

**EVALUATION OF DOCTOR'S KNOWLEDGE, ATTITUDE, ADHERENCE TO  
CLINICAL PRACTICE GUIDELINE (GINA 2011) RECOMMENDATIONS AND COST  
ASSOCIATED WITH ASTHMA TREATMENT**

**By**

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To

My precious grandparents, parents and uncles  
who gave me inspiration, unconditional sacrifice and love for completing  
this scholastic work

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## LIST OF ABBREVIATIONS

APC	Antigen presenting cells
CHF	Congestive heart failure
COPD	Chronic obstructive pulmonary disease
CPG	Clinical practice guidelines
DALYs	Disability adjusted life years
EBM	Evidence based medicine
ED	Emergency department
FEV1	Forced expiratory volume in 1 second
FVC	Forced vital capacity
GERD	Gastroesophageal reflux disease
GINA	Global initiative for Asthma
GP	General practitioners
HPP	Hospital Pulau Pinang
ICU	Intensive cardiac unit
IV	Intravenous
IL-1B	Interleukin-1-B
NAEPP	National Asthma Education and Prevention Program
NSAID	Non steroidal anti-inflammatory drug
PEF	Peak expiratory flow
RSV	Respiratory syncytical virus
SD	Standard deviation
SpO2	Oxygen saturation
TH2 cells	T helper 2 cells
WHO	World Health Organisation

## LIST OF PUBLICATIONS

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### Conference

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**PENILAIAN PENGETAHUAN, SIKAP DAN PENEPIATAN TERHADAP  
GANSPANDUAN AMALAN KLINIKAL (GINA 2011) DIKALANGAN  
DOKTOR DAN KOS YANG BERKAITAN DENGAN RAWATAN ASMA  
ABSTRAK**

literatur yang sedia ada mencadangkan bahawa ketidakpatuhan doktor terhadap garis panduan GINA ini adalah salah satu faktor utama yang menyumbang kepada kawalan asma yang kurang memuaskan. Kajian ini melibatkan 27 doktor dari Jabatan Kecemasan dan 6 doktor dari Jabatan Respiratori yang terlibat dalam satu kajian yang telah dijalankan di Hospital Pulau Pinang (HPP). Matlamatnya adalah untuk menilai pengetahuan doktor, sikap terhadap garis panduan amalan klinikal asma (CPG), faktor yang mempengaruhi pengurusan asma, ketetapan doktor terhadap garis panduan GINA 2011 dan kos langsung yang berkaitan dengan rawatan asma di HPP. Pengetahuan, sikap doktor terhadap CPG (GINA 2011) dan faktor-faktor yang memberi kesan kepada pengurusan asma telah dinilai melalui SATU soal selidik.

Preskripsi yang ditulis oleh 27 doktor di Jabatan Kecemasan dan 6 doktor di Jabatan Respiratori diteliti . Sebanyak 810 preskripsi pesakit dari Jabatan Kecemasan dan 180 preskripsi pesakit dari Jabatan Respiratori diambil (30 preskripsi bagi setiap doktor yang didaftar) . Preskripsi yang diteliti telah dikelaskan sama ada sebagai " mematuhi " atau "tidak mematuhi " dengan CPG ( GINA 2011). Satu ratus lapan puluh (180) pesakit di Jabatan Respiratori telah dianalisa sekali lagi pada lawatan susulan. Nilai spirometri ( FEV1 ) dicatatkan pada lawatan susulan telah dibandingkan dengan nilai spirometry pada lawatan pertama. SPSS 20 telah digunakan untuk analisis data di mana p nilai < 0.05 dianggap signifikan secara statistik. Dua puluh dua (22) doktor dari Jabatan Kecemasan ( 81.5 %) dan kesemua enam (6) doktor dari Jabatan Respiratori mempunyai pengetahuan yang cukup dalam CPG (GINA 2011). Doktor dari Jabatan Kecemasan dan Jabatan Respiratori

mempunyai ketetapan positif terhadap CPG (GINA 2011) dengan menunjukkan skor min sebanyak 20.8 (SD  $\pm$  1.6) mata dan 20.33 (SD  $\pm$  2.55 ) masing-masing pada skala yang mempunyai 25 mata. Satu korelasi yang tidak signifikan secara statistik telah diperhatikan di antara pengetahuan dan amalan skor doktor dari Jabatan Kecemasan ( 0.13 , p = 0.49) dan doktor dari Jabatan Respiratori '(0.53 , p = 0.27). Enam ratus dua puluh lapan (628) pesakit (77.5 %) dari Jabatan Kecemasan dan 143 pesakit ( 78.9 %) dari Jabatan Respiratori menerima farmakoterapi yang mematuhi garis panduan. Kawalan asma pesakit pernafasan mempunyai hubungan yang signifikan dengan jantung (p = 0.015 ). Nilai spirometri dari lawatan kedua pesakit berbeza daripada lawatan pertama pesakit secara statistik (P < 0.001) . Kos preskripsi bagi peasakit asma yang terkawal namun tidak patut kepada garis panduan GINA (RM = 10.39 ) adalah lebih tinggi daripada kos preskripsi bagi peasakit asma yang terkawal dan patut kepada garis panduan GINA (RM = 9.18) di Jabatan Kecemasan manakala kos purata preskripsi kepatuhan (RM = 70.80 ) pesakit dari Jabatan Respiratori adalah lebih tinggi daripada kos purata ketidakpatuhan preskripsi (RM = 13.74 ).

Daripada 180 pesakit asma dari Jabatan Respiratori, seramai 158 (87.7%) pesakit berjaya mencapai kawalan asma yang baik. Antara pesakit yang berjaya dirawat, 124 (78.4%) pesakit menerima farmakoterapi yang mematuhi garis panduan, manakala 34 (21.6%) pesakit tidak menerima farmakoterapi yang mematuhi garis panduan. Ketidakpatuhan doktor terhadap garis panduan dan berdasarkan pengalaman peribadi menyebabkan 34 (21.6%) pesakit asma berjaya dirawat dan telah menjimatkan 4.51% daripada kos langsung perawatan asma di jabatan pernafasan.

