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Commentary

National expert consensus on short-acting beta$_2$-agonist overreliance in asthma care in Malaysia

Running head: Consensus on SABA overreliance

Andrea Ban Yu-Lin[1,*], Sri Wahyu Taher[2], Jaya Muneswarao[3], Ho Bee Kiau[4], Rashidi Ahmad[5], Lalitha Pereirasamy[6], Chong Li Yin[7], Shamsuriani Md Jamal[8], Arvindran Alaga[9], Helmy Haja Mydin[10], Chang Li Cheng[11], Nor Azila Md Isa[12], Mohd Arif Mohd Zim[13]

[1]Department of Medicine, Faculty of Medicine UKM, Hospital Canselor Tuanku Muhriz, 56000 Cheras, Kuala Lumpur, Malaysia

[2]Klinik Kesihatan Simpang Kuala, 05400 Alor Setar, Kedah, Malaysia

[3]Department of Pharmacy, Hospital Pulau Pinang, 10990 George Town, Penang, Malaysia

[4]Klinik Kesihatan Bandar Botanik, 41200 Klang, Selangor, Malaysia

[5]KPJ Seremban Specialist Hospital, 70200 Negeri Sembilan, Malaysia

[6]Hospital Pulau Pinang, 10990 George Town, Penang, Malaysia

[7]Hospital Sultan Idris Shah Serdang, 43000 Kajang, Selangor, Malaysia

[8]Department of Emergency, Faculty of Medicine UKM, Hospital Canselor Tuanku Muhriz, 56000 Cheras, Kuala Lumpur, Malaysia

[9]Hospital Sultanah Bahiyah, 05460 Alor Setar, Kedah, Malaysia

[10]Hospital Pantai, 59100 Kuala Lumpur, Malaysia

[11]Klinik Kesihatan Kuang, 48050 Rawang, Selangor, Malaysia

[12]Klinik Kesihatan Nilai, 71800 Seremban, Negeri Sembilan, Malaysia

[13]Damansara Specialist Hospital 2, Bukit Lanjan, 60000 Kuala Lumpur, Malaysia

*Corresponding author.

Address: Department of Medicine, Faculty of Medicine UKM, Hospital Canselor Tuanku Muhriz, 56000 Cheras, Kuala Lumpur, Malaysia

Email: andreaban@ppukm.ukm.edu.my

Email address of all authors:

Andrea Ban Yu-Lin: andreaban@ppukm.ukm.edu.my; Helmy Haja Mydin: helmy.hajamydin@gmail.com; Sri Wahyu Taher: sriwahyu2006@yahoo.com.my; Chang Li Cheng: chang_licheng@yahoo.com; Arvindran Alaga: arvindran_82@yahoo.com; Lalitha Pereirasamy: lalithapereira@gmail.com; Mohd Arif Mohd Zim: firadhom@yahoo.com; Ho Bee Kiau: bkho@hotmail.com; Nor Azila Md Isa: iradit@yahoo.com; Jaya Muneswarao: rahulraoraorao@gmail.com; Chong Li Yin: leannrespi@gmail.com; Rashidi Ahmad: drcd2011@gmail.com; Shamsuriani Md Jamal: drsuria@ukm.edu.my.

Keywords

Asthma management, SABA overuse, overprescription, recommendations, GINA

Abstract

Objective: Inappropriate use of short-acting beta2-agonists (SABA) in asthma has been associated with undesired outcomes. This national expert consensus was developed to spread awareness of SABA overuse and provide recommendations on the ways to eliminate SABA overprescription and overreliance in asthma care in Malaysia.

Data sources: This expert consensus was developed by searching the PubMed database, using index terms to identify SABA overuse-related burden and recommendations made in asthma guidelines. Consensus recommendations were made via the Delphi method, involving a Malaysian expert committee comprising 13 healthcare professionals (five pulmonologists, four family medicine specialists, two emergency medicine physicians and two pharmacists).

