض صدري مزمن تصاب به الرئتين ينتج عن التهاب وحساسية في الشعب الهوائية حيث تضيق هذه الشعب وبالتالي يصعب التنفس. الشعب الهوائية في الشخص المصاب بالربو تكون شديدة الحساسية لعوامل معينة تسمى المهيجات أو المثبرات **triggers** وعند إثارتها بهذه المهيجات تلتهب مجاري الهواء وتنتفخ ووتضخم ويزيد إفرازها للمخاط وتنقبض عضلاتها ويؤدي ذلك إلى إعاقة التدفق العادي للهواء، وهذا ما يسمى بنوبة الربو.

#### Asthma attack

عادة أزمة الربو تكون بشكل بسيط، وتسمح الممرات الهوائية بمرور الهواء مرة أخرى بعد دقائق أو ساعات قصيرة بعد حدوث الأزمة. أما بالنسبة للأزمات الشديدة فهي تحدث بمعدل أقل بكثير ولكنها أخطر الربو مثل أي مرض مزمن يحتاج علاجه إلى فترة طويلة أو دائمة فالاستمرار على البخاخ يكون بسبب تهيج الشعب الهوائية وليس بسبب استخدام البخاخ.





### الأعراض (العلامات الدالة) Asthma symptoms

تختلف الأعراض من شخص لآخر، كما ان الإصابة بالربو غير مرتبطة بجنس أو جنس. وتتراوح شدة الحالة ما بين خفيفة إلى حادة،

وهي نوبات من السعال مستمر ، خاصة أثناء الليل أو الصباح الباكر وضيق في التنفس وصغير في الصدر (ازيز أو حشرقة). الأزيز صوت يحدث عندما يمر الهواء في مجاري التنفس الضيقة بفعل الانقباض والمخاط والتشنج الشعبي. ويمكن أن يحدث الأزيز فجأة ويكون إشارة إلى صعوبة في التنفس. إذا تطورت حدة النوبة قد يختفي الأزيز. إن غياب الأزيز هو إشارة إلى أن الهواء لا يتحرك داخل أو خارج الرئتين، وهذه حالة خطيرة للغاية. سيعود الأزيز مع تحسن النوبة، ويختفي في النهاية تماماً قد يصاحب مرض الربو في بعض الأحيان امراض حساسية أخرى مثل حساسية الجلد وحساسية الأنف وحساسية العين، وهذه الحالات تستدعي تدخلا علاجيا طبييا مختلفا عن علاج الربو. عادة تحدث حالة أزمة الربو البسيطة بمعدل أكثر. وفي هذه الحالة تسمح الممرات الهوائية بمرور الهواء مرة أخرى بعد دقائق أو ساعات قصيرة بعد حدوث الأزمة. أما بالنسبة للأزمات الشديدة فهي تحدث بمعدل أقل بكثير ولكنها أخطر. ويجب أيضاً معالجة حالات الربو البسيطة والاهتمام بها وذلك لتجنب حدوث حالات أشد خطورة فيما بعد.

### المهيجات: Triggers

- التدخين ودخان الحطب والروائح والعمور والمنظفات والملطفات والمبيدات.
- مثيرات الحساسية مثل حيوب اللقاح وغبار المنازل والصراصير. والمكيفات(الفلتر) والتعرض الى درجات حرارة متغيره
- غبار الطلع: يحمل الهواء غبار الطلع في مواسم تفتح الأشجار والأعشاب والزهور.
- الحيوانات وخاصة الحيوانات المنزلية وكذلك بقاياها.
- تلوث البيئة سواء كان في موقع العمل أو الدراسة أو المعيشة
- التهاب وحساسية الجهاز التنفسي (الأنفلونزا، التهاب الجيوب الأنفية وحساسية الأنف) نزلات البرد
- محاولة عدم الإفراط: سواء في مشاعر الإثارة أو الإحباط أو الفرح أو الحزن
- عدم الإفراط في التمارين الرياضية بدون لياقة بدنية وبدون تناول العلاج قبل البدء بممارسة الرياضة. وتعتبر السباحة رياضة جيدة بالنسبة لمرضى الربو .
- بعض العقاقير مثل: الأسبرين و Beta Blockers ، العقاقير التي تعالج ارتفاع ضغط الدم، الصداع النصفي والمياه الزرقاء.
- إذا وجد تحسس غذائي فقد يؤثر على المريض ايضا

### اهداف الخطة العلاجية The goal of treatment

تهدف للسيطرة الجيدة على الربو يمكنك أن تتوقع التالي:

- \* التخلص من أعراض الربو ليلاً ونهاراً ويتضمن ذلك النوم خلال الليل
- \* أن تكون قادراً على المشاركة الكاملة في أي نشاط تختاره
- \* أن لا تتغيب عن العمل أو المدرسة بسبب أعراض الربو
- \* تقليل الحاجة لاستخدام موسعات الشعب الهوائية. والتحكم بالمرض
- \* تقليل /عدم الحاجة لزيارة الطوارئ أو للتنويم في المستشفيات للسيطرة على الربو
- \* استخدام أدوية السيطرة (الوقائية) على الربو بأقل الأعراض الجانبية

## كيف يمكن السيطرة على الربو How to control asthma

- يلعب المريض /الاهل دورا اساسيا في علاج الربو والقدرة في التحكم فيه مثله مثل اي مرض مزمن ولكن يتم ذلك متى ما حرص المريض والاهل على القيام بالمسؤولية واصبح لديهم المام تام بجميع جوانب الخطة العلاجية للربو والقدرة على تغيير بعض السلوكيات والالتزام
1. التعرف على منبهاته ومهيجاته الربو وتفاديها
  2. الالتزام بتناول الدواء طبقا للإرشادات
  3. مراقبة والتنبيه لوقوع النوبة مبكرا
  4. معرفة ما يلزم عمله في حالة نوبة الربو الكتمة (الخطة الإرشادية)
- وحتى لو لم يكن في الإمكان تجنب جميع هذه المسببات إلا انه من المفيد لك أن تعلم بان تناول العلاج بانتظام يمنع من حدوث نوبات الربو

## أدوية الربو Medication

لا يوجد علاج نهائي للربو، ولكن علاجه هو التحكم في عدم ظهور أزمات الربو. البخاخ أهم طريقة لإعطاء أدوية الربو لأنه يوصل العلاج بشكل مباشر الى الرئتين، تقسم الى نوعين وذلك اعتماد على عملها

### 1- مسكنة ( حيث تعالج اعراض الربو)

موسعات الشعب الهوائية (مثل: فنتولين وبريكينيل): "Bronchodilators" تعمل هذه الأنواع من العلاجات الدوائية على ارتخاء أربطة العضلات والتي تقوم بالضغط على الممرات الهوائية. وبالتالي فهي تقوم بتيسير الطريق أمام الهواء للدخول إلى الرئة بسهولة وتحسين عملية التنفس. تعمل هذه العلاجات أيضاً على طرد المخاط من الرئة الذي يقوم بسد الطريق أمام الهواء. وعندما تتسع الممرات الهوائية، يخرج المخاط بسهولة حتى يتمكن المريض من إخراجه بسهولة من الفم. وبالنسبة للعلاج السريع والقصير المدى، فيقوم "Bronchodilators" بالحد من أعراض أزمة الربو عندما تبدأ. \* ينبغي استخدام موسع الشعب الهوائية عند الإحساس بأعراض الربو وليس بشكل مستمر لأن الاستمرار عليه لا يؤدي الى زوال الالتهاب المسبب للربو.

### 2- الوقائية (ادوية التحكم)

- مضادات الالتهاب "Anti-inflammatory" مثل مشتقات الكورتيزون:

\* استخدام مشتقات الكورتيزون عن طريق البخاخ لا يؤدي الحدوث اضرار الكورتيزون المعروفة، ومضار البخاخ محدودة جدا وهي حدوث بحة في الصوت وبعض الالتهابات الفطرية والتي يمكن تجنبها بغسل الفم جيدا بعد البخاخ والغرغرة.

\* اقرص الكورتيزون ينبغي قصرها على الأزمات(النوبات) الحادة في الحالات المتقدمة فقط. "Anti-inflammatory" مضادات الالتهاب:

تعمل هذه الأنواع من العلاجات الدوائية على الحد من تضخم الممرات الهوائية وتقليل تكوين المخاط فيهم. وبالتالي تكون الممرات الهوائية أقل حساسية تجاه عوامل إثارة الأزمة. يتم تناول هذه العقاقير بشكل يومي لمدة أسابيع قبل بداية التحكم في حدوث أزمات الربو. تعمل هذه العلاجات على تقليل فرص حدوث أزمات ربو وتحسين تدفق الهواء، تقليل الحساسية لدى الممرات الهوائية تجاه بعض العوامل التي قد تساعد في حدوث الأزمة وتعمل على تقليل عدد مرات حدوث الأزمة. ومع هذا العلاج المستمر قد تساعد على منع حدوث أزمات الربو على الإطلاق. يتم غالباً تناول هذه العقاقير عن طريق الجهاز الخاص بالربو والذي يتم استنشاق العقار عن طريقه.

### \*الأعراض الجانبية والمضاعفات للكورتيزون:

أكثر مستحضرات الكورتيزون استعمالاً في حالات الربو هو الاستنشاق بالفم إما على شكل بخاخ أو مسحوق، واحتمال حدوث الأعراض الجانبية قليل جداً إذا استعمل بالشكل الصحيح والغرغرة أو شرب الماء بعد الاستعمال مما يقلل كثيراً من حدوث الأعراض الجانبية وقد يحدث شعور بالجفاف ناتج عن نمو فطريات في الحلق نتيجة عدم الغرغرة بعد الاستعمال.

أما حبوب الكورتيزون فهي خالية من الأعراض الجانبية والمضاعفات إذا استعملت لفترة قصيرة من 5 – 7 أيام في الصباح للقضاء على نوبات الربو أو الحساسية الزائدة أو المصاحبة للزلات الشعبية، ويجب ألا تُؤخذ الحبوب على معدة فارغة لأنها تهيج المعدة وقد تخدشها.

### 3- هناك الكثير من أدوية الربو مثل:

- \* أقرص ثيوفيلين الموسعة للشعب الهوائية.
- \* البخاخات الحاوية على مشتقات الكرومولين.
- \* موسعات الشعب الهوائية الحاوية على مادة أتروفنت.
- \* موسعات الشعب الهوائية طويلة الأمد مثل سيريفنت وأوكسيم.

### جهاز البخاخ Inhaler

البخاخ هو جهاز يستخدم لإيصال الدواء إلى الرئتين ويمكن أن يحتوي البخاخ الواحد على نوع واحد من الدواء أو اثنين. أهم خطوة في علاج الحساسية هو استخدام البخاخ المانع (الواقى) بشكل منتظم وحسب الجرعة المعطاة، الاستفادة من البخاخ الواقى قد تطول إلى عدة أيام أسابيع فينبغي عدم الاستعجال على توقع الفائدة المرجوة منه. البخاخ الواقى (المانع) لا بد أن يستخدم بانتظام اما البخاخ الموسع للشعب الهوائية يستخدم بانتظام أيضا أو يستخدم عند حدوث أعراض الحساسية فقط.