Pengetahuan dan kepatuhan doktor dengan CPG (GINA 2011) menunjukkan tahap yang baik secara keseluruhan diperhatikan di HPP.

**EVALUATION OF DOCTOR'S KNOWLEDGE, ATTITUDE, ADHERENCE  
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RECOMMENDATIONS AND COST ASSOCIATED WITH ASTHMA  
TREATMENT**

**ABSTRACT**

The existing literature suggests that doctors' divergence from GINA guidelines is one of the major contributing factor for poor asthma control. The present study includes 27 doctors from the emergency department and 6 doctors from the respiratory department in study that was conducted at Hospital Pulau Pinang (HPP). Its aim was to evaluate doctors' knowledge, attitude towards asthma clinical practice guideline (CPG), factors affecting asthma management, practices on GINA 2011 guideline and direct cost associated with asthma treatment at HPP. Doctor's knowledge, attitude towards CPG (GINA 2011) and factors affecting asthma management were evaluated through a questionnaire.

Prescriptions written by enrolled 27 emergency and 6 respiratory department doctors were noted. A total of 810 patients prescriptions from emergency and 180 patients prescription from respiratory department were noted (30 prescriptions per enrolled doctor). The noted prescriptions were classified either as "adhered" or "non-adhered" with CPG (GINA 2011). One hundred and eighty (180) patients in respiratory department were followed for second visit. Spirometry values (FEV1) noted on second visit were differentiated from spirometry values at first visit. SPSS 20 was used for data analysis. Where a *p* value of <0.05 was considered statistically significant. Twenty two (22) emergency department doctors (81.5%) and all 6 respiratory department doctors had adequate knowledge of CPG (GINA 2011). Twenty six (26) emergency and all 6 respiratory department doctors had positive attitude towards CPG (GINA 2011) with mean scores of 20.8 (SD ± 1.6) points and

20.33 (SD  $\pm$  2.55) points respectively on a 25 point scale. A statistical insignificant correlation was observed between emergency doctors' (0.13,  $p=0.49$ ) and respiratory doctors' (0.53,  $p=0.27$ ) knowledge and practice scores. Six hundred and twenty eight (628) patients (77.5%) from emergency department and 143 patients (78.9%) from respiratory department received guideline adhered pharmacotherapy. Respiratory patients asthma control had a significant relation with gender ( $p=0.015$ ). Spirometry values from patient second visit were statistically different from patients first visit ( $P < 0.001$ ). Cost of non adhered prescription for mild asthma patients (RM= 10.39) was higher than adhered mild asthma prescription (RM=9.18) at emergency department whereas the average cost of adhered prescription (RM=70.80) of respiratory department patients was higher than average non adhered prescription (RM=13.74).

Of 180 asthma patients from respiratory department, 158 (87.7%) patient treatment outcome was successful. Among successfully treated patients, 124 (78.4%) patients received guideline adhered pharmacotherapy where as 34 (21.6%) patients did not receive guideline adhered pharmacotherapy. Doctor deviance from guideline based on personal experience and patient condition among successfully treated 34 (21.6%) asthma patients saved 4.51% of direct asthma cost at respiratory department.

An overall good level of doctors' knowledge and adherence with CPG (GINA 2011) was observed at HPP.

## **Chapter 1**

### **Introduction**

#### **1.1 Knowledge, attitude and practice (KAP) studies**

The KAP studies evaluates the existing knowledge, attitude and practices of a specific population that elaborates what is known, believed and accomplished by that specific population about a particular area of interest (WHO, 2008). Three main pillars of a KAP studies are as follows

##### **1.1.1 Knowledge**

Knowledge is defined as ability to acquire information through experience, skills and comprehension i.e. understanding a subject (Lakhan *et al.*, 2010). Knowledge of health behaviour is considered to be beneficial. However, does not automatically mean that this behaviour will be followed. The degree of knowledge assessed by the survey helps to locate areas where information and education efforts remain to be exerted.

##### **1.1.2 Attitude**

Attitude is the ability to respond in a particular way in a particular situation i.e. perceived idea towards subject (Lakhan *et al.*, 2010). Attitudes are connected to the individual's knowledge, emotions and values and consequently it might change from negative to positive and vice versa. As a result of studying attitude we can identify the emotional attitude/evaluation of individuals towards survey issues



### **1.1.3 Practices**

Practice is the ability to demonstrate knowledge and attitudes that lead to actions i.e. practical application of knowledge and attitude (Lakhan *et al.*, 2010). Studying knowledge and attitude is not enough without studying existing practices. One of the advantages of KAP studies is that they provide a possibility to identify the practice model of population towards study issue in detail.

KAP studies gain popularity due to their ability to generalise small results to large population. Moreover, simple methodology and easy interpretation of results is another wide spread utilization of KAP studies (Launiala, 2009). KAP studies tend to reveal not only characteristic traits in knowledge, attitude and behaviours about health related to religious, social, traditional factors, but also help identify factors that are often the source of misconceptions or misunderstandings that may represent obstacles to the activities we like to implement and potential barriers to behavioural changes (The KAP survey model, 2011).

### **1.2 Clinical practice guidelines (CPG)**

Clinical practice guidelines are defined as “systemic developed statements to assist practitioners and patient decisions about appropriate health care for specific clinical circumstances” (Field *et al.*, 1990). Clinical quality is achieved by developing a system that utilizes multi disciplinary approach in implementing appropriate practices, involves patient convince and participation in clinical decision making. Variation in practices regarding diagnosis, treatment and prevention of disease due to uncertainty, biases and difference of opinion affects clinical quality (Eddy, 1984). To change clinical practices and to line them up with evidence based medicine (EBM), multiple strategies including management, regulation and education have been

implied (Browman *et al.*, 1995; Woolf, 1990). Clinical practice guidelines (CPG) are one of many strategies that are applied to improve clinical quality (Woolf *et al.*, 1999).

