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Readiness of Southeast Asian Primary Healthcare Facilities for Asthma Management: A Literature Review

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ABSTRACT

Introduction: Asthma is a major noncommunicable disease causing high mortality rates in Southeast Asia, where primary care serves as the initial management point. According to the WHO-SARA, primary care readiness is measured by the availability of trained staff, guidelines, diagnostic equipment, and essential medicines. ***Objective:*** This study aimed to review and evaluate primary healthcare (PHC) facilities' readiness in Southeast Asian countries to manage asthma across key readiness domains. ***Methods:*** We conducted a narrative synthesis of recent literature, reviewing journal articles, official websites, and clinical guidelines from Southeast Asian countries that report data on primary care readiness. ***Results:*** Access to spirometry is severely limited and underused because of equipment shortages and low physician confidence. Peak flow meters are more accessible but inconsistently used. Recommended first-line Inhaled Corticosteroid (ICS)-LABA combinations are underused and poorly available because of high costs, supply chain gaps, and restrictive national health policies, leading to widespread overreliance on Short-Acting Beta-Agonists (SABA). Significant knowledge gaps remain among healthcare providers regarding GINA guidelines, inhaler counseling, and interpretation of diagnostic tests. While most countries have national guidelines, documented evidence of facility-level protocol availability remains scarce. ***Conclusion:*** Primary healthcare facilities in Southeast Asia exhibit suboptimal and uneven readiness for asthma management. Addressing these gaps requires tiered diagnostic strategies, expanded access to controller medications, and interprofessional training. Furthermore, research evaluating PHC readiness across the region remains scarce, underscoring the urgent need for comprehensive studies to guide policy reform.

Keywords: asthma management; healthcare readiness; primary healthcare; Southeast Asia

INTRODUCTION

Asthma is a major noncommunicable disease (NCD), affecting an estimated 363 million people worldwide in 2023 [1]. According to the Global Burden of Disease, Southeast Asia had 40.31 million asthma cases in 2021, with most cases among women [2]. Asthma prevalence has not increased in this region [3]. However, the mortality rates have been consistently high at about 13 per 100,000 per year because of the low access to inhaled corticosteroids, the recommended medication for controlling asthma [4]. Furthermore, significant focus on cardiovascular disease and cancer has led to asthma being under-prioritized, particularly in low- and middle-income countries [2].

Asthma is the second most common chronic respiratory disease (CRD) that requires comprehensive management, ranging from diagnosis to treatment [4]. According to the Global Initiative for Asthma (GINA) 2026, asthma can be diagnosed based on symptom patterns and evidence of variable expiratory flow [5]. Spirometry is the main recommended lung function test for diagnosing and monitoring asthma [6]. For treatment, the ICS-formoterol combination has remained GINA's recommended first-line option since 2019 because it is the most effective medication for managing asthma across all ages and severity levels [5].

Every healthcare facility must have spirometry and ICS-formoterol available and accessible to support optimal asthma management.

Primary care plays a crucial role as it is the initial point of care for asthma patients [7]. Adequate primary healthcare (PHC) facilities can support early diagnosis, appropriate treatment, and ongoing monitoring, thereby improving symptom control and reducing the risk of exacerbations. Overall, PHC readiness can reduce hospital admissions and healthcare costs [8]. According to the World Health Organization Service Availability and Readiness Assessment (WHO-SARA), health service readiness is measured by the availability of trained staff, guidelines, diagnostic equipment, and essential medicines [9].

In practice, however, PHC in Southeast Asia still faces significant barriers to meet those readiness standards for asthma management. In Klang Valley, Malaysia, only 33.5% of PHC facilities have spirometry. Many physicians prioritize obtaining a patient's medical history over spirometry because of high patient loads and limited availability of trained healthcare personnel to perform spirometry [10]. In Indonesia, national guidelines require community health centers to have spirometers or peak flow meters [11]. However, availability remains incomplete, and existing devices are often underutilized in daily practice for the same reason as in Malaysia. In Singapore, although spirometry is limited to a small number of government-subsidized polyclinics, an established referral system allows patients from other facilities to access the service when needed [12,13]. As a result, asthma patients still have equitable access to essential diagnostic facilities [12].

Regarding medication availability, Indonesia excludes recommended ICS-LABA inhalers from the primary care essential medicine list and does not initially cover them under national health insurance. As a result, newly diagnosed asthma patients must first be referred to secondary care to receive covered inhaler treatment. Controller inhalers become covered and accessible at the primary care level only through back-referral, based on the specialist's prescription [14]. In contrast, Thailand launched the 'Easy Asthma Clinic' under its Universal Coverage Scheme (UCS), managed by general practitioners in district hospitals. Since 2011, this program has fully covered ICS-LABA inhalers and made them available to all asthma patients [15]. Malaysian public health clinics also provide free inhalers to civil servants, pensioners, school-aged children, and adults aged 60 and above. For other patients, out-of-pocket costs remain low at MYR 1 per clinic visit, covering consultation, investigations, and medications. Nevertheless, a study across public health clinics in Klang District found that ICS-LABA inhaler supply remains inadequate to meet clinical demand. As a result, not all asthma patients can receive the recommended therapy [16].