إذا لم يستخدم البخاخ بطريقة سليمة، فإن الفائدة المرجوة منه تكون محدودة، لذلك ينبغي سؤال الطبيب عن طريقة استخدام البخاخ نظرا لاختلاف أنواع البخاخات. هناك خوف عند كثير من الناس من أن يعتادوا على البخاخ لذلك ينبغي معرفة ان الربو مثل اي مرض مزمن يحتاج علاجه الى فترة طويلة او دائمة فالاستمرار على البخاخ يكون بسبب تهيج الشعب الهوائية وليس بسبب استخدام البخاخ.

### أنواع البخاخات Type of Inhaler

- البخاخ عبارة عن جهاز يساعد على وصول الجرعة الدوائية المجاري التنفس وهناك العديد منها وأكثرها استخداما:
- \* البخاخات أحادية الجرعة (Metered dose inhalers).
  - \* البخاخ ذو القرص (ديسك هيلر، Diskhaler).
  - \* البخاخ ذو الأقرص (روتواهيلر، Rotahaler).
  - \* البخاخ التريبيني عديد الجرعات (تيريو هيلر، Turbohaler).
- جهاز قياس القدرة على الهواء

### اختبار قياس كفاءة الرئة Peak Flow Meter (PFM)

هذا الاجراء يماثل قياس نسبة السكر في الدم الذي يجريه مريض السكر بنفسه في المنزل أو قياس ضغط الدم بغرض مراقبة السيطرة على هذه الامراض . يشير قياس قدرة الرئة إلى كفاءة الرئة وسرعة تدفق الهواء منها ومدى توسع مسالك الهواء فيها.

يمكن اجراء هذا القياس بنفسك باستخدام جهاز قياس القدرة القصوى لنفخ الهواء لمعرفة أعلى معدل لتدفق الهواء ومدى توسع مسالك الهواء في الرئة.

يجب عليك متابعة حالتك في المنزل من خلال تسجيل نتائج هذا القياس صباحا ومساء لمساعدة الطبيب على تقدير مدى استجابتك للعلاج

•التنبؤ بحدّة النوبة

•تحديد العلاج المناسب

### كيفية استخدام جهاز قياس القدرة القصوى لنفخ الهواء How to use PFM

1. ضع المؤشر مقابل علامة الصفر وتجنب لمس المؤشر أثناء النفخ
2. قف وامسك بالجهاز افقيا مقابل فمك
3. خذ نفسا عميقا على قدر المستطاع
4. ضع شفطيك باحكام حول فتحة الفم
5. انفخ بأقصى وبأسرع ما تستطيع وسجل قياس المؤشر

6. أعد المحاولة مرتين وسجل قياس المؤشر كل مرة  
7. سجل أعلى قياس من الثلاثة قياسات  
وبذلك تحصل على مؤشر لقدرك القسوى لنفخ الهواء في هذه الوقت

#### الخطة العلاجية المكتوبة ( AAP ) Asthma Action Plan

- وهي تعد لكل مريض على حدة وخاصة في الحالات المتوسطة والشديدة وتحتوي على معلومات عن المريض وحالة الصحيه وكذلك
1. ما يجب على المريض عمله في حالة تعرضه لنوبة ربو. مثل استخدام موسع الشعب وتعديل جرعة الدواء الوقائي وزيارة المستشفى او الطواري.
  2. كيفية استخدام العلاج الوقائي .
  3. توضيح بعض المهبجات.
  4. ارقام الطبيب او المرفق الصحي.

#### التوصيلة القموية القمع spacer devices

وغالبا تستخدم مع صغار السن . وهي تساعد على وصول الجرعة للرنه باكثر فعالية وكذلك تساعد على التقليل من الآثار الجانبية للدواء

#### الرياضة والربو Exercises and asthma

أصبح بإمكان مريض حساسية الصدر الاستمتاع بمزاولة الرياضة بشكل لا يؤثر عليه او على التحكم في مرضه ،في ما يلي بعض الخطوات التي ينبغي على المصاب بمرض الحساسية اتباعها قبل اداء اي تمرين مراعاة عمل فترة تسخين كافية قبل التمارين او اداء المجهود وزيادة بالتدرج ايضا . بعض الحالات قد تؤثر وقتيا على المريض مثل الالتهابات الفيروسية التي تهيج الشعب الهوائية فينبغي تجنب التمارين الرياضية اثناءها، كذلك الاجواء التي لا تتناسب ومرض الربو مثل الجو البارد او الجاف او الاوقات التي يكثر فيها اللقاح في فصل الربيع او الاجواء المغيرة فيستحسن عندئذ اداء التمارين في الصالات المغلقة والدافئ . البخاخات الموسعة للشعب الهوائية تساعد على تجنب اعراض الحساسية المصاحبة للتمارين الرياضية، لذلك فينبغي اخذ بختين قبل اداء التمارين بخمس عشرة دقيقة، هذه البخاخات توسع القصبات الهوائية وبالتالي تخفف او تمنع ظهور الاعراض خصوصا عند اتباع النصائح الطبية السابقة. وكذلك استشارة طبيب مختص يساعده على عمل الاحتياطات اللازمة واختيار نوع الرياضة المناسب .

#### معلومات عامة عن مرض الربو General information

- 1- الربو هو تهيج وزيادة حساسية الشعب الهوائية بحيث انها تضيق مما يؤدي الى ظهور أعراض الربو
- 2- الابتعاد عن أي مهبجات للشعب الهوائية له دور فعال في التحكم في أعراض الربو.
- 3- أهم خطوة في علاج الربو هي استخدام البخاخ المانع (الواقى) بشكل منتظم وحسب الجرعة المعطاة كما هو مبين في المربع الأول، الاستفادة من البخاخ الوقائي قد تطول إلى عدة أيام أسابيع فينبغي عدم الاستعجال على توقع الفائدة المرجوة منه.
- 4- البخاخ الوقائي (المانع) لا بد أن يستخدم بانتظام اما البخاخ الموسع للشعب الهوائية (مثل فنترولين) يمكن ان يستخدم عند حدوث أعراض الربو.
- 5- إذا لم يستخدم البخاخ بطريقة سليمة، فإن الفائدة المرجوة منه تكون محدودة.
- 6- لذلك ينبغي سؤال الطبيب عن طريقة استخدام البخاخ.
- 7- هناك تخوف عند كثير من الناس من أن يعتادوا على البخاخ لذلك ينبغي معرفة ان الربو مثل اي مرض مزمن يحتاج علاجه لفترة طويلة او دائمة. فالاستمرار على البخاخ يكون بسبب تهيج الشعب الهوائية وليس بسبب استخدام البخاخ.
- 8- ممارسة الرياضة مهمة لجميع مرضى الربو وأحسن انواع الرياضة السباحة ، إذا كانت التمارين الرياضية تزيد من أعراض الربو فيلزم استخدام البخاخ الموسع للشعب الهوائية قبل اداء التمارين ب (15) دقيقة.

#### المراجع References

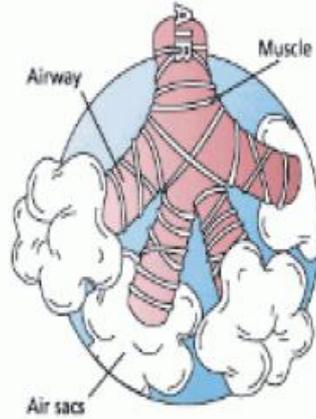
1. المنهاج السعودي لتشخيص وعلاج الربو
2. د. محمد صالح الحجاج
3. د. محمد سعد العمري
4. الجمعية السعودية لطب وجراحة الصدر
5. الجمعية الصيدلانية السعودية

1. Saudi asthma guideline .
2. Prof Mohammed Saleh Al Hajjaj.
3. Prof Mohammed saad AL Omari.
4. Saudi Thoracic Society (STS) King Saud University.
5. Saudi Pharmaceutical society.
6. King Khalid University Hospital - College of Medicine.

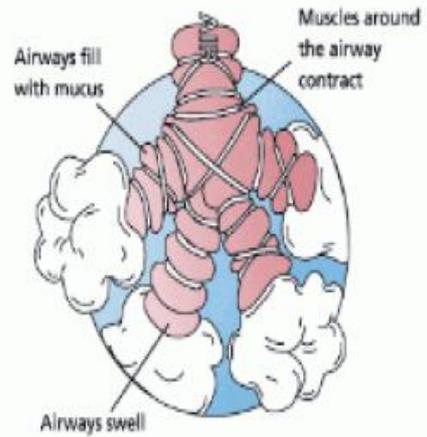
King Fahad National Guard Hospital

## Appendix L: Education Tool

Before an Asthma Episode



After an Asthma Episode



القصبات السليمة

<http://encyclopedia.thefreedictionary.com/bronchial+asthma>

القصبات المصابة (المتتهبة)

Normal bronchiole



Asthmatic bronchiole



ADAM.

<http://www.healthline.com/adamimage?contentId=1000141&id=19346&tab=series&slideshowId=25>