The objective of clinical practice guideline (CPG) is to achieve effective and efficient patient care, educate practitioners and patients, to assess and assure quality of care and guide allocation of health resources (Tan, 2006). Properly developed guidelines bring EBM into practice; reduce irrational practices, harmful interventions and make sure of best possible outcomes with cost effectiveness (Culleton, 2009).

The delay in implementing research finding in clinical practice results in suboptimal care. On average, it takes 17 years to integrate facts found in clinical trials into clinical practices and even then, evidence is not incorporated as it should be (Carroll, 2002). The effective and systemic way of bringing and practicing these evidences into clinical practices is the development and dissemination of CPG (Grimshaw *et al.*, 2005). Clinical practice guidelines which were initially based on expert opinion are now considered to be systemically developed and evidence based (Lohr *et al.*, 1998). Clinical practice guideline should be valid, reliable, clinically applicable and flexible, developed through multidisciplinary process, continuously updated and documented (Field *et al.*, 1990; Tan, 2006). The skills and resources required for the development of CPG are usually not available to individuals or a single health care organization, due to this reason CPG are developed by specialized national and international institutions (Ollenschläger *et al.*, 2004).

### **1.3 Need for emergence of clinical practice guidelines**

With the advancements in mid of twentieth century, traditional private and hospital practice in almost every part of the world began to face increasing pressure for

standardization. Numerous innovations as a result of medical research created serious dilemmas even as they offered physicians new therapeutic tools. Moreover, individual clinical judgement was becoming visibly inadequate to accommodate with recent advancements in medical sciences.

In the light of recent advancements in new therapeutic agents and an attempt to preserve professional autonomy in the face of administrative pressure or as a way for groups and institutions to compete in the market place, therefore a need for clinical practice guideline emerged (Weisz *et al.*, 2007).

In the past it has been a traditional approach by the clinicians to order all the diagnostic procedures that might have helped in clarifying patient's condition and could help them in identifying appropriate treatment regimens. However, this traditional view ignores stubborn economic facts that make resources finite (Fowkes *et al.*, 1984). Hence a need of clinical practice guideline emerged that would strive to provide a standardized clinical approach in treating patients with an added benefit at a socially acceptable cost.

#### **1.4 Impact of clinical practice guideline**

Number of CPG are developed, widely disseminated and regularly updated in almost every field of medicine. For improving the delivery of quality care to achieve the best possible outcomes, the systemic dissemination and successful implementation of guideline is of utmost importance (Lugtenberg *et al.*, 2009).

Existing literature suggests that most of the time successful implementation of guideline resulted in better quality of care and improved patient outcome. Successful implementation of guidelines is developed by Dutch college of General practitioners on the management of asthma and chronic obstructive pulmonary disease (COPD)

resulted in significant improvement in lung function and respiratory symptoms (Jans *et al.*, 2001). In a multi centre, observational study conducted in six European countries, adherence to European guidelines on the management of congestive heart failure (CHF) was strongly and independently correlated with fewer CHF cardiovascular hospitalization rates (Komajda *et al.*, 2005). Similarly Hypertension control was significantly better in high risk cardiovascular patients treated by a group of physicians who had received training from European Society of Hypertension guideline (Asmar *et al.*, 2007). Feder and colleagues while conducting a randomized controlled trial in general practices reported that the use of local guidelines improved the management of diabetes and asthma (Feder *et al.*, 1995).

### **1.5 Clinical practice guideline for asthma management**

In order to improve asthma management, reduce practice variation and provide cost beneficial therapy of guidelines for management of asthma have been developed and disseminated in various countries around the world. Various major guidelines for management of asthma include Global initiative for Asthma (GINA) guideline for the management of asthma (GINA, 2011), British thoracic society guideline for management of asthma, (BTS/SIGN Asthma guideline, 2011), Guideline for the diagnosis and management of asthma 2007, National Heart, Lung and blood institute (Expert panel report 3, 2007), Asthma model of care 2011, Government of Western Australia (Asthma Model of Care, 2012). A joint venture of Malaysian Thoracic society, Ministry of health Malaysia and Academy of medicine of Malaysia developed and published guidelines for asthma management in 1997 which was last updated in 2002 (Ministry of Health Malaysia, 2012). Despite the availability and dissemination of asthma management guidelines, literature review suggests the existence of wide gaps between guideline recommendations and actual clinical

practice (Guidry *et al.*, 1992; Doerschug *et al.*, 1999; Salmeron *et al.*, 2001; O'Dowd *et al.*, 2003; Robinson *et al.*, 2003).

## **1.6 Factors affecting guideline adherence**

### **1.6.1 Doctor knowledge of guideline adherence**

Doctors' awareness and familiarity with guideline is the initial step to translate guideline into clinical practices (Cabana *et al.*, 1999; Pathman *et al.*, 1996). Studies conducted in this regard have shown awareness of guideline among doctors, has improved their adherence with the guideline (El-Solh *et al.*, 2011; Ikeda *et al.*, 2006).

The relationship between guideline awareness and their adherence is not straight forward. Holland *et al.*, 2008 concluded that even though 945 of doctors were familiar with guideline recommendations most of them showed poor adherence.

### **1.6.2 Doctor attitude towards guideline**

According to Cabana *et al.*, (1999) attitude has an important role in guideline adherence in clinical practice. Similarly, doctor's intent to use clinical practice guideline can be attributed to their attitude towards them (Limbert *et al.*, 2002). The use of guideline can be predicted from attitude of doctors (Kortteisto *et al.*, 2010) which can be determined by various factors, such as their knowledge about guidelines, past clinical experience and outcomes of their practice (Clerc *et al.*, 2011).