Implementation of global asthma management recommendations may vary across countries because healthcare systems, regulations, and resource availability differ. Understanding conditions and regulations in different countries is important not to determine which country has the best regulation or implementation, but to describe patterns of resource availability and utilization, and to identify country-specific challenges. This information is essential for updating and formulating national and international policies to ensure optimal asthma management, even in resource-limited settings. This review aimed to describe and compare PHC facilities' readiness for asthma management across Southeast Asian countries, focusing on the availability and utilization of diagnostic equipment, availability and access to essential asthma medicines, healthcare providers' competency, and availability and accessibility of clinical guidelines. We conducted a narrative synthesis using recent literature, including journal articles, official websites, and clinical guidelines. We included only Southeast Asian countries with reported data on primary healthcare facilities' readiness for asthma management.

RESULT AND DISCUSSION

1. Overview of Asthma

The word “asthma” is derived from the Greek word “aazein”, which means “panting” [17]. Asthma's etiology involves a complex interplay among environmental, host, and genetic factors. Environmental factors include air pollution, pollen, mold, other aeroallergens, and weather, whereas host-related factors include allergic sensitization, obesity, nutrition, and respiratory infections. Genetic factors include specific asthma susceptibility loci. Asthma is not a single disease, but a group of heterogeneous phenotypes with different etiologies and prognoses [18]. Common phenotypes include allergic and non-allergic asthma, cough-variant and cough-predominant asthma, adult-onset or late-onset asthma, asthma with persistent airflow limitation, and asthma with obesity [5].

Both children and adults can develop asthma [1]. Childhood-onset asthma is more common, but adult-onset asthma is more severe and contributes to higher mortality [18]. During the first decade of life, boys are more likely to have asthma. However, after puberty, it becomes more prevalent in women. Childhood-onset asthma is strongly associated with allergic phenotypes, while adult-onset asthma is more frequently non-allergic, often linked to occupational exposures, obesity, or hormonal influences [19].

The core of this disease is persistent airway inflammation [20]. This inflammation triggers bronchial hyperresponsiveness, mucus production, and airway remodeling. Initially, allergen exposure damages the airway epithelium, activating and recruiting immune cells [21]. The interplay between immune cells and neighboring epithelial cells drives inflammation and bronchial hyperresponsiveness, triggering typical asthma symptoms such as cough,

wheezing, shortness of breath, and chest tightness [5,21]. In early stages, it is still reversible with bronchodilators. However, in more severe cases, airway obstruction becomes irreversible. Therefore, bronchodilators are no longer effective [21].

Asthma severity is classified into mild, moderate, and severe. Mild asthma is asthma that is well controlled with low-dose ICS-formoterol or low-dose ICS plus as-needed SABA. Moderate asthma is well controlled with low- or medium-dose ICS-LABA. Severe asthma is asthma that remains uncontrolled despite optimized treatment with high-dose ICS-LABA or asthma that requires high-dose ICS-LABA to prevent it from being uncontrolled [5]. Assessing these severity levels in primary care is essential to guide pharmacological interventions and determine the appropriate timing for specialist referrals.

2. Asthma Management in Primary Care

WHO defines primary care as the first point of contact for people seeking healthcare services because it is located closest to the patient. By offering comprehensive, continuous, patient-centered care, primary care is essential for people living with chronic diseases [22]. Asthma is a chronic disease, with 60% of patients managed in primary care [23]. Strengthening primary care is very important to improve asthma management and achieve broader health system goals. Asthma management in primary care spans from diagnosis to treatment for stable and exacerbated conditions, including patient monitoring and referral for severe cases [5].

2.1 Diagnosis

Asthma diagnosis is based on the patient's history, physical examination, and supporting tests. The four cardinal symptoms of asthma are wheezing, cough, shortness of breath, and chest tightness. These symptoms typically occur intermittently, often worsen at night, can last from hours to days, and may resolve when the trigger is removed or medication is administered. During history taking, physicians should consider the underlying etiology to guide treatment. A family history of asthma and allergy, or a personal history of atopic conditions, is also crucial for distinguishing asthma from other diseases [24].

Asthma patients often have normal physical examination findings. However, auscultation may reveal rhonchi during expiration. In severe asthma exacerbations, a “silent chest” can occur due to near-total occlusion of the bronchial lumen. Wheezing can also be heard in people with COPD, laryngeal obstruction, tracheomalacia, or respiratory infections like tuberculosis. Therefore, supporting tests are necessary to perform [5].