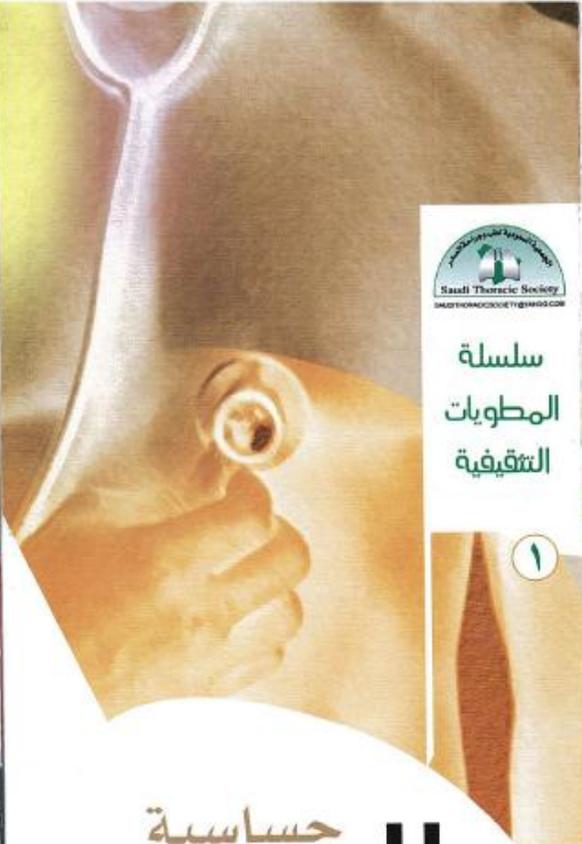




سلسلة  
المطويات  
التثقيفية

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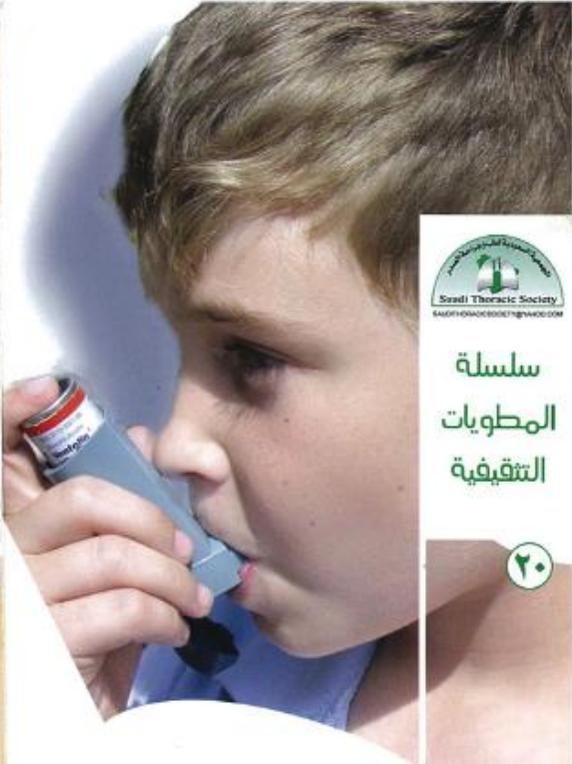
كيفية استعمال  
علاج  
الربو



سلسلة  
المطويات  
التثقيفية

١

حساسية  
الصدر  
الربو

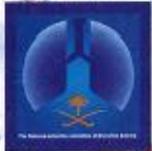
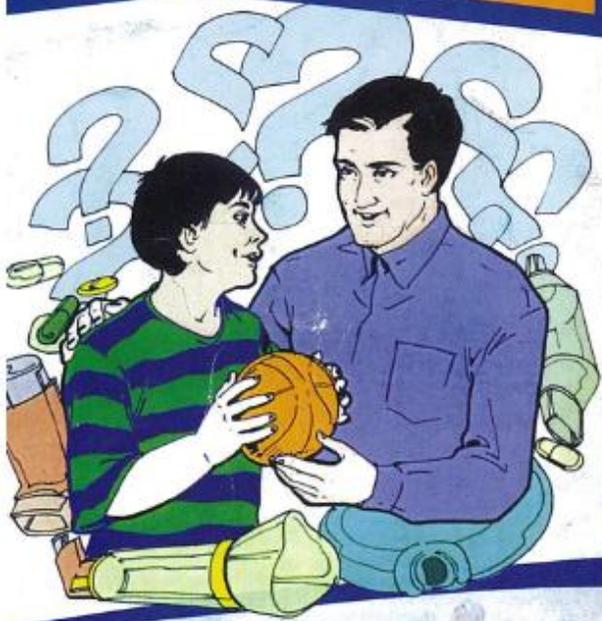


سلسلة  
المطويات  
التثقيفية

٢٠

حالات الربو الصعبة  
وكيفية التعامل معها

# اسئلة مهبة في الربو



برنامج توعية من جلاكوسميث كلاين العالمية  
باشراف اللجنة الوطنية العلمية لتشخيص وعلاج الربو



مركز الطب المتقدم للتخصصات الدقيقة  
Advanced Medicine Center For Subspecialties

## الحساسية والربو

البروفيسور

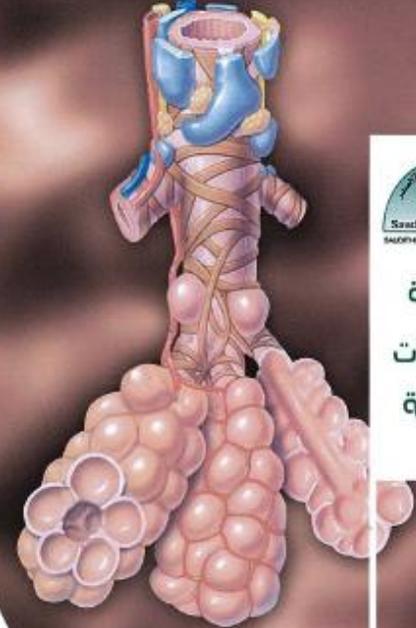
### محمد بن صالح الحجاج

استاذ واستشاري الأمراض الصدرية ، كلية الطب  
ومستشفى الملك خالد الجامعي ، جامعة الملك سعود  
اليورد الأمريكي و الزمالة الكندية  
رئيس الجمعية السعودية لطب وجراحة الصدر

الرياض - طريق الملك عبد الله

تليفون : 2004040

فاكس : 4502311



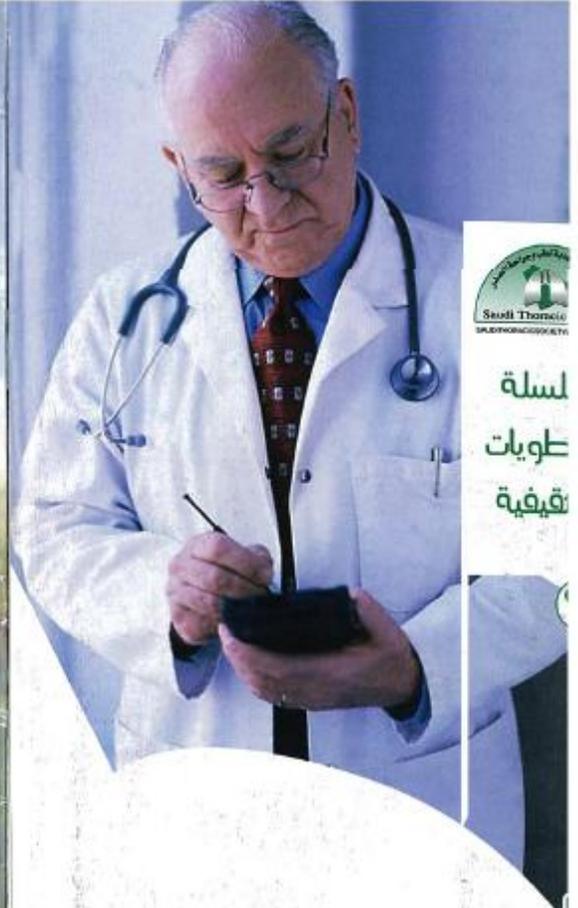
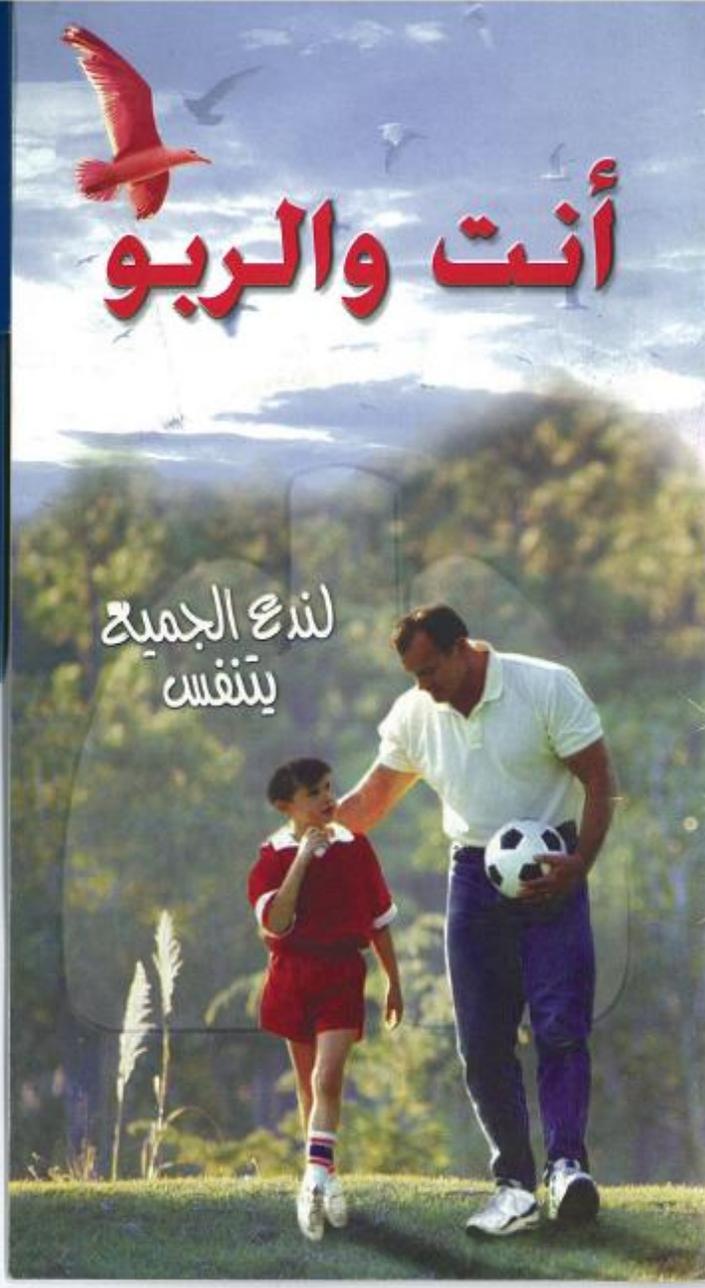
سلسلة  
المطويات  
التثقيفية

19

# تهدد السنعب الهوائية

# أنت والربو

لذء الجمية  
يتنفسه



لسلة  
طويات  
تقيفية

أخطاء العنصرة  
هي التعامل مع الربو

الخططة العلاجية  
للربو وحساسية الصدر  
تعطى للمرضى  
الموصوف لهم  
دواء سبيجيكورت سمارت

590-09-5115-1141-009

الخططة العلاجية  
للربو وحساسية الصدر

AstraZeneca  
KIP 1981 Tishah, Jeddah, KSA



**Appendix M:**  
**Questionnaires in Arabic**

## Phase one questionnaire (Arabic v)

### استبيان المريض

#### عزيزي المشارك او المشاركة:-

- 1- اشكر لكم حسن تعاونكم وتجاوبكم وأمل إجابة جميع الأسئلة
- 2- يتم تعيينة الاستبيان بدون تسجيل أي معلومات شخصيه عن المريض علما بان جميع البيانات ستعامل بسرية تامه ولن تستخدم الا لاغراض البحث كما ان ذلك لن يؤثر على الخدمة العلاجية المقدمة للمريض
- 3- هناك ملحق يحوي بعض أسماء وإشكال الأدوية المستخدمة في علاج الربو يمكن الاستعانة بها في الإجابة على سؤال 4 من الجزء الخامس
- 4- هناك ملحق يحوي صوره لأنواع وسائل التوصيلة الفموية ( قمع وسيط) Spacer

ولكم مني كل التقدير والاحترام

الباحث

سلطان سعد ال ثقفان

جوال 0557729119

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7	هل في اعتقادك :-	نعم	لا	غير متأكد

8	هل في اعتقادك :-	نعم	لا	غير متأكد
أ	أنه قد تمت السيطرة تماماً على مرض الربو الذي يعاني منه طفلك خلال الـ 4 أسابيع الماضية؟			
ب	أنه يستطيع تناول ادوية الربو حسب التوجيهات ؟			
ج	أن لديك المعلومة الكافية لمساعدته في السيطرة على مرض الربو ( الأزمة)؟			
د	أن العلاجات التي يتناولها طفلك ذات فعالية في السيطرة على هذا المرض ؟			

9	هل الطبيب أو مقدم الخدمة العلاجية :	نعم	لا	غير متأكد
أ-	يشركك أنت وطفلك المريض في اتخاذ قرارات بشأن علاج الربو			
ب-	وهل يعلم ان طفلك يفضل تناول علاج معين للربو مثل (حبوب ، دواء سائل ، دواء استنشاق) .			