### **1.6.3 Doctor demographics**

Sarrell *et al.*, (2002) studied the compliance of primary care doctors to asthma guideline concluded that younger doctors attended the educational programs more

than their senior colleagues and were likely to adhere to asthma guideline. Apart from doctor age and experience studies indicate that doctor gender and specialty also affects guideline adherence (Fams *et al.*, 2002; Holmes *et al.*, 2004)

#### **1.6.4 Patient related factors**

Patient related factors that affect the guideline adherence are complex and involve social, demographic and behavioural issues. Inconvenience with treatment (Tashkin, 1995), laziness and carelessness (Bosley *et al.*, 1995), unwilling to adopt life style moreover social issues such as large family size and chaotic home environment affects patients adherence to regimen, hence further complexes the matter.

#### **1.6.5 Practices setting**

Placing written reminder and computer based tools at practice setting increase guideline adherence (Goethe *et al.*, 1997). Similarly factors such as financial constraints, lack of training and lack of continuing medical education are few of the many factors that contribute to guideline adherence (Rashidian *et al.*, 2008).

### **1.7 Asthma**

Asthma is the chronic inflammatory disorder of the airway in which many cells and cellular elements play a role. The chronic inflammation associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing particularly at night or in the early morning. These episodes are associated with widespread, but variable airflow obstruction within the lung that is often reversible either spontaneously or with treatment (Eric *et al.*, 2011).

## **1.8 Epidemiology of asthma**

Asthma is the most common chronic disease among children and is prevalent globally (WHO, 2013) approximately three hundred million people are suffering from asthma, this figure is expected to rise to four hundred million by year 2025 (Price *et al.*, 2006). Two hundred and fifty thousand people die annually due to asthma; almost all these deaths are avoidable (Price *et al.*, 2006). Over 80 % asthma deaths occur in lower and lower middle income countries. In the United States, the prevalence of asthma has increased from 7.3 % in 2001 to 8.4% in 2010 (Akinbami *et al.*, 2012). In 2010, 25.7 million people had asthma in the US, of which 7 million were aged less than 18 years, more than half (53 %) of people suffering from asthma had acute exacerbation and accounted for 3447 deaths. Moreover, hospitalized patients due to asthma were 1.5 times higher among females (Akinbami *et al.*, 2012). According to global burden of asthma report, there are nearly 30 million people affected with asthma in Scandinavia, the UK, Ireland and Western Europe. The prevalence of asthma is higher in urban areas than suburban and rural areas throughout Europe. In response to health survey regarding asthma attacks during last 12 months in Europe, prevalence was highest in France (7 %), Romania reported to be least (1.5 %). In the same survey, asthma was more commonly reported in females (4.3 %) then to males (3.3%). The largest disparity among gender was noted in Turkey (5 % & 2.5 %) (OECD, 2012).

Asthma is a chronic condition responsible for disability, utilizes high medical resources and affects quality of life. Asthma affects both children and adults with different intensities. Multiple factors are responsible for the development and triggering of an asthmatic episode including genetic factors. The incidence of asthma is estimated between 2.65 to 4/1000 per year. In children less than 5 years, the

incidence of asthma is estimated to be 8.1 to 14/1000 per year for boys and 4.3 to 9/1000 per year, in girls this difference in gender tends to disappear in adulthood. The incidence of asthma over 25 years is estimated at 2.1/1000 per year (Chung, 1995). The prevalence of asthma varies globally and ranges from 0.7 % in Macau to 18.4 % in Scotland (Worldwide variations in the prevalence of asthma symptoms, 1998). Studies indicate epidemiology of exacerbation of asthma attack are linked to multiple factors, epidemic of asthma exacerbations in Barcelona was linked to exposure of atmospheric soybean dust released during cargo handling (Antó *et al.*, 1989). In Northern Hemisphere, asthma exacerbation in school going children in September was related to seasonal Rhinovirus infection (Sears *et al.*, 2007).

In a survey of asthmatics in 8 regions of Asia Pacific it was observed that only 13.6 % of asthma patients used corticosteroids despite half of them had persistent asthma (Lai, 2003). Asthma mortality and morbidity is related with under use of objective medication, under diagnosis and inappropriate supervision. Overall, 51.4 % of respondents had daytime symptoms, whereas 44.3 % reported sleep disturbances. About 26.5 % of adults and 36.5 % of children had missed their work or school because of asthma during the past one year. Moreover, 46.3 % of the respondents have been hospitalized and had an emergency visit during the previous one year.

In Malaysia, asthma is a common cause of hospital admission and emergency visits. According to National Morbidity and health survey, the prevalence of self-reported asthma in Malaysia was 4.2 % (Rugayah *et al.*, 1997). The prevalence of asthma reported at Negri Sembilan was 7.1%, Kelantan was 3.9%, Johar was 4.3% and at Sarawak was 4.6% (Norsian 2008, Izamin *et al.*, 2008, Rohayah 2008, Asri 2008). Generally rural areas had higher prevalence of asthma (4.5 %) when compared to urban areas (4.0 %). The prevalence of asthma in children aged 13-14 years is 9.6 %.



The survey also reports that only 36.1 % of adult asthma patients had ever had their peak flow measurement. Mild asthma was reported in 87.3 % patients, 9.9 % had moderate asthma and 2.7 % of patients had severe asthma (Rugayah *et al.*, 1997). The prevalence of asthma in Malaysia among children is 13.8 %, the prevalence of chronic cough and persistent wheezing was higher among Indian children ( $p < 0.05$ ) (Azizi, 1990).

## **1.9 Pathophysiology of asthma**

Asthma is an inflammatory disorder of the airway that involves several inflammatory cells and multiple mediators. There are two main events that are associated with asthma.