Spirometry is the most reliable lung function test. Since asthma is characterized by variable expiratory flow, the assessment of forced expiratory volume in 1 second (FEV1) and the ratio of FEV1 to forced vital capacity (FEV1/FVC) are crucial [5]. FEV1/FVC assessment can help distinguish asthma from COPD. COPD typically shows a persistently low FEV1/FVC ratio after bronchodilator administration. In contrast, the FEV1/FVC ratio in asthma may be reduced during symptomatic periods, but it improves significantly after treatment [25]. If spirometry is unavailable, peak flow meters can assess Peak Expiratory Flow (PEF), although they are less reliable because PEF can be reduced in various lung diseases. However, PEF assessment can help evaluate treatment responsiveness. Other tests can also support asthma diagnosis, including bronchial provocation tests, allergy evaluation using skin prick tests or specific immunoglobulin E (sIgE) measurement, chest CT, Fractional Exhaled Nitric Oxide (FeNO), and blood or sputum eosinophil counts. Nevertheless, these tests are not specific for diagnosing asthma [5].

2.2 Treatment

Asthma treatment comprises two primary approaches, pharmacological and non-pharmacological. Pharmacological treatment is divided into control-based management for stable asthma and acute management for exacerbations [5]. Stable asthma is defined as the normal phase of asthma, without any symptoms, daily activity limits, and the need for a reliever inhaler over the last four weeks. However, stable asthma still needs controller medication to maintain symptoms control. In contrast, acute asthma or exacerbation is defined as a progressive or sudden onset of worsening symptoms, thereby requiring an immediate intervention [26].

Control-based management for stable asthma includes controller and reliever medications. Controller medications contain inhaled corticosteroids (ICS) to reduce symptoms and future risk of exacerbations. Reliever medications are taken only if symptoms worsen. For now, controller medications and reliever medications are combined, called maintenance-and-reliever therapy (MART), containing ICS and formoterol. Inhaled ICS-formoterol is taken when symptoms occur and before exercise or allergen exposure, at a dose based on asthma severity. Non-pharmacological treatment strategies include educating patients on allergen avoidance, regular physical activity, smoking and environmental tobacco smoke cessation, a healthy diet, breathing exercises, and emotional stress management [5].

For acute management, primary care should first assess the patient’s severity, whether the condition is mild, moderate, severe, or life-threatening. Assess severity by dyspnea, respiratory rate, oxygen saturation, and lung function (PEF). Start SABA and oxygen therapy as needed. In moderate or severe exacerbation, ipratropium can also be added along with SABA therapy to reduce hospitalization. If the patient does not respond to increased reliever or maintenance ICS-containing medication, add oral corticosteroids (OCS). If an anaphylactic reaction occurs, administer epinephrine first. If the condition persists, worsens, or does not respond to initial treatment, refer the patient immediately [5].

2.3 Monitoring

Asthma monitoring includes clinical symptom control using Asthma Control Questionnaire (ACQ) and Asthma Control Test (ACT), reliever medication use frequency, physical activity limitations, pulmonary function measurement, adherence and inhaler technique, and monitoring for drug side effects. Lung function with spirometry or peak flow meters should be assessed 3-6 months after starting ICS-containing treatment, and repeated every 1-2 years to evaluate response, adherence, inhaler technique, and potential dose adjustments [5].

2.4 Referral

For most cases, primary care can manage mild or moderate asthma attacks [27]. However, certain conditions require referral, including difficulty in confirming the asthma diagnosis, asthma with comorbidities, persistent or severely uncontrolled asthma with frequent exacerbations, and significant treatment-related side effects [5].

3. Readiness of Primary Healthcare Facilities Across Southeast Asian Countries

According to WHO, readiness is the capacity of health facilities to provide health services. WHO-SARA identifies key readiness domains as diagnostic equipment, essential medicines, key human resources, and clinical guidelines [9]. For asthma management, these components include healthcare providers' ability to diagnose and manage asthma, availability of clinical guidelines for asthma diagnosis and management, availability of spirometry or peak flow meters to assess lung function, and availability of essential medicines such as ICS-formoterol inhalers.

3.1 Availability and Utilization of Diagnostic Equipment

Spirometry is the most recommended diagnostic tool for asthma. However, its physical availability in primary care across several Southeast Asian countries remains critically limited. Empirical studies in Malaysia and Singapore (see Table 1) showed that most primary care centers lacked spirometry equipment [16,28,29]. Even where spirometry was available, clinical utilization remained limited. Primary care providers reported limited familiarity with operating the device and interpreting the spirometry results [16]. Beyond provider familiarity, other operational factors, including high testing costs, time-consuming testing protocols, and a lack of dedicated space within busy primary care clinics substantially hinder routine spirometry utilization. This underutilization carries serious clinical risks, including diagnostic inaccuracies, inappropriate prescribing of controller therapies, and missed opportunities to deliver optimal long-term patient care [29].