10	في خلال الـ 12 شهر الماضية هل اشرف الطبيب أو أحد مقدمي الخدمة في توضيح كيفية تعاطي طفلك لعلاج الربو	نعم	لا	غير متأكد

11	هل أنت أو طفلك تلقيت خطة إرشادية من الطبيب المعالج توضح لكم كيفية التصرف المطلوب في حالة حدوث نوبة الربو ؟	نعم	لا	غير متأكد
أ-	كيفية تناول الطفل للادوية (الادوية الوقائية) . في الأحوال التي لا تكون فيها نوبات الربو			
ب-	كيفية تناول الطفل للادوية (الادوية الوقائية) . في الأحوال التي لا تكون فيها نوبات الربو			

12	هل يستعمل طفلك جهاز استنشاق أو مرذة ( البخاخ الأزرق ) للتخلص السريع من أعراض الأزمة	نعم	لا	غير متأكد
----	----------------------------------------------------------------------------------------	-----	----	-----------

أ- ( إذا كانت الإجابة بنعم ) حدد عدد المرات التي استعمل فيها طفلك جهاز الاستنشاق ( البخاخ ) في اليوم الواحد خلال الاربعة الأسابيع الماضية

صفر	مرة الى مرتين يومياً	3 الى 4مرات يومياً	5 الى 6 مرات يومياً	أكثر من 6 مرات يومياً
-----	----------------------	--------------------	---------------------	-----------------------

ب- خلال الـ 12 شهر الماضية ما عدد المرات في اليوم التي استعمل فيها طفلك أداة الاستنشاق أو البخاخ الأزرق ( مرذاذ ) للتخلص السريع من نوبة الربو

صفر	مرة الى مرتين يومياً	3 الى 4مرات يومياً	5 الى 6 مرات يومياً	أكثر من 6 مرات يومياً
-----	----------------------	--------------------	---------------------	-----------------------

13	هل تلقى طفلك وصفة طبية ليست للحالات الطارئة، ولكن للسيطرة على حالة الربو ( الأزمة ) (الأدوية الوقائية) التي يعاني منها ؟	نعم	لا
----	--------------------------------------------------------------------------------------------------------------------------	-----	----

( إذا كانت الإجابة بنعم) فهل

يتناوله كل يوم .
يتناوله لبعض الأيام دون أخرى .
كان يتناوله في الماضي وتركه الآن
يتناول الدواء فقط في حالة الأعراض
لم يتناوله إطلاقاً .

نشكرك على الإجابة على هذا الجزء من الاستبانة .

هل تحب أن تشير إلى أي شيء يتعلق بإصابة طفلك بمرض الربو أو طريقة العناية الطبية التي يتلقاها

.....

.....

.....

.....

.....

الجزء ( 2 )

في هذا الجزء نود أن نتعرف على مدى المعاناة التي سببها مرض الربو (الأزمة) خلال الأسابيع الأربعة الماضية  
1- خلال الأسابيع الأربعة الماضية ، كم عدد المرات التي عانى فيها طفلك من الأعراض الآتية :

بوميا	4 إلى 5 مرات في الأسبوع	مرة إلى مرتين في الأسبوع	مرة في الأسبوع أو أقل	لم يعان إطلاقاً	.
					أالكحة
					ب-قشع ( بلغم أو مخاط عند الكحة)
					ج-ضيق في الصدر ( صعوبة عند أخذ نفس عميق )
					د-أزيز أو صوت حشرجة في الصدر

2- خلال الـ 4 أسابيع الماضية كم في المتوسط استيقظ طفلك بالليل بسبب حالة الربو (الأزمة)

لم يحدث	أقل من مرة في الأسبوع	مرة أو مرتين في الأسبوع	ثلاث مرات أو أكثر في الأسبوع

3- خلال الـ 4 أسابيع الماضية ، في المتوسط كم مرة من المرات عانى طفلك من نوبات الربو ؟ ( 0 نوبة الربو)  
الأزمة ( تعني صعوبة في التنفس ربما تكون مصحوبة بكحة زائدة ، حشرجة في الصدر ، ضيق في الصدر أو  
أي أعراض أخرى .

لم يحدث	بمعدل أقل من مرة في الأسبوع	بمعدل مرة أو مرتين في الأسبوع	بمعدل ثلاث مرات أو أكثر في الأسبوع

### الجزء ( 3 )

الأسئلة التالية عن التجارب المختلفة التي مرت بطفلك مع مرض الربو(الأزمة) .  
1-من الناحية العامة هل تعتقد أن إصابة طفلك بالربو من الناحية التشخيصية كانت:

خفيفة جداً	خفيفة	متوسطة	حادة	حادة جداً

2-هل يستطيع طفلك تفادي نوبات الربو؟

بسهولة جداً	بسهولة	وسط	بصعوبة	بصعوبة جداً

3-(أ)- هل يستعمل طفلك الستيرويد المستنشق، مثل: بيكلوميثازون (بيكوتيد-خياركس) او بيوديسونيد (بولميكورت) ، سيرييتايد ، سيميكورت او علاجات أخرى ( لعلاج الربو؟

نعم*	لا**	لا اعرف**

\* إذا كانت الإجابة بنعم فنرجو الإجابة على السؤال 3(ب) أدناه  
\*\*إذا كانت الإجابة بلا او لا اعرف فنرجو الذهاب إلى الجزء الرابع

3(ب) ليا إذا كانت الإجابة بنعم على السؤال 3 (أ) أعلاه فأني من الآتي يصف جيداً طريقة استنشاق طفلك لمركبات الستيرويد

( نرجو أن تختار إجابة واحدة فقط ) :

1- يستنشق الستيرويد كل يوم في حالة أعراض الأزمة أو دون أعراض	
2- بالرغم من توصية الطبيب باستنشاق الستيرويد كل يوم إلا أن الطفل يقوم بذلك أقل من المطلوب.	
3- يستنشق الستيرويد عدة مرات في الأسبوع .	
4- يستنشق الستيرويد فقط في حالة أعراض الأزمة	

## الجزء (4) :

يلأظن أن الأسئلة التالية تتمحور حول جهاز قياس كمية الهواء الخارج من الرنة واستعمل جهاز الاستنشاق والتوعية باستخدام الدواء وتعديل الجرعة

1- أي من الحالات التالية تنطبق على طفلك ؟

ليس لديه جهاز	لديه جهاز ويستعمله بانتظام	لديه جهاز ولكن لا يستعمله بانتظام

2 - إذا كان لدى طفلك جهاز قياس الهواء فأى من الآتي ينطبق على طفلك :

لا	نعم	
		أ تم إرشاده عن كيفية استعمال جهاز قياس الهواء بواسطة الطبيب أو الممرض أو احد مقدمي الخدمة العلاجية.
		ب لديه الدراية الكاملة بطريقة القراءة بنفسه
		ج لديه مذكرة خاصة بجهاز قياس الهواء الخارج من الرنة
		د يعدل في جرعات العلاج حسب قراءة جهاز كمية الهواء الخارجة من الرنة
		هـ أقوم بإخطار الطبيب في حالة انخفاض قراءة الجهاز إلى مستوى معين

3- هل تم إرشاد طفلك على الطريقة الصحيحة لاستعمال اجهزة أدوية الاستنشاق (البخاخ) بواسطة الطبيب أو الممرض أو احد مقدمي الخدمة العلاجية .

لا يستعمل جهاز استنشاق لعلاج الأزمة	نعم	لا

4- عند الزيارة الرسمية ، هل قام الطبيب أو الممرض او احد مقدمي الخدمة العلاجية بملاحظة كيفية استعمال جهاز الاستنشاق (البخاخ)

لا يستعمل جهاز استنشاق لعلاج الأزمة	نعم	لا

\*\* (فضلا اختر أجابه واحده لكل سؤال من الأسئلة التالية 5,6,7,8,9)

5- هل تم إرشاد طفلك بواسطة الطبيب او الممرض أو المشرف الطبي على كيفية تناول علاج الربو؟

1-نعم- و أنا وطفلي نعي ذلك جيداً	2-نعم- وأنا وطفلي نعي ذلك إلى حدا ما
3-نعم- و أنا وطفلي غير مطمئنين من هذه الناحية	4-لا-و أنا وطفلي لم يتم إرشادنا .

6-هل قام الطبيب أو الممرض او احد مقدمي الخدمة العلاجية بتوضيح ما يفعله طفلك في حالة تعرضه لتوبة حادة من الربو

1-نعم- و أنا وطفلي نعي ذلك جيداً	2-نعم- وأنا وطفلي نعي ذلك إلى حدا ما
3-نعم- و أنا وطفلي غير مطمئنين من هذه الناحية	4-لا-و أنا وطفلي لم يتم إرشادنا .

7- هل شرح الطبيب أو الممرض أو احد مقدمي الخدمة العلاجية له كيفية القيام بتعديل الجرعات عند اشتداد نوبة الربو؟

1-نعم- وأنا وطفلي نعي ذلك جيداً	2-نعم- وأنا وطفلي نعي ذلك إلى حدا ما
3-نعم- وأنا وطفلي غير مطمئنين من هذه الناحية	4-لا- وأنا وطفلي لم يتم إرشادنا .

8- هل أوضح الطبيب أو الممرض أو احد مقدمي الخدمة العلاجية له ما الأشياء التي تزيد من سوء حدة الربو وكيفية تجنبها .

1-نعم- وأنا وطفلي نعي ذلك جيداً	2-نعم- وأنا وطفلي نعي ذلك إلى حدا ما
3-نعم- وأنا وطفلي غير مطمئنين من هذه الناحية	4-لا- وأنا وطفلي لم يتم إرشادنا .