### **1.9.1 Bronchoconstriction**

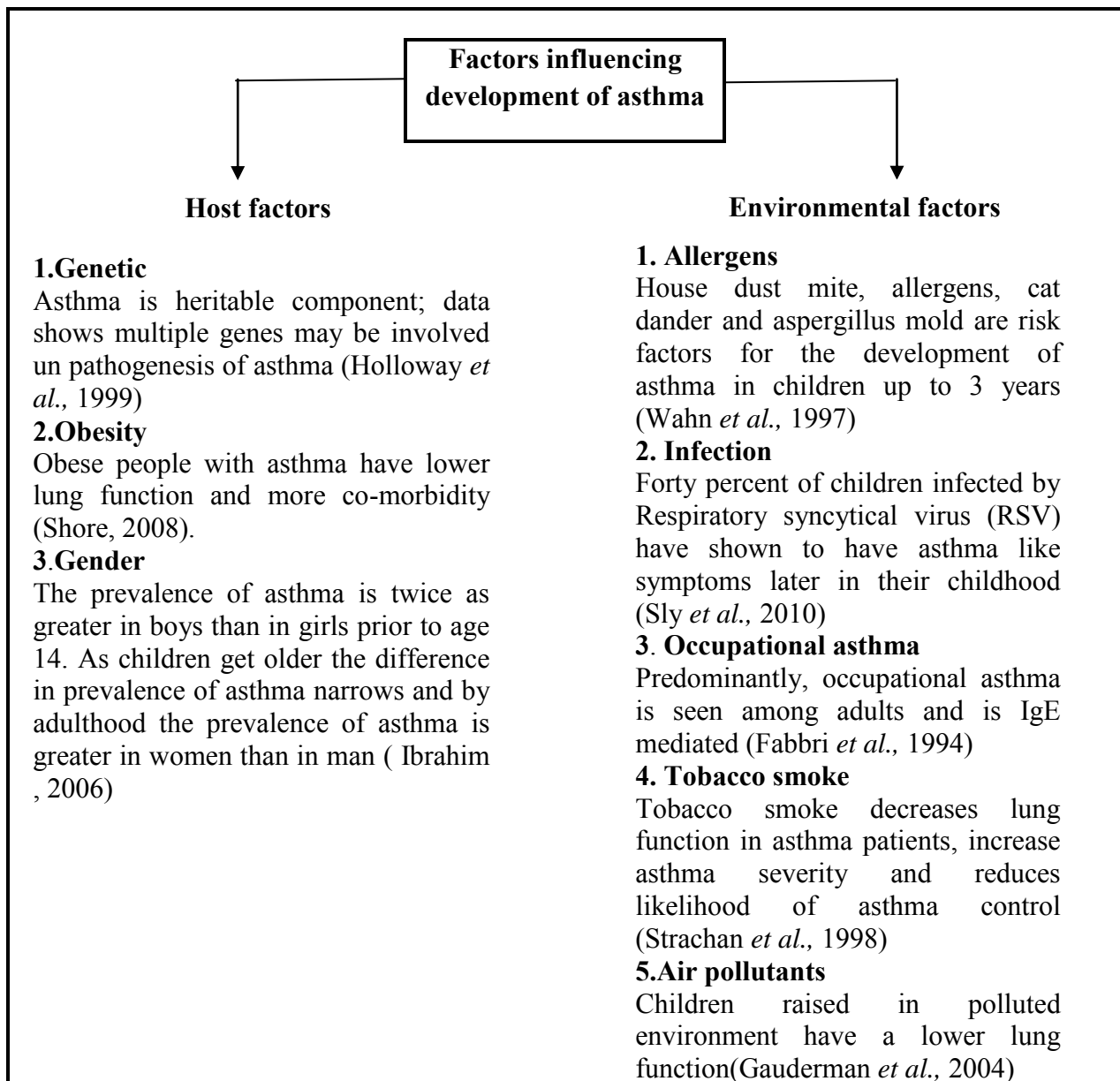
Bronchoconstriction is defined as narrowing of airway in the lungs. During an asthma attack, the airway narrows and produces excessive mucus making it harder to breath. In response to certain stimuli, postganglionic parasympathetic fibres release acetylcholine which binds to muscarinic receptors resulting in smooth muscle contraction causing spasm (James, 2005).

### **1.9.2 Bronchial inflammation**

Inhaled allergens that find their way to inner airway are ingested by antigen presenting cells (APC). APC present these allergens to immune cells and activate TH<sub>2</sub> cells in asthmatic patients. This series of events results in activation of humoral immune system which produces antibodies against inhaled allergens. Further exposure to inhaled allergens activates humoral response resulting in inflamed airway (Cohn *et al.*, 2004).

## 1.10 Factors influencing in development and expression of asthma

Factors that influence the risk of asthma can be categorized as those that influence the development of asthma, other may aid in triggering of asthma. The former include host factors that are primarily genetic whereas environmental factors influence the latter one (Figure 1.1).



**Figure 1.1: Factors influencing development and expression of asthma**

## **1.11 Asthma management**

### **1.11.1 Aims of asthma management**

Asthma has a significant impact on individuals, their families and society. Although there is no cure of asthma however, appropriate management most often results in the achievement of its control. The aims of asthma management according to GINA, 2011 are

1. Recognize asthma
2. Abolish asthma symptoms
3. Restore normal or best possible airway function
4. Reduce morbidity and mortality

The management of asthma can be approached in different ways depending on various forms of asthma treatment and taking in to account cultural preferences and health care systems. However, above mentioned aims aid in diagnosis of asthma, its treatment, avoiding precipitating factors and by doing so will assist in reducing morbidity and mortality of asthma.