To address these diagnostic barriers, GINA recommends using peak flow meters as a pragmatic surrogate in primary care settings because they are more accessible, cost-effective, and easier to operate. Although peak flow meters are less sensitive than spirometry, they provide objective testing that substantially improves diagnostic confirmation beyond subjective clinical judgment alone [5]. Furthermore, compared with spirometry, peak flow meters support long-term therapeutic monitoring, evaluation of treatment response, and assessment of medication adherence [6]. The literature confirmed that peak flow meters were more widely available than spirometry [28,30]. Nevertheless, clinical use of peak flow meters remains suboptimal because of supply chain gaps, such as the lack of single-use mouthpieces at the point of care, and a general lack of provider awareness of the appropriate clinical indication and timing for PEF measurements [28]. Additionally, in settings like Singapore, routine PEF testing faces resistance because of heightened infection-control concerns about aerosol transmission during forced expiratory maneuvers [31].

TABLE 1: Overview of Availability and Utilization of Diagnostic Equipment in Southeast Asian Countries' Primary Care.

Author, year (Country)	Type of the study	Sample	Availability of Spirometry	Utilization of Spirometry	Availability of Peak Flow Meters	Utilization of Peak Flow Meters	Barriers
Hussein *et al.,* 2023 (Malaysia) [16]	Cross-sectional study using questionnaires	6 public health clinics and 100 doctors in Klang District	Only 1 of 6 clinics had a handheld spirometry	Only 18% of doctors had used spirometry to diagnose asthma	Available in all 6 clinics	Most doctors relied on clinical assessment plus peak expiratory flow (PEF) with reversibility testing. Peak flow rate was mainly assessed and documented during routine follow-up, and only about two-thirds of the doctors carried out peak flow assessment during unscheduled visits (potentially for an attack)	Barriers in spirometry utilization among doctors: lack of accessibility (80%), lack of familiarity (20%); inability to interpret results (10%); and costly (4%)
Hussein *et al.,* 2020 (Malaysia) [32]	Cohort study (Published as a conference abstract)	1280 asthma patients in 6 public primary care clinics in Klang District, Selangor, comprising 1094 adults and 186 children	Not reported	6.5% of adult patients and 4.3% of child patients had spirometry at diagnosis	Not reported	54.5% of adult patients and 53.8% of child patients had Peak Expiratory Flow Rate (PEFR) performance recorded at least once in the last three visits	Not reported
Cheong *et al.,* 2021 (Malaysia) [28]	Qualitative study using a constructivist approach	26 healthcare providers (HCPs) in 6 public primary care clinics, Selangor	Spirometry was not available in the primary care clinics in this study	Not reported	Peak expiratory flow (PEF) meters were available in the studied clinics but not at the point of assessment	PEF measurement was often missed because staff forget to carry out the assessment	Limited spirometry access, limited space to perform PEF measurement, unavailability of mouthpiece, staff unaware of the PEF measurement procedure
Ang *et al.,* 2021 (Singapore) [29]	Multi-pronged approach to improve spirometry utilization at GP clinics (Published as a poster abstract)	GP clinics in Singapore (total number of clinics was not reported)	Spirometry was unavailable in 64,5% GP's clinic	Spirometry in Singapore was underutilized.	Not reported	Not reported	The top 3 barriers to utilization of spirometry were location of tests (69.2%), unavailability of tests (64.5%), and patient affordability (61.5%)

Author, year (Country)	Type of the study	Sample	Availability of Spirometry	Utilization of Spirometry	Availability of Peak Flow Meters	Utilization of Peak Flow Meters	Barriers
Ying *et al.,* 2024 (Singapore) [33]	Cross-sectional study using SingHealth Polyclinics (SHP) patient data on spirometry tests and survey (Published as a conference poster)	398 SHP patients' spirometry test data and collected feedback surveys from 164 patients	Not reported	Spirometry was underused in Singapore	Not reported	Not reported	Time constraints, staffing issues, equipment quality and control, and inadequate training in data interpretation
Khor *et al.,* 2024 (Singapore) [31]	Cross-sectional study using questionnaires	141 adult asthma patients in a polyclinic in the Western part of Singapore	Not reported	Not reported	Not reported	Peak flow meters were not routinely used in Singapore	Peak flow meters were not routinely used because of concern about infection control
Nguyen *et al.,* 2017 (Vietnam) [34]	Cross-sectional study using questionnaires	201 primary care physicians (PCPs) who attended the "family medicine training course" in Tien Giang province or Ho Chi Minh City, or who worked in four district hospitals in Ho Chi Minh City	Not reported	49.8% of PCPs used spirometry in practice	Not reported	Not reported	Lack of training and low asthma knowledge, especially in operating spirometry

To overcome these implementation barriers and optimize asthma care in resource-constrained primary care settings, several targeted strategies must be prioritized. First, health system administrators must address basic supply-chain vulnerabilities by ensuring an uninterrupted supply of disposable, single-use mouthpieces with viral/bacterial filters to reduce infection transmission risk. Second, primary care should integrate structured, practical training programs to build clinician confidence in performing spirometry and peak flow meter measurements, including rapid interpretation of the results. Establishing clear clinical workflows that embed routine PEF measurements during initial diagnostic assessments rather than reserving them exclusively for acute exacerbations will help bridge the gap between guideline recommendations and real-world primary care practice.