9- كيف تقيم نوعية المعلومات والنصائح من قبل الطبيب، الممرض أو احد مقدمي الخدمة العلاجية لطفلك

جيدة جداً	جيدة	لا بأس بها ( مقبوله )	سيئة	سيئة جداً	لا توجد إرشادات

10- أي من الآتي ينطبق على طفلك ؟

لا	نعم
	أ عادة ما يستعمل وسائل التوصيله القموية(قمع وسيط Spacer) عند استعماله لجهاز الاستنشاق
	ب يستعمل جهاز قياس التنفس لمراقبة حالات الربو
	ج يستطيع الطفل ان يتعامل مع التغييرات عند اشتداد الربو (الأزمة) في معظم الأحيان
	د الطفل يتبع الإرشادات المحددة بواسطة الطبيب أو الممرض .
	هـ يستطيع التعرف على الأشياء التي تزيد من حدة الربو
	و يعرف ما يفعله في حالة الإصابة بنوبة من الربو
	ز يتناول علاجات الربو حينما تكون ملائمة
	ح يتعرف على الدلائل والمؤشرات التي تنذر بحدوث حالة الربو.

## الجزء ( 5 )

في هذا الجزء نود أن نتعرف على مدى اقتناعك بمستوى العناية الصحيحة التي يتلقاها طفلك فيما يتعلق بمرض الأزيمة .

ممتازة	جيد جداً	جيد	ضعفه لحد ما	ضعفه

1-نوعية المعلومات والإرشادات التي زود بها طفلك لتعنيه يومياً على مواجهة مرض الربو.

2-ما مدى الإصغاء والاهتمام من طرف الدكتور أو الممرض بالنسبة لطفلك حيال إصابة ابنك بالربو

3-من ناحية عامة ، كيف تقيم درجة العناية الصحية(الدرجة من عشرة) التي تلقاها طفلك المصاب بالأزيمة خلال الـ 12 شهر الماضية

ممتاز	جيد جداً	جيد	متوسط	ضعيف	ضعيف جداً
10	9	8	7	6	5

4-نرجو كتابة العلاجات التي يتناولها طفلك مع توضيح عدد مرات الاستعمال ، وكمية الجرعة وكيفية الاستعمال (يمكن الاستعانة بالملحق الذي يحوي أسماء وصور لبعض الادوية المستخدمة للربو).

اسم الدواء	شكل الدواء ( أقراص ، جهاز استنشاق .. الخ )	كمية الجرعة ( عدد الأقراص ، البخاخات )	عدد مرات الاستعمال مثلاً ( عدد المرات في اليوم

5- هل عانى طفلك من أي من الأعراض التالية منذ بدء العلاج للربو :

لا	نعم

6-هل أدخل طفلك لمستشفى أو غرفة الطوارئ خلال الـ 3 أشهر الماضية  
نعم ( ) لا ( )  
( إذا كانت الإجابة بنعم ،كم عدد المرات ) ( ) مرة

## Phase three questionnaire (Arabic v)

Consent Arabic v

### موافقة

أوافق على المشاركة في الدراسة مع العلم انني قد فهمت مايلي:-

- 1-مشاركتي اختياريه ولي الحق بالانسحاب اذا رغبت بدون اي التزام وفي اي وقت.
  - 2-اهداف وغرض الدراسة تم شرحها لي وجميع اسئلتني تم الاجابة عليها.
  - 3-سوف استفيد باذن الله من هذه الدراسة لمعرفة المزيد عن حالتي المرضية وكيف التعامل مع المرضى وكيف يمكن التحكم فيه.
  - 4-جميع المعلومات ستبقى سرية ومحفوظة في جميع الاوقات وسوف تستعمل لغرض البحث فقط بمعرفة الباحث. وسوف تحفظ في مكان امن في كلية الصيدلة بجامعة كيرتن.
  - 5- سوف احصل على صورة من هذا الاقرار.
- تمت قراءة هذا النموذج وفهمه وبالتوقيع عليه يعني الموافقة على الاشتراك في هذه الدراسة.

التوقيع  
التاريخ

### استبيانه

تمت تعبئه الاستبانة بواسطة

- 1- المريض   
2- الاب او الام   
3- المريض وبمساعدة الاب او الام   
الجزء الاول:- معلومات عامة  
(ضع علامة ✓ في المربع)  
1- ما هو جنس المصاب بمرض الربو:  
ذكر  انثى

2- كم عمره المريض ؟

- أ- اقل من 5 سنوات  ب- من 5 إلى اقل من 10 سنوات   
ت- من 10 سنوات الى اقل من 15 سنة  ث- من 15 سنة الى اقل من 18 سنة   
3- مستوى التعليم

المريض	ابتدائي او اقل	متوسط	ثانوي	جامعي
<input type="checkbox"/>				
<input type="checkbox"/>				
<input type="checkbox"/>				

4- معدل الدخل الشهري للأسره

- أ- اقل من 5000 الالف ريال  
ب- من 5001 الى 10000 ريال  
ت- من 10001 الى 15000 ريال  
ث- من 15001 الى 20000 ريال  
ج- اكثر من 20001 ريال

5- هل لدى المريض او الاسرة تامين صحي

- أ- نعم  ب- لا

6- هل تعتقد أن إصابتك/اوإصابة طفلك بالربو من الناحية التشخيصية كانت

- أ- خفيفة جدا  ب- خفيفة   
ت-متوسطه  ث- حادة

7- غالبا ما مدى المعاناة التي سببها مرض الربو (الأزمة) خلال الأسابيع الأربعة الماضية

للاعراض التالية {كحة، ضيق في الصدر (صعوبة عند أخذ نفس عميق) و أزيز( صوت حشرجة في الصدر)} لك أو لطفلك

- أ- مرة في الشهر أو اقل   
ب- مرة في الأسبوع   
ت- مرتين في الأسبوع   
ث- يوميا

8- خلال الـ 4 أسابيع الماضية كم في المتوسط استيقظت/او استيقظ طفلك بالليل بسبب حالة الربو(الأزمة)

- أ- ا- لم يحدث
- ب- ب- اقل من مرة في الأسبوع
- ت- ت- مرة او مرتين في الاسبوع
- ث- ج- ثلاث مرات او اكثر في الاسبوع

9- غالبا ما مدى تأثر/هو تأثر طفلك في الانتظام في الدراسة أو النشاطات اليومية ( كالعاب ، زيارة صديق أو أي نشاط عائلي ) بسبب الربو ؟

- أ- ا- مرة في الشهر أو اقل
- ب- ب- مرة في الأسبوع
- ت- ت- مرتين في الأسبوع
- ث- ث- أكثر من مرتين في الأسبوع

10- أي مما يلي ينطبق على حالتك أو حال طفلك

لا	نعم	غير متأكد
		هل أنت أو طفلك تلقيت خطة إرشادية مكتوبة من الطبيب المعالج توضح لكم كيفية التصرف المطلوب في حالة حدوث نوبة الربو ؟
<input type="checkbox"/>	<input type="checkbox"/>	هل لديك/لدى طفلك جهاز قياس تدفق الهواء لمراقبة حالات الربو – إذا كانت الإجابة بنعم هل يستعمل بانتظام*
		هل تستعمل/او طفلك الكورتيزون المستنشق (الاستيرويد ) مثل: بيكلوميثازون (بيكوتيد- فلكسوتايد) او بيوديسوناييد (بولميكورت) او مركبة تحوي كورتيزون مستنشق مثل سمبيكورت او سيريتايد لعلاج الربو؟ e.g. Becotide, flixotid, pulmicort, symbicort and seretid )
		هل تعتقد أن العلاجات التي تتناولها/او طفلك ذات فعالية في السيطرة على هذا المرض ؟
		هل الطبيب أو مقدم الخدمة العلاجية يشرك أنت وطفلك المريض في اتخاذ قرارات بشأن علاج الربو؟
		هل تعتقد أن لديك المعلومة الكافية لمساعدتك في السيطرة على مرض الربو (الأزمة)؟

11- إذا كانت الإجابة بنعم على السؤال رقم 10 فقرة (ت) أهله فأي من الآتي يصف جيدا طريقة استنشاقك/او طفلك لمركبات الكورتيزون المستنشق(الاستيرويد)

- أ- يستنشق الاستيرويد كل يوم في حالة أعراض الأزمة أو دون أعراض
- ب- يتناوله لبعض الأيام دون أخرى
- ث- يتناول الدواء فقط في حالة الأعراض

## الجزء الثاني : المعتقدات الصحية

توجيهات: نحن مهتمون في هذا الجزء بالأمور التي تجعل من الصعوبة بمكان القيام برعاية المصابين بداء الربو. يوجد في الأسفل قائمة الأشياء التي يعتقد بعض الأطفال ( أو والديهم ) أو يشعرون أنه ينبغي القيام بها للاهتمام بمرضهم. عندما تقرأ عبارة " برنامج معالجتى " قم بالتفكير رجاء حول ما يمكن للطفل ( أو أبويه ) أن يقوم به لتقديم الرعاية الصحية لمرضك الربو وفق نظام يومي؛ ويتضمن هذا الأمر تناول الأقراص الدوائية، البخاخ أو العلاجات الأخرى، وتحديد النشاط البدني، والأشياء التي يجب تجنبها ( مثل الغبار، والحيوانات، ودخان السجائر، أو بعض الأطعمة)، القيام بزيارة عيادة الطبيب أو المستشفيات... إلخ.