Study selections: The articles reviewed include randomized controlled trials, systematic reviews, meta-analyses, observational studies, guidelines, and surveys, with abstracts in English and published up until June 2023. Relevant recommendations were also sourced from the verified websites of medical organizations and societies.

Results: Eleven consensus statements were developed, each statement achieving *a priori* agreement level of at least 70%. The statements reflect SABA overreliance in asthma care, as well as recommendations to eliminate SABA overprescription and overreliance in Malaysia. Supporting evidence in literature as well as expert committee discussions leading to the development of the finalized statements were elaborated.

Conclusion: This national expert consensus discussed the burden of SABA overreliance and made specific recommendations to eliminate SABA overprescription and overreliance in the Malaysian context. This consensus document is anticipated to impart better awareness among Malaysian healthcare providers and contribute to the continuous improvement of asthma care in the country.

Introduction

Inappropriate use of short-acting beta$_2$-agonists (SABA) in asthma has been associated with undesired outcomes, such as an increased risk of exacerbation, asthma-related admissions, emergency department (ED) visits, and mortality (1-3). The Global Initiative for Asthma (GINA) no longer recommend SABA monotherapy for mild asthma since 2019, and instead recommends inhaled corticosteroid (ICS)-based treatments instead (4). However, the adoption of the latest guidelines recommendation remains lacking in Malaysia, as evidenced by a high proportion of patients (47.4%) overprescribed with SABA (5). The issue of SABA overprescription is prevalent globally, affecting 26.7% in Asian countries (6). The prevalence varies widely in other regions, with rates reported at 14.6% in the United States (7), 25% in the Netherlands (8), 30% in Sweden (1), and 70.1% in Australia (9).

Malaysia, located in Southeast Asia, is a diverse nation with a population of 33.7 million (as of 2023) (10). Asthma was found to affect an estimated 6.4% of adults in Malaysia, based on the National Health Morbidity Survey 2011, with the highest prevalence among those above 75 years at 10.7% (11). In the same survey, no significant differences in the incidence of asthma were observed across marital status, location, income level and occupation (11). The public healthcare system receives substantial government subsidies, while access to private insurance is restricted to individuals who can afford it (12). Healthcare service utilization is generally skewed towards the public healthcare system, with 75.3% of patients admitted to public hospitals (13). Private healthcare facilities are more concentrated in urban areas, and are more commonly utilized by patients from more affluent backgrounds (13). Given the high proportion of patients overusing SABA in local settings (5, 14-16), this national expert consensus was developed to provide recognition of SABA overreliance and recommendations on the practical approaches to eliminate SABA overreliance in Malaysia.

Methodology

Expert selection

This consensus was developed by an expert committee comprising 13 healthcare professionals (five pulmonologists, four family medicine specialists, two emergency medicine physicians and two pharmacists) from academic centers, primary care centers, and specialty healthcare centers in Malaysia. The experts were selected based on their experience with asthma management, with each expert having a minimum of 15 years' experience in asthma care in various healthcare settings within the country.

Consensus development

The expert consensus was developed via the Rand Corporation (RAND)/University of California, Los Angeles (UCLA) modified Delphi panel method (Figure 1) (17, 18). A search of the literature in PubMed database was conducted, using index terms to identify SABA overuse-related burden and recommendations based on GINA guidelines. The studies selected include randomized controlled trials, systematic reviews, meta-analyses, observational studies, guidelines, and surveys, with abstracts in English and published up until June 2023. Relevant recommendations were also sourced from the verified websites of medical organizations and societies (4, 19-29). Upon reviewing the results from the literature review, ten preliminary consensus statements were drafted.

[Figure 1 here]

These statements were disseminated to the expert committee, who rated their level of agreement with each statement ("Agree", "Maybe", or "Disagree") via an anonymous virtual voting system (the first voting round) hosted on SurveyMonkey. On the voting platform, the expert panel also anonymously provided their reasons should they not fully agree with a

particular statement. The statements were then discussed between the expert panel at an in-person meeting, where any areas of disagreement were debated. Following the meeting, the statements were revised as needed and with the addition of one new statement; these eleven statements were then rated in the second round of anonymous virtual voting. *A priori* agreement level of 70% and above indicated consensus. This was followed by the development of this report summarizing the areas of agreement and the discussions which took place.