3.2 Availability and Accessibility of Essential Asthma Medicines

GINA recommends ICS-LABA combination inhalers as essential asthma medications because they target underlying airway inflammation effectively while providing prompt bronchodilation, reducing severe exacerbations and asthma-related mortality [5]. Furthermore, the World Health Organization (WHO) Model List of Essential Medicines includes ICS-LABA therapies, designating them as critical treatments that should be continuously available and affordable in primary care settings [35]. Despite these strong global recommendations, evidence across Southeast Asia shows that ICS-LABA inhaler availability in primary healthcare remains consistently low, which can undermine patient outcomes (see Table 2).

In Indonesia, the Global Asthma Network reported that inhaled corticosteroid (ICS) and bronchodilator combinations were available but limited in most district hospitals [36]. Under national Formulary (Fornas) policy restrictions, the National Health Insurance scheme covers these controller medications only at the hospital level, excluding primary healthcare facilities from coverage [14]. As a direct consequence, primary care physicians cannot routinely prescribe ICS-LABA inhalers until patients are referred to secondary or tertiary hospitals, creating severe treatment delays, administrative bottlenecks, high out-of-pocket expenses, and widespread reliance on oral bronchodilators and nebulizers. A study confirmed that ICS-LABA inhalers are expensive and unaffordable for many patients [37].

In Malaysia, a study found that public primary care clinics had limited ICS-LABA inhalers, with prescriptions reserved for patients with difficult-to-control asthma because of limited supply and restricted prescribing authority [28]. Another study found the same; although surveyed public clinics provide highly subsidized rates (MYR 1) or free ICS-LABA inhalers for eligible groups, quantities were insufficient to meet demand, keeping access limited to a small subset of poorly controlled patients [16]. A study noted that ICS-LABA inhalers were available and affordable in Malaysian private pharmacies. However, Thailand experienced shortages in public pharmacies and public healthcare facilities, Vietnam faced severe unaffordability and primary care shortages [34,37], and Timor-Leste lacked availability in private healthcare facilities [37].

This lack of accessible controller therapies has driven a widespread over-reliance on Short-Acting Beta-Agonists (SABA). Data from the SABINA III study evaluating primary care practices in Malaysia and Singapore revealed that a substantial proportion of primary care physicians continue to prescribe SABA over controller therapies like ICS-LABA. This frequent SABA over-prescription without concurrent anti-inflammatory controller coverage directly correlates with poor asthma control and heightened exacerbation risks [38,39]. Similarly, a study from the Philippines reported low utilization of ICS-LABA inhalers among patients, driven primarily by the unavailability and unaffordability of these controller inhalers at the community level [40].

Across Southeast Asia, the main barriers in primary care are restrictive national drug formularies and insurance policies that prohibit primary care prescribing, high out-of-pocket costs, procurement and supply chain deficits, and a lack of spacers [28,34,36]. To address these challenges, national health authorities must align local policies with GINA recommendations by updating essential medicine lists and insurance coverage to permit primary care doctors to prescribe ICS-LABA directly. Additionally, governments should implement pooled procurement to secure reliable inhaler and spacer supply chains, lower medication costs, and run educational initiatives for healthcare providers to reduce reliance on SABAs and optimize asthma care.

TABLE 2: Overview of Availability and Accessibility of Essential Asthma Medicines in Southeast Asian Countries' Primary Care.