ضع دائرة حول الإجابة التي أفضل ما يقولها المريض ( أو والديهم ) أو يشعر بها، بعد قراءة كل عبارة في الصفحة التالية

- |                  |                                                     |
|------------------|-----------------------------------------------------|
| س د = أرفض بشدة  | ( هذا غير صحيح قطعياً بالنسبة لي أو لطفلي )         |
| د = لا أوافق     | ( هذا حقيقة غير صحيح بالنسبة لي أو لطفلي )          |
| ن = معتدل        | ( هذا ليس صحيحاً ولا غير صحيح بالنسبة لي أو لطفلي ) |
| أ = أتفق مع ذلك  | ( يعتبر هذا نوعاً ما صحيحاً بالنسبة لي أو لطفلي )   |
| س أ = أوافق بشدة | ( هذا صحيح تماماً بالنسبة لي أو لطفلي )             |

أوافق بشدة	أوافق	معتدل	لا أوافق	أرفض بشدة	
س	أ	ن	د	س	1- أنا أكره فكرة الاستسلام والخضوع للأشياء التي يخبرني الأطباء أن أخضع لها
س	أ	ن	د	س	2- أعتقد أنني إذا قمت برعاية نفسي ومتابعة برنامج معالجاتي ؛ فإن صحتي ستتحسن
س	أ	ن	د	س	3- أحاول نسيان أنني مصاب بمرض
س	أ	ن	د	س	4- يستهلك نظام معالجاتي الكثير من الوقت والجهد
س	أ	ن	د	س	5- لا أستطيع تذكر كل شيء يقترض بي القيام به تجاه مرضي أحياناً
س	أ	ن	د	س	6- لا أربح أن يعلم أصدقائي حول مرضي
س	أ	ن	د	س	7- عندما يوجد تغيرات ببرنامج معالجاتي، تختلط علي الأمور أحياناً
س	أ	ن	د	س	8- عندما أشعر بالترفضة أو القلق؛ يكون من الصعب علي اتباع برنامج معالجاتي
س	أ	ن	د	س	9- لا أحد من أصدقائي عليه التعامل بمثل هذا الأمر؛ فلماذا أنا؟
س	أ	ن	د	س	10- من السهل معالجة مرضي أكثر من العديد من الأمراض الأخرى
س	أ	ن	د	س	11- أنا أتفهم ما المطلوب مني القيام به للاهتمام بمرضي
س	أ	ن	د	س	12- يعالجتني الأطباء كطفل صغير لا يمكنه رعاية نفسه/ ها
س	أ	ن	د	س	13- لدي صعوبة في فهم تعليمات الطبيب التي يخبرني بها حول أدويتي
س	أ	ن	د	س	14- إنني لا أثق دائماً بالأطباء والممرضات
س	أ	ن	د	س	15- إن اتباع برنامج معالجاتي يسبب لي الألم البدني وعدم الارتياح
س	أ	ن	د	س	16- لن يحدث شيء سيء لي إن لم أتبع برنامج معالجاتي
س	أ	ن	د	س	17- يتميز الأطباء القائمين على علاجي بالود والمرونة بالمحادثة
س	أ	ن	د	س	18- إن من الصعوبة بالنسبة لي تخطيط الأشياء بعناية؛ لذا فأنا أفقد بعض الأمور خلال متابعة برنامج معالجاتي
س	أ	ن	د	س	19- تسبب أدويتي آثاراً جانبية سيئة والتي لا أربح بها حقيقة
س	أ	ن	د	س	20- يصعب علي تناول أدويتي عندما أكون خارج المنزل
س	أ	ن	د	س	21- لا تتفهم عائلتي ما الأسلوب الذي ينبغي العيش معه أثناء فترة مرضي
س	أ	ن	د	س	22- لا أمانع أو أهتم فيما لو تحدث أصدقائي عن مرضي أو سألوني عنه
س	أ	ن	د	س	23- لا يبدو أن الأطباء يتفهمون مدى أهمية برنامج معالجاتي في حياتي
س	أ	ن	د	س	24- تقدم عائلتي لي الدعم الكثير لمساعدتي في متابعة برنامج معالجاتي
س	أ	ن	د	س	25- يقوم الأطباء بعمل جيد من خلال شرح الأشياء لي
س	أ	ن	د	س	26- يصعب علي البقاء منتظماً بشكل كافٍ للمحافظة على طريقة تناول الأدوية أو الأمور الأخرى المرتبطة بمرضي
س	أ	ن	د	س	27- أرفض منح الوقت لأصدقائي حتى يقوموا برعايتي من مرضي
س	أ	ن	د	س	28- من الواضح أن الأطباء منشغولون لدرجة كبيرة أو في عجلة من أمرهم للتحدث حول مرضي أو معالجاتي
س	أ	ن	د	س	29- يؤدي برنامج معالجاتي إلى تبدلات في جسمي لا أربح بها

### الجزء الثالث: عوانق الالتزام

برأيك، إلى أي مدى تشكل الأمور التالية عائقاً لاستعمال المريض اليومي مركبات الكورتيزون  
المستنشق (الاستيرويد) القشرية؟  
( قم بتسجيل معدل المقياس من 1 إلى 5 ، حيث تعني 1 التأثير القوي ، وتعني 5 أنه لا يوجد  
تأثير )

5	4	3	2	1	العائق
لا يوجد تأثير	تأثير ضعيف	تأثير خفيف	تأثير متوسط	تأثير قوي	
					كثرة النسيان والإهمال
					الخوف من الآثار الجانبية للأدوية
					الخوف من الإدمان / الاعتماد على الأدوية
					تكلفة الدواء أو الرعاية الصحية
					عدم فهم أنواع و دور الدواء (ما هي الأدوية التي تستخدم لمعالجة الأعراض وما يستخدم للتحكم في المرض) ومتى يستخدم كل منها
					عدم فهم الاستعمال الصحيح لجهاز البخاخ ( المنشقة )
					عدم توافر أو نقص المعلومات الموثوقة
					صعوبة قراءة وفهم التعليمات المقدمة من الأطباء أو احد مقدمي الخدمة العلاجية
					الاعتقاد أن الدواء غير فعال
					غياب العلامات المنذرة (اعرض الربو مثل الكحة وصعوبة التنفس والازيز) والتي تعني لي عدم الحاجة لاستخدام اي دواء
					صعوبة لغة تعليمات الدواء (المرفقه بالدواء)
					الاستغناء عن الدواء باستعمال العلاج التقليدي (الشعبي)
					استعمال انواع مختلفه من البخاخات
					استعمال أنماط دوائية مختلفة متعددة (أدوية ضبط اوقانيه و ادويه لعلاج الأعراض)
					الشعور بعدم الارتياح لاستعمال الدواء
					الاعتقاد بان الربو ليس مرضاً خطيراً ولا يحتاج معالجة مستمرة
					عدم الاقتناع او ( الملل من) بتوقيت جدول الزيارة ( المواعيد ) والوقت المنتظر لصرف الدواء من الصيدلية
					الخوف من معرفة أقرباني وأصدقائي بمرضي وعلاجي

## Phase three questionnaire (Arabic v)

Consent Arabic v

### موافقة

اوافق على المشاركة في الدراسة مع العلم انني قد فهمت مايلي:-

- 1-مشاركتي اختياريه ولي الحق بالانسحاب اذا رغبت بدون اي التزام وفي اي وقت.
  - 2-اهداف وغرض الدراسة تم شرحها لي وجميع اسئلتني تم الاجابة عليها.
  - 3-سوف استفيد باذن الله من هذه الدراسة لمعرفة المزيد عن حالتي المرضية وكيف التعامل مع المرضى وكيف يمكن التحكم فيه.
  - 4-جميع المعلومات ستبقى سرية ومحفوظة في جميع الاوقات وسوف تستعمل لغرض البحث فقط بمعرفة الباحث. وسوف تحفظ في مكان امن في كلية الصيدلة بجامعة كيرتن.
  - 5- سوف احصل على صورة من هذا الاقرار.
- تمت قراءة هذا النموذج وفهمه وبالتوقيع عليته يعني الموافقة على الاشتراك في هذه الدراسة.

التوقيع  
التاريخ

### استبيانه

تمت تعبئه الاستبانة بواسطة

- 1- المريض   
2- الاب او الام   
3- المريض وبمساعدة الاب او الام

الجزء الاول:- معلومات عامة

(ضع علامة ✓ في المربع)

1-ما هو جنس المصاب بمرض الربو:

- ذكر  انثى

2-كم عمره المريض ؟

- أ- اقل من 5 سنوات  ب- من 5 إلى اقل من 10 سنوات   
ت- من 10 سنوات الى اقل من 15 سنه  ث- من 15 سنة ألى اقل من 18 سنه

3- مستوى التعليم

ابتدائي او اقل	متوسط	ثانوي	جامعي
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4- معدل الدخل الشهري للأسره

- أ- اقل من 5000 الاف ريال  
ب- من 5001 الى 10000 ريال  
ت- من 10001 الى 15000 ريال  
ث- من 15001 الى 20000 ريال  
ج- اكثر من 20001 ريال

5- هل لدى المريض او الاسرة تامين صحي

- أ- نعم  ب- لا

6- هل تعتقد أن إصابتك/اوإصابة طفلك بالربو من الناحية التشخيصية كانت

- أ- خفيفة جدا  ب- خفيفة   
ت-متوسطه  ث- حادة

7- غالبا ما مدى المعاناة التي سببها مرض الربو (الأزمة) خلال الأسابيع الأربعة الماضية

للأعراض التالية {كحة، ضيق في الصدر ( صعوبة عند أخذ نفس عميق) و أزيز( صوت

حشرجة في الصدر) لك او لطفلك

- أ- مرة في الشهر أو اقل   
ب- مرة في الأسبوع   
ت- مرتين في الأسبوع   
ث- يوميا

8- خلال الـ 4 أسابيع الماضية كم في المتوسط استيقظت/واستيقظ طفلك بالليل بسبب حالة الربو(الأزمة)

- أ- 1- لم يحدث
- ب- 2- أقل من مرة في الأسبوع
- ت- 3- مرة أو مرتين في الأسبوع
- ث- 4- ثلاث مرات أو أكثر في الأسبوع

9- غالباً ما مدى تأثر/هو تأثر طفلك في الانتظام في الدراسة أو النشاطات اليومية ( كالعاب ، زيارة صديق أو أي نشاط عائلي ) بسبب الربو ؟

- أ- 1- مرة في الشهر أو أقل
- ب- 2- مرة في الأسبوع
- ت- 3- مرتين في الأسبوع
- ث- 4- أكثر من مرتين في الأسبوع

10- أي مما يلي ينطبق على حالك أحوال طفلك

غير متأكد	لا	نعم	
			أ هل أنت أو طفلك تلقيت خطة إرشادية مكتوبة من الطبيب المعالج توضح لكم كيفية التصرف المطلوب في حالة حدوث نوبة الربو ؟
<input type="checkbox"/> نعم ويستعمل بانتظام			ب هل لديك/لدى طفلك جهاز قياس تدفق الهواء لمراقبة حالات الربو – إذا كانت الإجابة بنعم هل يستعمل بانتظام*
<input type="checkbox"/> نعم ولايستعمل بانتظام			ت* هل تستعمل/او طفلك الكورتيزون المستنشق (الاستيرويد) مثل: بيكلوميثازون (بيكوتيد- فلنكسوتايد) او بيوديسوناييد (بولميكورت) او مركبة تحوي كورتيزون مستنشق مثل سمبيكورت او سيريتايد لعلاج الربو؟ e.g. Becotide, flixotid, pulmicort, symbicort and seretid )
			ث هل تعتقد أن العلاجات التي تتناولها/او طفلك ذات فعالية في السيطرة على هذا المرض ؟
			ج هل الطبيب أو مقدم الخدمة العلاجية يشركك أنت وطفلك المريض في اتخاذ قرارات بشأن علاج الربو ؟
			د هل تعتقد أن لديك المعلومة الكافية لمساعدتك في السيطرة على مرض الربو (الأزمة)؟

11- إذا كانت الإجابة بنعم على السؤال رقم 10 فقرة (ت) أعلاه فأني من الآتي يصف جيداً

طريقة استنشاقك/او طفلك لمركبات الكورتيزون المستنشق(الاستيرويد)

- أ- يستنشق الاستيرويد كل يوم في حالة أعراض الأزمة أو دون أعراض
- ب- يتناوله لبعض الأيام دون أخرى
- ث- يتناول الدواء فقط في حالة الأعراض

## الجزء الثاني : المعتقدات الصحية

توجيهات: نحن مهتمون في هذا الجزء بالأمور التي تجعل من الصعوبة بمكان القيام برعاية المصابين بداء الربو. يوجد في الأسفل قائمة الأشياء التي يعتقد بعض الأطفال ( أو والديهم ) أو يشعرون أنه ينبغي القيام بها للاهتمام بمرضهم. عندما تقرأ عبارة " برنامج معالجتى " قم بالتفكير رجاء حول ما يمكن للطفل ( أو أبويه ) أن يقوم به لتقديم الرعاية الصحية لمرضك الربو وفق نظام يومي؛ ويتضمن هذا الأمر تناول الأقراص الدوائية، البخاخ أو العلاجات الأخرى، وتحديد النشاط البدني، والأشياء التي يجب تجنبها ( مثل الغبار، والحيوانات، ودخان السجائر، أو بعض الأطعمة)، القيام بزيارة عيادة الطبيب أو المستشفيات...إلخ.