### **1.11.2 Approach for asthma management**

The approaches for asthma management in order to achieve aims of asthma management are as follows

1. Education of patient and family
2. Avoidance of precipitating factors
3. Use of lowest convenient dose of asthma medication
4. Patient response to therapy

### **1.11.2.1 Education of patient and family**

Educating asthma patient and family is often the negligible part of asthma management. Education should be an integral part of all interactions between health care professional and patient. All patients require certain core information and skills, but most education must be personalized and given to the patient in multiple steps. Good communication is essential for basis of subsequent good compliance (Cabana *et al.*, 2006). Patient education should include following points

1. Nature of asthma
2. Preventive measure
3. Proper use of inhaled drugs and their side effects
4. Knowledge of preventive and relieving medications
5. Recognition features of worsening asthma
6. Proper use of peak flow meter
7. Self management plan

### **1.11.2.2 Avoidance of precipitating factors**

Asthma symptoms may be precipitated by number of factors referred as “triggers” that include allergens, viral infections, pollutants and drugs. Reducing exposure to some of these categories improves the control of asthma and reduces the need for medication. Since many patients react to multiple factors, avoiding these factors completely is usually impractical. However, medications used in asthma control have important roles as patients with their controlled asthma are less sensitive to risk factors (Bateman *et al.*, 2008).

### 1.11.2.3 Asthma medications

There are two major drug groups to treat asthma (GINA, 2011)

1. **Bronchodilators** : For relieving bronchospasm and improve symptoms
2. **Anti-inflammatory drug**: For treating bronchial airway inflammation and bronchial hyper responsiveness.

**Table 1.1: Medication used for asthma treatment (GINA, 2011)**

Bronchodilator	Anti-inflammatory drug
<p><b>1.β2 agonist</b>            (a) Inhaled β2 agonist            (b) Oral long acting β2 agonist            (c) Oral short acting β2 agonist</p> <p><b>2.Anticholinergics</b>  <b>3.Methylxanthine</b></p> <p><b>Other treatment</b>            (a) Anti-histamines            (b) Anti-cholinergic</p>	<p><b>1. Corticosteroid</b>            (a) Inhaled corticosteroids            (b) Systemic corticosteroids            (c) Oral corticosteroids</p> <p><b>2. Cromones</b></p>

### 1.11.2.4 Patient response to therapy

Assessment to response to asthma medication should be done as follows

1. **Clinical assessment**: Clinical assessment of patient symptoms include sleep disturbance, disturbance of daily activity and frequency of daily reliever medication (GINA, 2011)
2. **Lung function values**: spirometry and peak flow meter (PEF) aid in assessment of lung function values. Personal best lung function values indicate positive effect of medication on patient (GINA, 2011).

## 1.12 Management of chronic asthma

Apart from the pharmacological management of asthma, non pharmacological management of chronic and acute asthma remains similar, that includes educating patient and family, identifying and avoiding predisposing risk factors, assessing lung function values and other parameters to assess the response to current asthma pharmacotherapy.

The effective chronic asthma management requires assessing patient asthma control. Each patient should be assessed for asthma control for current treatment regimen. Patient asthma control is classified as “controlled”, “partial controlled” and “uncontrolled” based on patient clinical parameters (GINA, 2011). Patient current asthma control and current treatment determines the selection of pharmacological treatment. For example, if asthma is not under control on current treatment regimen, treatment should be stepped up until control is achieved. If control is maintained for at least three months, treatment can be stepped down with aims of establishing the lowest step dose of treatment that maintains control. Figure 1.2 describes the scheme for step up and step down treatment.

Level of control	Treatment action
Controlled	Maintain and find lowest controlling step
Partially controlled	Consider stepping up to gain control
Uncontrolled	Step up till controlled
Exacerbated	Treat as acute asthma attack in emergency

Step 1	Step 2	Step 3	Step 4	Step 5
As needed rapid acting $\beta$ agonist				
Controller option*	Select one	Select one	To step 3, select one or more	To step 4 add either
	Low dose inhaled ICS**	Low dose ICS plus long acting $\beta$ agonist	Medium or high dose ICS plus long acting $\beta$ agonist	Oral glucocorticosteroid (lowest dose)
	Leukotriene modifier	Medium or high dose ICS  Low dose ICS plus Leukotriene modifier  Low dose ICS plus sustained release theophylline.	Leukotriene modifier  Sustained release theophylline	Anti-IgE treatment

\*Recommended treatment (shaded box), \*\*Inhaled corticosteroids

**Figure 1.2: Management based on asthma control as per GINA 2011 guideline (GINA, 2011)**

### 1.13 Management of acute asthma

Acute management of asthma initially requires assessment for severity of asthma exacerbations. Once severity of disease is established, asthma is managed

accordingly. A working scheme for acute management of asthma is described in Figure 1.3

<b>Initial assessment</b>
History, physical examination (heart rate, respiratory rate, PEF or FEV1, Oxygen saturation)
<b>Initial treatment</b>
<ul style="list-style-type: none"> <li>• Oxygen to achieve Oxygen saturation</li> <li>• Inhaled rapid acting <math>\beta</math> agonist continuously for one hour</li> <li>• Systemic glucocorticosteroid if no immediate response, or if patient took oral glucocorticosteroid, or if episode is less severe.</li> <li>• Sedation in contraindicated.</li> </ul>
<b>Reassess after one hour</b>
Physical examination, PEF, O2 saturation and other test needed

<p style="text-align: center;"><b>Criteria for moderate episode</b></p> <p>PEF: 60-80 % of personal best, physical examination</p> <p><b>Treatment:</b> Oxygen, Inhaled <math>\beta</math> agonist and Anticholinergics, Oral glucocorticosteroid</p>	<p style="text-align: center;"><b>Criteria for severe episode</b></p> <p>PEF&lt;60 % of personal best, physical examination.</p> <p><b>Treatment:</b> Oxygen, Inhaled <math>\beta</math> agonist and inhaled Anticholinergics, systemic glucocorticosteroid, intravenous magnesium</p>
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<b>Reassess after 1-2 hours</b>		
<b>Good response</b>	<b>Incomplete response</b>	<b>Poor response</b>
PEF:> 70 %, physical examination, O2 Saturation >90 %	PEF<60 %, physical examination, O2 saturation not improving.	PEF:<30 %, physical examination
Discharge patient with appropriate medications	<b>Admit to acute care setting</b> Oxygen, Inhaled $\beta$ agonist, systemic glucocorticosteroid, IV magnesium, Monitor PEF, O2 saturation, pulse	<b>Admit to intensive care</b> Oxygen, inhaled $\beta$ agonist, Anticholinergics, IV glucocorticosteroid, IV theophylline