Author, year (Country)	Type of the study	Sample	Availability of ICS-LABA Inhalers	Accessibility of ICS-LABA Inhalers	Barriers
Global Asthma Network, 2018 (Indonesia) [36]	Country report	Not reported	Inhaled corticosteroids and bronchodilators were available, but limited in most district hospitals	Inhaled corticosteroids and bronchodilators were only covered by the National Health Insurance scheme at district hospitals, as primary healthcare facilities were not covered under this scheme	High cost, limited availability in district hospitals, limited insurance coverage for essential asthma medications at the PHC level, and unavailability of spacers
Cheong *et al.,* 2021 (Malaysia) [28]	Qualitative study using a constructivist approach	26 healthcare providers (HCPs) in 6 public primary care clinics, Selangor	Poor availability of ICS-LABA inhalers	ICS-LABA inhalers only reserved for patients whose asthma was difficult to control	Limited ICS-LABA inhalers and free spacers restricted prescribing decisions
Hussein *et al.,* 2023 (Malaysia) [16]	Cross-sectional study using questionnaires	6 public health clinics and 100 doctors in Klang District	ICS-LABA inhalers were available in all clinics	Access to ICS-LABA inhalers was limited to only a few patients with poorly controlled asthma. However, the medication cost was affordable in government-funded public health clinics	ICS-LABA inhaler quantities were inadequate to meet the clinical demand
Global Asthma Network, 2022 (Thailand) [41]	Country report	Not reported	The availability of asthma controllers (ICS) was increased	Asthma controllers were included in the Essential Medicines List subsidized by the government for eligible groups (government employees, and those on the social security program and universal coverage scheme)	Not reported
Nguyen *et al.,* 2017 (Vietnam) [34]	Cross-sectional study using questionnaires	201 primary care physicians (PCPs) who attended the "family medicine training course" in Tien Giang province or Ho Chi Minh City, or who worked in four district hospitals in Ho Chi Minh City	Controller medications such as ICS were often unavailable in primary care	Controller medications such as ICS were unaffordable for patients with low-to-average income	Unavailability and unaffordability of ICS

Author, year (Country)	Type of the study	Sample	Availability of ICS-LABA Inhalers	Accessibility of ICS-LABA Inhalers	Barriers
Stolbrink *et al.,* 2024 (Indonesia, Malaysia, Thailand, Timor-Leste, Vietnam) [37]	Cross-sectional survey of healthcare professionals	Healthcare professionals from pharmacies, healthcare facilities, and central medicine stores (total number of participants was not reported)	**Indonesia:** ICS-LABA inhalers were available in public healthcare facilities and private pharmacies **Malaysia:** ICS-LABA inhalers were available in private pharmacies and central medicine stores **Thailand:** ICS-LABA inhalers were not available in public pharmacies and public healthcare facilities **Timor-Leste:** ICS-LABA inhalers were not available in private healthcare facilities **Vietnam:** ICS-LABA inhalers were available in private pharmacies and public healthcare facility	**Indonesia:** ICS-LABA inhalers were not affordable **Malaysia:** ICS-LABA inhalers in private pharmacies were affordable **Vietnam:** The price of ICS-LABA inhalers was not affordable	Not reported

TABLE 3: Overview of Healthcare Providers' Competency in Managing Asthma Across Southeast Asian Countries' Primary Care.

Author, year (Country)	Type of the study	Sample	Main Findings	Barriers
Lorensia et al., 2023 (Indonesia) [42]	Mixed-method study with quantitative and qualitative approaches	53 pharmacists practicing in Surabaya city pharmacies	60.4% of pharmacists had high perceptions regarding asthma management. They felt it was very important to provide information and counseling to patients and recommend the right drug based on the doctor's diagnosis and the patient's condition. Nevertheless, perceptions of inhaler technique were low among 49.1% of pharmacists due to limited knowledge of inhaler use	Some pharmacists had limited knowledge of inhaler technique, lacked confidence in their skills, and had limited time to counsel and demonstrate inhaler use to asthma patients. Pharmacists often assumed that patients collecting their second, third, or subsequent prescription already understood how to use the medication, so they were reluctant to provide pharmaceutical services
Hussein *et al.,* 2023 (Malaysia) [16]	Cross-sectional study using questionnaires	6 public health clinics and 100 doctors in Klang District	All healthcare personnel on the asthma teams across the six clinics had received formal asthma training, with each clinic providing one to three asthma training courses or workshops annually. However, of 100 doctors, only 18% used spirometry to diagnose asthma; 20% reported being unfamiliar with spirometry; and 10% did not know how to interpret the results	Limited access to spirometry and low confidence in performing and interpreting the test might have hindered its use. Peak flow meters were more accessible, so most doctors relied on clinical assessment and peak expiratory flow (PEF) measurements when diagnosing asthma

Author, year (Country)	Type of the study	Sample	Main Findings	Barriers
Cheong *et al.,* 2021 (Malaysia) [28]	Qualitative study using a constructivist approach	26 healthcare providers (HCPs) in 6 public primary care clinics, Selangor	Some clinics relied on doctors to perform peak expiratory flow assessment during consultation, but others assigned the task to nurses or medical assistants before the doctor's consultation	Some clinics had limited trained nurses and medical assistants in asthma management
Gonzales-Javier *et al.,* 2025 (The Philippines) [40]	Retrospective cohort study using electronic medical records (EMRs)	240 EMRs of children with asthma	Analysis of prescription patterns showed underuse of ICS, overuse of SABA-only treatment, and overuse of antibiotics	Beyond unfamiliarity with recently published guidelines, the unavailability and higher cost of ICS also influence physicians' prescribing decisions
Nguyen *et al.,* 2017 (Vietnam) [34]	Cross-sectional study using questionnaires	201 primary care physicians (PCPs) who attended the "family medicine training course" in Tien Giang province or Ho Chi Minh City, or who worked in four district hospitals in Ho Chi Minh City	Only 49,8% PCPs used spirometry in practice. Overall, the PCPs also had low knowledge of asthma, especially about control criteria and stepwise treatment according to GINA guidelines	PCPs lacked training in asthma management, and training courses conducted in Vietnam did not include case presentations to fill knowledge gaps among PCPs