ضع دائرة حول الإجابة التي أفضل ما يقولها المريض ( أو والديهم ) أو يشعر بها، بعد قراءة كل عبارة في الصفحة التالية

- |                                                     |                  |
|-----------------------------------------------------|------------------|
| ( هذا غير صحيح قطعياً بالنسبة لي أو لطفلي )         | س د = أرفض بشدة  |
| ( هذا حقيقة غير صحيح بالنسبة لي أو لطفلي )          | د = لا أوافق     |
| ( هذا ليس صحيحاً ولا غير صحيح بالنسبة لي أو لطفلي ) | ن = معتدل        |
| ( يعتبر هذا نوعاً ما صحيحاً بالنسبة لي أو لطفلي )   | أ = أتفق مع ذلك  |
| ( هذا صحيح تماماً بالنسبة لي أو لطفلي )             | س أ = أوافق بشدة |

ارفض بشدة	لا وافق	معتدل	اتفق مع ذاك	وافق بشدة	
س د	د	ن	أ	س أ	1- أنا أكره فكرة الاستسلام والخضوع للأشياء التي يخبرني الأطباء أن أخضع لها
س د	د	ن	أ	س أ	2- أعتقد أنني إذا قمت برعاية نفسي ومتابعة برنامج معالجاتي؛ فإن صحتي ستتحسن
س د	د	ن	أ	س أ	3- أحاول نسيان أنني مصاب بمرض
س د	د	ن	أ	س أ	4- يستهلك نظام معالجاتي الكثير من الوقت والجهد
س د	د	ن	أ	س أ	5- لا أستطيع تذكر كل شيء يفترض بي القيام به تجاه مرضي أحياناً
س د	د	ن	أ	س أ	6- لا أريد أن يعلم أصدقاؤني حول مرضي
س د	د	ن	أ	س أ	7- عندما يوجد تغيرات ببرنامج معالجاتي، تختلط علي الأمور أحياناً
س د	د	ن	أ	س أ	8- عندما أشعر بالذفرزة أو القلق؛ يكون من الصعب علي اتباع برنامج معالجاتي
س د	د	ن	أ	س أ	9- لا أحد من أصدقاؤني عليه التعامل بمثل هذا الأمر؛ فلماذا أنا؟
س د	د	ن	أ	س أ	10- من السهل معالجة مرضي أكثر من العديد من الأمراض الأخرى
س د	د	ن	أ	س أ	11- أنا أتفهم ما المطلوب مني القيام به للاهتمام بمرضي
س د	د	ن	أ	س أ	12- يعالجن الأطباء كطفل صغير لا يمكنه رعاية نفسه/ها
س د	د	ن	أ	س أ	13- لدي صعوبة في فهم تعليمات الطبيب التي يخبرني بها حول أدويتي
س د	د	ن	أ	س أ	14- إنني لا أثق دائماً بالأطباء والمرضات
س د	د	ن	أ	س أ	15- إن اتباع برنامج معالجاتي يسبب لي الألم البدني وعدم الارتياح
س د	د	ن	أ	س أ	16- لن يحدث شيء سيء لي إن لم أتبع برنامج معالجاتي
س د	د	ن	أ	س أ	17- يتميز الأطباء القانمين على علاجي بالود والمرونة بالمحادثة
س د	د	ن	أ	س أ	18- إن من الصعوبة بالنسبة لي تخطيط الأشياء بعناية؛ لذا فأنا أفقد بعض الأمور خلال متابعة برنامج معالجاتي
س د	د	ن	أ	س أ	19- تسبب أدويتي آثاراً جانبية سيئة والتي لا أريد بها حقيقة
س د	د	ن	أ	س أ	20- يصعب علي تناول أدويتي عندما أكون خارج المنزل
س د	د	ن	أ	س أ	21- لا تتفهم عائلتي ما الأسلوب الذي ينبغي العيش معه أثناء فترة مرضي
س د	د	ن	أ	س أ	22- لا أمانع أو أهتم فيما لو تحدث أصدقاؤني عن مرضي أو سالوني عنه
س د	د	ن	أ	س أ	23- لا يبدو أن الأطباء يتفهمون مدى أهمية برنامج معالجاتي في حياتي
س د	د	ن	أ	س أ	24- تقدم عائلتي لي الدعم الكثير لمساعدتي في متابعة برنامج معالجاتي
س د	د	ن	أ	س أ	25- يقوم الأطباء بعمل جيد من خلال شرح الأشياء لي
س د	د	ن	أ	س أ	26- يصعب علي البقاء منتظماً بشكل كافٍ للمحافظة على طريقة تناول الأدوية أو الأمور الأخرى المرتبطة بمرضي
س د	د	ن	أ	س أ	27- أرفض منح الوقت لأصدقاؤني حتى يقوموا برعايتي من مرضي
س د	د	ن	أ	س أ	28- من الواضح أن الأطباء منشغولون لدرجة كبيرة أو في عجلة من أمرهم للتحدث حول مرضي أو معالجاتي
س د	د	ن	أ	س أ	29- يؤدي برنامج معالجاتي إلى تبدلات في جسمي لا أريد بها

### الجزء الثالث: عوانق الالتزام

برأيك، إلى أي مدى تشكل الأمور التالية عائقاً لاستعمال المريض اليومي مركبات الكورتيزون  
المستنشق (الاستيرويد) القشرية؟  
( قم بتسجيل معدل المقياس من 1 إلى 5 ، حيث تعني 1 التأثير القوي ، وتعني 5 أنه لا يوجد  
تأثير )

5	4	3	2	1	العائق
لا يوجد تأثير	تأثير ضعيف	تأثير خفيف	تأثير متوسط	تأثير قوي	
					كثرة النسيان والإهمال
					الخوف من الآثار الجانبية للأدوية
					الخوف من الإدمان / الاعتماد على الأدوية
					تكلفة الدواء أو الرعاية الصحية
					عدم فهم انواع و دور الدواء (ما هي الادوية التي تستخدم لمعالجة الاعراض وما يستخدم للتحكم في المرض) ومتى يستخدم كل منها
					عدم فهم الاستعمال الصحيح لجهاز البخاخ ( المنشقة )
					عدم توافر او نقص المعلومات الموثوقة
					صعوبة قراءة وفهم التعليمات المقدمة من الاطباء او احد مقدمي الخدمة العلاجية
					الاعتقاد أن الدواء غير فعال
					غياب العلامات المنذرة (اعرض الريبومثل الكحة وصعوبة التنفس والازيز) <u>والتي تعني لي عدم الحاجة لاستخدام اي دواء</u>
					صعوبة لغة تعليمات الدواء (المرفقه بالدواء)
					الاسغناء عن الدواء باستعمال العلاج التقليدي (الشعبي)
					استعمال انواع مختلفه من البخاخات
					استعمال أنماط دوائية مختلفة متعددة (أدوية ضبط اوقانيه و ادويه لعلاج الأعراض)
					الشعور بعدم الارتياح لاستعمال الدواء
					الاعتقاد بان الربو ليس مرضاً خطيراً ولا يحتاج معالجة مستمرة
					عدم الاقتناع او ( الملل من) بتوقيت جدول الزيارة ( ) المواعيد ) والوقت المنتظر لأصرف الدواء من الصيدلية
					الخوف من معرفة أقربائي وأصدقائي بمرضي وعلاجي

## Phase four questionnaire (Arabic v)

### استبيان المريض

عزيزي المشارك أو المشاركة:-

- 1- اشكر لكم حسن تعاونكم وتجاوبكم وأمل إجابة جميع الأسئلة
- 2- يتم تعبئة الاستبيان بدون تسجيل أي معلومات شخصية عن المريض علما بان جميع البيانات ستعامل بسرية تامة ولن تستخدم إلا لإغراض البحث كما ان ذلك لن يؤثر على الخدمة العلاجية المقدمة للمريض

ولكم مني كل التقدير والاحترام

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الباحث

سلطان سعد ال ثقفان

جوال 0531005838

## موافقة

اوافق على المشاركة في الدراسة مع العلم انني قد فهمت مايلي:-

- 1-مشاركتي اختياريه ولي الحق بالانسحاب اذا رغبت بدون اي التزام وفي اي وقت.
  - 2-اهداف وغرض اندراسة تم شرحها لي وجميع اسئلتني تم الاجابة عليها
  - 3-سوف استفيد باذن الله من هذه الدراسة لمعرفة المزيد عن حالتي المرضية وكيف التعامل مع المرضى وكيف يمكن التحكم فية
  - 4-جميع المعلومات ستبقى سرية ومحفوظة في جميع الاوقات وسوف تستعمل لغرض البحث فقط بمعرفة الباحث.وسوف تحفظ في مكان امن في كلية الصيدلة بجامعة كيرتن.
  - 5- سوف احصل على صورة من هذا الاقرار.
- تمت قراءة هذا النموذج وفهمه وبالتالي التوقيع عنية بالموافقة على الاشتراك في هذه الدراسة.