**Figure 1.3: Scheme for management for acute asthma management as per GINA 2011 guideline (GINA, 2011)**



### **1.14 Economic burden of asthma**

Patients suffering from asthma may require lifelong medications due to the chronic nature of disease. Under use of medications often results in emergency visits and contributes substantially to health care system. It is essential to understand and identify medicine regimen that are not only based on clinical success and safety but are cost effective as well thereby adding the importance for value for money. The asthma cost in the United States of America grew from about USD 53 billion to USD 56 billion from year 2002 to 2007, with an increase of 6 % (American academy of allergy asthma and immunology, 2011). Cost associated with asthma in Europe is approximately USD 21.65 billion annually, of which productivity loss accounts for 55 %, outpatient care 22 %, anti-asthmatic drugs 20 % and accounts 3 % for inpatient representing a significant economic burden (Russels, 2003). Asthma affects directly and indirectly by treatment cost to the healthcare system and also by days lost to work. The number of disability adjusted life years (DALYs) lost due to asthma has been estimated as 15 million per year globally, similar to that of diabetes, cirrhosis of liver and schizophrenia (Global burden of asthma, 2011). A study assessing cost of asthma in Asia pacific region reported that the average cost of treating asthma per patient in Malaysia among 404 subjects was USD 108 (SD ±13) (Lai *et al.*, 2006), with asthma population in Malaysia more than 1.8 million, the study indicate major economic burden of asthma in Malaysia.

### **1.15 Application of pharmacoeconomics in disease management**

Pharmacoeconomics (PE) is defined as the prescription and analysis of the cost of drug treatment to healthcare system and community (Bootman *et al.*, 1991). PE analysis provides tools for identifying, measuring and evaluating the impact of alternative drug therapies and other medical interventions.

Pharmacoeconomic analysis can be calculated according to different prospective, these include:

1. Society, in which all types of cost are included.
2. Provider (Physician, Pharmacist).
3. Payer (Government, insurances and employers).
4. Patients (only out of pocket money of patient is measured) (Choi *et al.*, 2002).

#### **1.15.1 Direct cost**

Direct cost is associated with treatment and hospitalization of an asthma patient and depends on disease severity, complying with medication and cost of health care. The largest component includes the cost of hospitalization whereas cost associated to physicians makes up the smallest component (Barnes *et al.*, 1996).

#### **1.15.2 Direct non-medical cost**

Monetary expenses that are paid at the result of illness (Schulman *et al.*, 2001) these include transportation from place to place, cost of meals, parking etc.

#### **1.15.3 Physicians cost**

Three studies classifying cost in association with general and specialist practitioners, reports physicians costs 22 % of which 75 % cost is related to general practitioners (GP) and 25 % to specialists (Mellis *et al.*, 1991). Therefore, improving patient management by General practitioners can reduce emergency visit and save money in long term.

#### **1.15.4 Drug cost**

Drug cost makes 37 % of total direct cost of asthma and represents a major cost proportion for mild to moderate asthma patients. Lack of treatment compliance on the behalf of patients results in morbidity and emergency visits. A study indicates 15 % of patients took medications as directed by doctors during 80 % period of study (Bosley *et al.*, 1994). Understanding patient factors in not complying with drug regimens and helping patients in understanding their medication could improve patient compliance. Thereby reducing emergency visits and reducing associated cost.

#### **1.15.5 Hospital cost**

Patients with moderate to severe asthma who fail to comply with prophylactic medication generally make most of proportion of hospital cost. The total hospital cost is 20-25 % of total direct cost. Inpatients make the major component of hospital cost (70-85 %), while emergency room treatment was around 14-18 %. Outpatient treatment accounted for the smallest proportion of hospital cost (Barnes *et al.*, 1996).

#### **1.15.6 Other direct cost**

This includes cost in treating asthma co-morbidities, nursing home cost, cost of home care and expenditures on alternative medicine.

#### **1.15.7 Indirect cost**

Indirect cost includes cost associated with loss of productivity, premature retirement and time spent by others caring for sick. Children account a high percentage of indirect cost (Weiss *et al.*, 1992). In Malaysia, the duration of work lost to asthma is 4.2 days per episode and for school is 2.4 days per episode, indicating significant morbidity and socio economic impact of disease (Rugayah *et al.*, 1997). Since,

asthma is not curable and can greatly limit patients' quality of life, this contributes to intangible cost. Improving patient quality of life and their view about the disease can have a positive effect on overall status of patients.