3.3 Healthcare Providers' Competency

Healthcare providers (HCPs) who mainly manage asthma patients in primary care include doctors, nurses, and pharmacists. Each plays a distinct role. Doctors play a central role in initial diagnosis, stepwise pharmacological treatment, and long-term monitoring, and they make final decisions about patient referral. Therefore, competent doctors who can accurately diagnose and treat asthma in primary care are essential to ensure patients are fully managed on-site, except for certain cases that require expert management. Nurses support doctors in caring for asthma patients, particularly by improving their self-management skills [43]. They deliver asthma education, explain treatment regimens, guide patients on avoiding triggers, and teach them to prevent and manage exacerbations. Nurses also demonstrate proper inhaler and nebulizer techniques, teach patients to use a peak flow meter for self-monitoring, and advise them when to seek medical attention if their condition worsens [44]. Pharmacists can also provide medication counseling, including treatment regimens, adherence support, and proper device use [43]. To support these roles, doctors, nurses, and pharmacists should have adequate knowledge and practical skills, particularly in operating diagnostic tools such as spirometry and peak flow meters, as well as administering inhalers and nebulizers as part of treatment, tailored to their respective roles.

Based on Southeast Asian primary care literature (see Table 3), healthcare providers appear insufficiently prepared to manage asthma, mainly because of limited knowledge of the disease and its management. In Vietnam, only 24% of primary care physicians answered at least half of the GINA control classification questions correctly, and only 22% did so for treatment decisions [34]. This knowledge gap carries over into practice. In a rural Philippine primary care cohort, physicians underused ICS, relied on SABA-only treatment, and overused antibiotics, partly because they were unfamiliar with recently published guidelines [40]. Spirometry is also rarely used in daily practice: only 49.8% of Vietnamese physicians used it [34], and in Malaysian public clinics only 18% of doctors had used it to diagnose asthma, 20% reported being unfamiliar with it, and 10% did not know how to interpret the results [16].

Other primary care team members show similar gaps, although the evidence is thinner. Nurses and medical assistants often perform tasks such as peak expiratory flow measurement, yet some clinics provided little training on their roles in asthma management [28]. Pharmacists in Surabaya, Indonesia generally valued patient counseling, but 49.1% had low confidence in inhaler technique because of limited knowledge [42]. Each group is represented by a single study, so these findings should be read as indications rather than regional trends.

The barriers behind these gaps are both individual and systemic. At the provider level, they include insufficient training [28,34], low confidence in performing and interpreting spirometry [16], and, among pharmacists, limited time for counseling and an assumption that repeat patients already know how to use their inhalers [42]. At the system level, access to spirometry is limited [16], and ICS is sometimes unavailable or costly [40]. Together, these barriers help explain why providers fall back on clinical judgment, peak flow, and reliever-based prescribing.

These gaps can weaken asthma care in primary care overall. Diagnosis may rest on clinical assessment alone rather than objective testing, and reliance on SABA over controller therapy may continue. Inadequate inhaler counseling may further reduce treatment effectiveness. To address this, countries should prioritize competency-based training for doctors, nurses, and pharmacists that includes hands-on spirometry, peak flow, and inhaler technique. They should also deliver guideline updates through practical primary care tools, widen access to spirometers or peak flow meters, and improve the availability and affordability of ICS and ICS-LABA. Clear role delegation and protected counseling time in clinic workflows would support these cases.

3.4 Availability and Accessibility of Clinical Guidelines

The availability and accessibility of guidelines for primary healthcare providers are also crucial to optimal asthma management in primary healthcare facilities. Clinical guidelines are written statements or recommendations for managing a disease to optimize patient care and help physicians make evidence-based decisions [45]. Before assessing guideline readiness across primary healthcare facilities, we must first evaluate whether the national government has provided guidelines to help primary healthcare settings manage asthma, given the country's available facilities and policies. These national guidelines can also serve as a foundation for primary healthcare facilities to develop clinic-specific implementation protocols. A literature review identified countries in the region with national guidelines for asthma management in primary care, including Indonesia, Malaysia, Singapore, Thailand, Myanmar, the Philippines, Vietnam, Cambodia, and Timor-Leste, whereas no such national guidelines were found in Laos and Brunei (see Table 4). However, only one study described access to national primary care guidelines in these countries. Across six public primary care clinics in Selangor, Malaysia, this study found that all healthcare providers involved in asthma management had access to national clinical guidelines and received training aligned with them [28]. This suggests that Malaysia has successfully ensured access to national guidelines across primary care facilities nationwide, fostering greater consistency in asthma management across primary healthcare settings. For other countries, this highlights the need to improve and document guideline accessibility. The lack of reported data in these regions does not necessarily imply poor access, rather, it underscores a critical gap in research and monitoring that warrants further investigation.