التوقيع

التاريخ

الجزء (1) :  
استبيان تقييم مرضى الربو ( الأزمة )

1	ما هو جنس طفلك: ( ضع علامة ✓ في المربع )	ذكور	انثى
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2	كم عمره ؟	أقل من 5 سنوات	5 إلى أقل من 10 سنوات	10 سنوات إلى أقل من 15 سنة	15 سنة إلى أقل من 18 سنة
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3	هل أخبرك الطبيب أنه يعاني من الربو	نعم	لا
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( إذا كانت الإجابة بلا فنرجو التوقف هنا ورد الاستبانة )

4- ما درجة أعراض الربو التي يعاني منها طفلك في كل موسم من مواسم السنة ؟

	لا توجد أعراض	قليلة	كثيرة
الشتاء			
الربيع			
الصيف			
الخريف			

5	في الأسابيع الـ 4 الماضية كم عدد الأيام التي :	لا توجد معاناة	3-1	4-7	أكثر من 7
	أ- يشعر فيها بازيز في الصدر أو صعوبة في التنفس عند أداء تمارين رياضية				
	ب- يشعر فيها بازيز في الصدر خلال اليوم دون أداء رياضة ؟				
	ج- يستيقظ فيها بالليل بسبب أزيز في الصدر أو صعوبة في التنفس				
	د- يتغيب فيها عن الدراسة بسبب الربو ؟				
	هـ- يتخلف فيها عن النشاطات اليومية ( كاللعب ، زيارة صديق أو أي نشاط عائلي ، بسبب الربو ) ؟				

6	هل أنت غير مقتنع بأي جزء من خطة العلاج الحالي للربو لطفلك ؟	نعم	لا	غير متأكد
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( إذا كانت الإجابة نعم ) نرجو التوضيح :

.....  
.....

7	في الاثني عشر شهراً الماضية هل تناول طفلك علاجاً للربو؟	نعم	لا
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8	هل في اعتقادك :-	نعم	لا	غير متأكد
أ	أنه قد تمت السيطرة تماماً على مرض الربو الذي يعاني منه طفلك خلال الـ 4 أسابيع الماضية؟			
ب	أنه يستطيع تناول ادوية الربو حسب التوجيهات ؟			
ج	أن لديك المعرفة الكافية لمساعدته في السيطرة على مرض الربو ( الأزمة)؟			
د	أن العلاجات التي يتناولها طفلك ذات فعالية في السيطرة على هذا المرض ؟			

9	هل الطبيب أو مقدم الخدمة العلاجية :	نعم	لا	غير متأكد
أ-	يشركك أنت وطفلك المريض في اتخاذ قرارات بشأن علاج الربو			
ب-	وهل يعلم ان طفلك يفضل تناول علاج معين للربو مثل (حبوب ، دواء سائل ، دواء استنشاق) .			

10	في خلال الـ 12 شهر الماضية هل اشرف الطبيب أو أحد مقدمي الخدمة في توضيح كيفية تعاطي طفلك لعلاج الربو	نعم	لا	غير متأكد
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11	هل أنت أو طفلك تلقيت خطة إرشادية مكتوبة من الطبيب المعالج توضح لكم كيفية التصرف المطلوب في حالة حدوث نوبة الربو ؟	نعم	لا	غير متأكد
أ-	كيفية تناول الطفل للادوية (الأدوية الوقائية) . في الأحوال التي لا تكون فيها نوبات الربو			

12	هل يستعمل طفلك جهاز استنشاق أو مرذة ( البخاخ الازرق ) للتخلص السريع من أعراض الأزمة	نعم	لا	غير متأكد
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أ- ( إذا كانت الإجابة بنعم ) حدد عدد المرات التي استعمل فيها طفلك جهاز الاستنشاق ( البخاخ ) في اليوم الواحد خلال الاربعة الأسابيع الماضية

صفر	مرة الى مرتين يومياً	3 الى 4مرات يومياً	5 الى 6 مرات يومياً	أكثر من 6 مرات يومياً

ب- خلال الـ 12 شهر الماضية ما عدد المرات في اليوم التي استعمل فيها طفلك أداة الاستنشاق أو البخاخ الازرق ( مرذاذ ) للتخلص السريع من نوبة الربو.

صفر	مرة الى مرتين يومياً	3 الى 4مرات يومياً	5 الى 6 مرات يومياً	أكثر من 6 مرات يومياً

13	هل تلقى طفلك وصفة طبية ليست للحالات الطارئة، ولكن للسيطرة على حالة الربو (الأزمة) (الأدوية الوقائية) التي يعاني منها ؟	نعم	لا	غير متأكد
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( إذا كانت الإجابة بنعم للسؤال رقم 13) فاختر الإجابة المناسبة من التالي

يتناوله كل يوم .	
يتناوله لبعض الأيام دون أخرى .	
كان يتناوله في الماضي وتركه الآن	
يتناول الدواء فقط في حالة الأعراض	
لم يتناوله إطلاقاً .	

نشكرك على الإجابة على هذا الجزء من الاستبانة .

هل تحب أن تشير إلى أي شيء يتعلق بإصابة طفلك بمرض الربو أو طريقة العناية الطبية التي يتلقاها

.....

.....

.....

### الجزء ( 2 )

في هذا الجزء نود أن نتعرف على مدى المعاناة التي سببها مرض الربو (الأزمة) خلال الأسابيع الأربعة الماضية

1- خلال الأسابيع الأربعة الماضية ، كم عدد المرات التي عانى فيها طفلك من الأعراض الآتية (الكحة، ضيق في الصدر ( صعوبة عند أخذ نفس عميق، أزيز أو صوت حشرجة في الصدر ) :

لم يعان إطلاقاً	مرة في الأسبوع أو أقل	مرة إلى مرتين في الأسبوع	4 إلى 5 مرات في الأسبوع	يومياً

### الجزء ( 3 )

الأسئلة التالية عن التجارب المختلفة التي مرت بطفلك مع مرض الربو(الأزمة) .  
1-من الناحية العامة هل تعتقد أن إصابة طفلك بالربو من الناحية التشخيصية كانت:

خفيفة جداً	خفيفة	متوسطة	حادّة

2- هل يستطيع طفلك تفادي نوبات الربو؟

بسهولة	وسط	بصعوبة	بصعوبة جداً

3- (أ)- هل يستعمل طفلك الكورتيزون المستنشق (الاستيرويد ) مثل: بيكلوميثازون (بيكوتيد - فلكسونيد) او بيوديوسونيد (بولميكورت) او مركبة تحوي كورتيزون مستنشق مثل سمبيكورت او سيريتايد لعلاج الربو؟

( e.g. Becotide, flixotid, pulmicort,symbicort and seretid )

نعم*	لا**	لا اعرف**

\* إذا كانت الإجابة بنعم فنرجو الإجابة على السؤال 3(ب) أدناه  
\*\*إذا كانت الإجابة بلا أو لا اعرف فنرجو الذهاب إلى الجزء الرابع

3- (ب) إذا كانت الإجابة بنعم على السؤال 3 (أ) اعلاه فأني من الآتي يصف جيداً طريقة استنشاق طفلك لمركبات الاستيرويد

( نرجو أن تختار إجابة واحدة فقط ) :

1- يستنشق الاستيرويد كل يوم في حالة أعراض الأزمة أو دون أعراض
2- بالرغم من توصية الطبيب باستنشاق الاستيرويد كل يوم إلا أن الطفل يقوم بذلك أقل من المطلوب.
3- يستنشق الاستيرويد عدة مرات في الأسبوع .
4- يستنشق الاستيرويد فقط في حالة أعراض الأزمة

#### الجزء ( 4 ) :

يلاحظ أن الأسئلة التالية تتمحور حول جهاز قياس كمية الهواء الخارج من الرئة واستعمل جهاز الاستنشاق والتوعية باستخدام الدواء وتعديل الجرعة

1- اختر الإجابة المناسبة لما يلي

	نعم	لا	غير متأكد
أ هل تم إرشاده عن كيفية استعمال جهاز قياس تدفق الهواء بواسطة الطبيب أو الممرض أو احد مقدمي الخدمة العلاجية.			
ب هل يستعمل جهاز قياس التنفس لمراقبة حالات الربو			
ج هل عادة ما يستعمل وسائل التوصيله الفموية(قمع وسيط Spacer) عند استعماله لجهاز الاستنشاق			
د هل يستطيع الطفل أن يتعامل مع التغييرات عند اشتداد الربو (الأزمة) في معظم الأحيان			

2- كيف تقيم نوعية المعلومات والتصانح من قبل الطبيب، الممرض أو احد مقدمي الخدمة العلاجية لطفلك

جيدة جداً	جيدة	لا بأس بها ( مقبولة )	سيئة	لا توجد إرشادات

7- نرجو كتابة العلاجات التي يتناولها طفلك مع توضيح عدد مرات الاستعمال ، وكمية الجرعة وكيفية الاستعمال. (يمكن الاستعانة بالملحق الذي يحوي أسماء وصور لبعض الأدوية المستخدمة للربو).

اسم الدواء	شكل الدواء ( أقراص ، استنشاق بخاخ .. الخ )	عدد الحبات او البخات	عدد مرات الاستعمال يوميا مثلاً ( عدد المرات في اليوم )

8- هل عانى طفلك من أي من الأعراض التالية منذ بدء العلاج للربو :

	نعم	لا
أ اكتسب وزناً زائداً		
ب تغير في المزاج والشعور بالإحباط مثلاً		
ج ظهور مرض السكري		
د بطء في النمو الجسمي		

9-هل أدخل طفلك لمستشفى أو غرفة الطوارئ خلال الـ 3 أشهر الماضية :

نعم  لا  ( إذا كانت الإجابة بنعم ،كم عدد المرات ) ( ) مرة

### الجزء الخامس

الاسئلة التالية تتعلق بتاثير مرض الربو على نوعية حياة طفلك/حياتك.

1- هل واجهت مشكلة خلال الاربعة اسابيع الماضيه بسبب اصابتك بمرض الربو؟

- أ- ابدا لم اواجه مشكلة [ ]  
ب- بعض الاوقات ( بمعدل مرة في الاسبوع او اقل) [ ]  
ت- غالب الاوقات (بمعدل مرتين- الى ثلاث في الاسبوع) [ ]  
ث- دائما ( يوميا) [ ]

2- هل شعرت بالقلق, الانزعاج او الخوف خلال الاربعة اسابيع الماضيه بسبب اصابتك بمرض الربو؟

- ا- ابدا لم اواجه مشكلة [ ]  
ب- بعض الاوقات ( بمعدل مرة في الاسبوع او اقل) [ ]  
ت- غالب الاوقات (بمعدل مرتين- الى ثلاث في الاسبوع) [ ]  
ث- دائما ( يوميا) [ ]

3- خلال الاربعة اسابيع الماضيه. هل شعرت بالزعل او التضايق بسبب اصابتك بمرض الربو؟

- ا- ابدا لم اواجه مشكلة [ ]  
ب- بعض الاوقات ( بمعدل مرة في الاسبوع او اقل) [ ]  
ت- غالب الاوقات (بمعدل مرتين- الى ثلاث في الاسبوع) [ ]  
ث- دائما ( يوميا) [ ]

4- خلال الاربعة اسابيع الماضيه. لم تستطيع اداء نشاطك اليومي المعتاد بسبب اصابتك بمرض الربو؟

- ا- ابدا لم اواجه مشكلة [ ]  
ب- بعض الاوقات ( بمعدل مرة في الاسبوع او اقل) [ ]  
ت- غالب الاوقات (بمعدل مرتين- الى ثلاث في الاسبوع) [ ]  
ث- دائما ( يوميا) [ ]