### **1.16 Factors contributing to sub-optimal control of asthma**

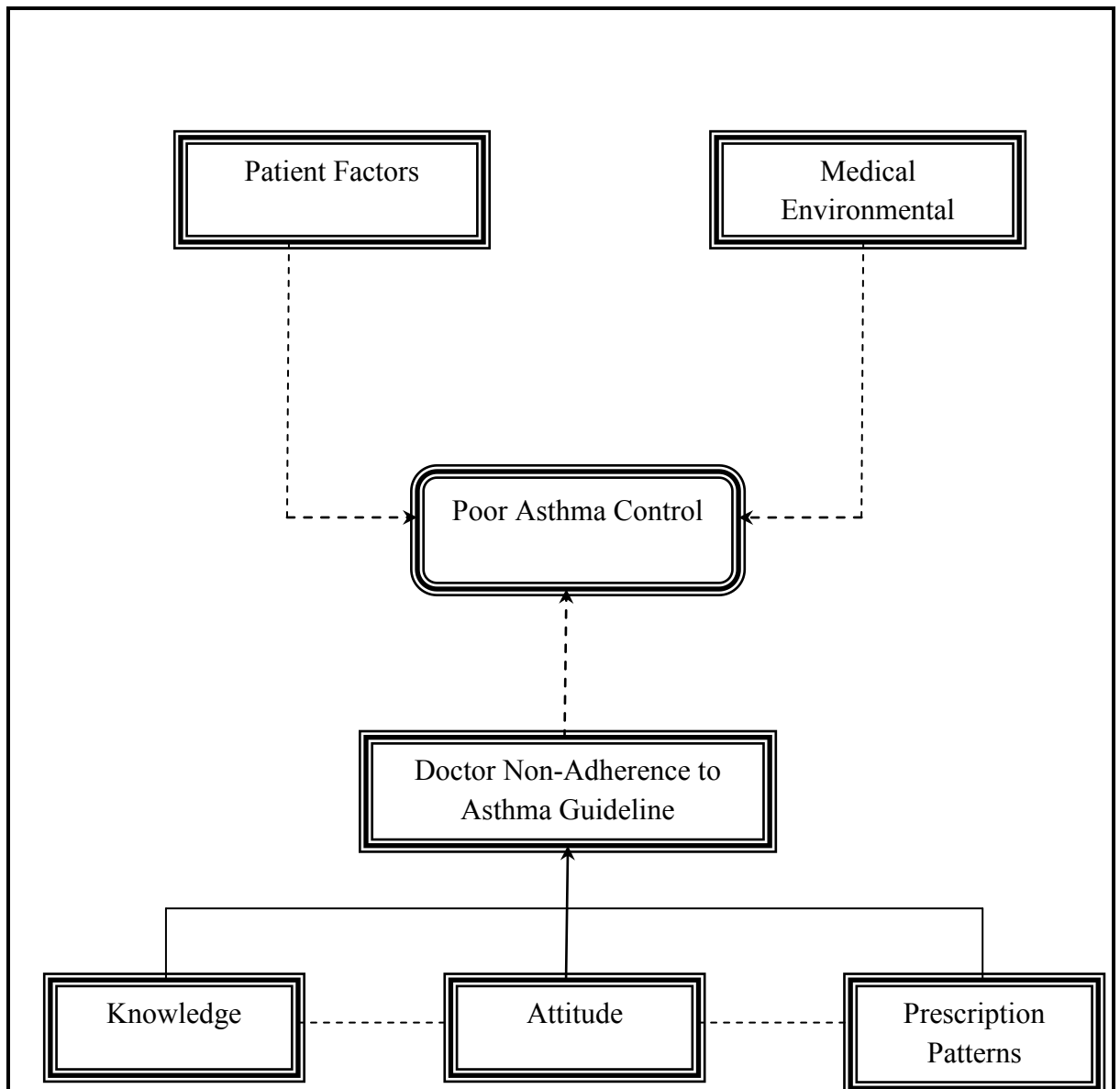
A number of research studies have been conducted to identify factors that affect the sub-optimal control of asthma. The major contributing factors are as follows

- Lack of knowledge regarding different aspects of disease (Doerschug *et al.*, 1999).
- Under diagnosis and under treatment (Gibson *et al.*, 2010).
- Patient related factors that include anxiety regarding side effects, forgetfulness and awkwardness of taking medication (Wöller *et al.*, 1993).
- Age and employment status of doctors; young and self-employed physicians are likely to likely to adopt guideline and attend educational programs. (Sarrell *et al.*, 2002).
- Lack of resources, organizational constraints and lack of reimbursement (Naish *et al.*, 1995).
- Lack of physician's awareness regarding recommended published clinical practice guideline (Bhogal *et al.*, 2010).
- Environmental factors; seasonal changes and exposure to allergens (Silverman *et al.*, 2003).
- Respiratory tract infections and co existing complications (Korhonen *et al.*, 2001).
- Unawareness of correct inhaler technique by health care professionals and most patients (National Asthma Council Australia, 2008).

- Limited access and affordability of medication (Kotwani, 2009; Serra-Batllés *et al.*, 1998).

### 1.17 Conceptual frame work

The above discussion about non adherence towards guideline and poor control of asthma can be summarized in Figure 1.4



**Figure 1.4: Factors liable for poor asthma control**

## **1.18 Study objective**

### **1.18.1 General objective**

The general objective of current study is to find out how well doctors know about the medication, pharmacological management recommendations of GINA 2011 guideline for management of asthma at emergency and respiratory department. To what extent doctors accept and practice them and to explore association between doctors demographics, their attitude, and knowledge about GINA 2011 for the management of asthma and their actual practices and to calculate the cost of treating asthma in emergency and respiratory department.

### **1.18.2 Specific objectives**

Following are the main specific objectives of current study

1. To evaluate doctor knowledge, attitude and practices on medication recommendation of GINA asthma guideline 2011 at Hospital Pulau Pinang (HPP). To evaluate factors that affect asthma management
2. To evaluate the relationship between doctor knowledge and clinical practices.
3. To evaluate direct cost in associated with asthma treatment.

## **1.19 Significance of Study**

1. The current study will provide information about the doctor current knowledge and attitudes regarding the clinical practice guideline.
2. Information will serve as an important foundation in identifying the gap between the clinical practice guidelines and actual clinical practices.

3. The study will provide information about different factors affecting the adherence rate to clinical practice guideline.
4. The study will provide information about the prescribing patterns at HPP.
5. The study will provide fundamental information, which will act as logical step for developing interventions in order to increase adherence to clinical practice guidelines.
7. The study is a step towards system development and implementation of clinical practice guidelines in Malaysia.