Beyond national guidelines, facilities also need asthma protocols to improve treatment consistency, reduce medical errors, and optimize health outcomes. Facilities adapt the protocols from available local resources [46]. Based on the available literature, only one study described the availability of primary care protocols. Conducted in Klang District, Malaysia, the study reported that all six public health clinics have asthma care pathways and asthma treatment protocols [16]. However, the study did not report barriers to implementing these protocols. Further research on the availability of asthma protocols across primary healthcare facilities in Southeast Asian countries is needed to fully describe this region's readiness to manage asthma.

TABLE 4: Overview of Availability and Accessibility of Asthma Clinical Guidelines in Southeast Asian Countries' Primary Care.

Country	Availability of national asthma guideline	Accessibility of national asthma guideline in primary care	Asthma protocols in primary care				
			Author, year	Type of the study	Sample	The availability	Barriers
Indonesia	Available: Decree of the Minister of Health of the Republic of Indonesia regarding Clinical Practice Guidelines for Doctors in Primary Health Care Facilities, written in Indonesian [47]	Not reported	-	-	-	-	-
Malaysia	Available: Clinical Practice Guidelines on Management of Childhood Asthma 2024 by Malaysian Thoracic Society and Clinical Practice Guidelines on Management of Asthma in Adults by the Ministry of Health Malaysia [48,49]	6 of 6 public primary care clinics in Selangor reported that all primary care physicians had access to clinical guidelines and received guideline-based training on asthma management [28]	Hussein *et al.,* 2023 [16]	Cross-sectional study using questionnaires	6 public health clinics and 100 doctors in Klang District	All clinics had asthma care pathways and asthma treatment protocols	Not reported
Singapore	Available: Agency for Care Effectiveness (ACE) guideline for Asthma by the Ministry of Health Singapore [50]	Not reported	-	-	-	-	-
Thailand	Available: Clinical Practice Guideline for Asthma Management in Primary Care 2023 by the Thai Asthma Council, written in Thai [51]	Not reported	-	-	-	-	-
Myanmar	Available: Basic Essential Package of Health Services (BEPHS), Ministry of Health. There are also guidelines from the Karen Department of Health and Welfare [52]	Not reported	-	-	-	-	-
The Philippines	Available: Clinical Practice Guideline and Pathway for the Management of Adults and Children with Bronchial Asthma in Family Practice by Philippine Academy of Family Physicians and PAPP Clinical Practice Guidelines for Pediatric Asthma 2021 by Philippine Pediatric Society [53,54]	Not reported	-	-	-	-	-
Vietnam	Available: Decision on the Issuance of the "Guidelines for the Diagnosis and Treatment of Bronchial Asthma" by the Minister of Health of Vietnam, written in Vietnamese [55]	Not reported	-	-	-	-	-

Country	Availability of national asthma guideline	Accessibility of national asthma guideline in primary care	Asthma protocols in primary care				
			Author, year	Type of the study	Sample	The availability	Barriers
Cambodia	Available: briefly mentioned in the Guidelines on the Minimum Package of Activities for Health Center Development by the Ministry of Health of Cambodia as part of non-communicable disease [56]	Not reported	-	-	-	-	-
Laos	No national guideline identified	Not applicable	-	-	-	-	-
Brunei	No national guideline identified	Not applicable	-	-	-	-	-
Timor-Leste	Available: National Health Sector Strategic Plan 2011–2030 by the Ministry of Health of Timor-Leste [57]	Not reported	-	-	-	-	-

CONCLUSIONS

Overall, PHC facilities in Southeast Asia demonstrate suboptimal and uneven readiness for asthma management, with limited access to standard diagnostic tools like spirometry, low availability and affordability of first-line controllers, persistent overreliance on SABA prescriptions, and gaps in provider competencies and clinical guideline implementation. These deficiencies can lead to poor symptom control, frequent acute exacerbations, high regional mortality rates, and inflated healthcare costs from avoidable hospitalizations. To address these challenges, countries must implement a tiered diagnostic strategy by deploying peak flow meters across all PHCs and hub-based spirometry, expand access to ICS-LABA inhalers at the primary care level, conduct interprofessional competency training, and operationalize national guidelines into local care pathways. Crucially, existing literature on PHC readiness for asthma in Southeast Asian countries remains extremely scarce. Therefore, further research is urgently needed to evaluate PHC readiness, including diagnostic availability, essential medicines supply chains, healthcare provider competencies, and the availability of primary care protocols, to provide a comprehensive overview of regional readiness and guide targeted policy reform.

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