Outcomes

Ten consensus statements were distributed to the expert panel at the first voting round (Appendix 1). Following the discussions which took place at the in-person meeting between the expert panel, several statements were refined, and one new statement was developed. A total of eleven consensus statements were then distributed to the expert panel for a second round of voting. The eleven statements and agreement percentage for each statement are shown in Table 1. Eight of the statements achieved unanimous agreement (100%) among the expert panel. Nonetheless, the remaining three statements (Statements 5-7) achieved an agreement rating of at least 85%, well above the *a priori* consensus threshold of 70%. The supporting evidence in literature as well as discussions leading to the development of the finalized statements are elaborated below.

[Table 1 here]

Burden of SABA overreliance in Malaysia

Statement 1: SABA overreliance is highly prevalent in Malaysian asthma care across various healthcare settings, including, but not limited to, primary and specialty care, emergency department, as well as community pharmacy.

Statement 2: SABA overreliance will lead to poor asthma control and increased risks of asthma exacerbations, hospitalization, and mortality.

Statement 3: SABA overreliance is a major healthcare issue in asthma care, which warrants proactive, urgent, and systematic intervention in the national health systems.

Malaysia has reported elevated numbers of oral and inhaled SABA prescription in several studies (5, 15, 16). SABA overprescription is prevalent in various healthcare settings in the country, including primary care, specialty care, ED, and community pharmacy (5, 15, 16). In addition to SABA inhalers, overuse of SABA tablets is also prevalent (20). In a national survey of primary care encounters (n = 325 818), the rate of oral SABA, oral steroids, inhaled SABA, and ICS prescriptions were 33, 33, 50 and 23 per 100 asthma encounters, respectively (15). Acknowledging that the Malaysian Clinical Practice Guideline for Asthma recommends avoiding oral SABA due to its slower onset of action and higher risk of adverse reactions compared to inhaled SABA (20), this consensus will focus on addressing the overuse of SABA inhalers in Malaysia.

In the Malaysian cohort of the SABINA III study, around half of patients (47.4%) with asthma in Malaysia were overprescribed with SABA (≥ 3 SABA prescriptions/year); 51.8% for patients with mild asthma, and 44.5% for patients with moderate-to-severe asthma (5). Despite giving background ICS-containing therapy, SABA overprescription persists as evidenced in both specialty care (46.7%) and primary care settings (28.8%) (5). In addition, 9% of patients had purchased SABA without a prescription; of these, 43.9% purchased ≥ 3 inhalers (5). Similarly, SABA overuse has also been reported in a retrospective study performed at two tertiary centers in Kuala Lumpur, with over 70% of patients admitted for asthma exacerbation using their SABA inhalers ≥ 3 times per week (16). The elevated

numbers of SABA prescription may potentially be attributed to the provision of substantial government subsidies for asthma medications (including ICS and SABA) in public healthcare settings (5).

SABA overprescription has been associated with worsened clinical outcome among Malaysian patients. Patients overprescribed with SABA were less likely to achieve at least partially controlled asthma, and the risk of severe asthma exacerbation doubled (5). Furthermore, the ASCOPE study showed an associated between high SABA use with poor asthma control in the Malaysian primary care setting (30). The Klang Asthma Cohort Study has also identified SABA use as a major risk factor for poorly controlled asthma (31). Furthermore, SABA overusers were generally less likely to describe their health status and asthma control as 'excellent' (32).

Most SABA overusers were unaware that frequent SABA usage could worsen their asthma control (32, 33). SABA overusers have also exhibited dependence towards SABA, due to the immediate symptom relief provided from SABA inhalers (32, 33). There is a need to identify patients whose perceptions of SABA might place them at risk of SABA overreliance to facilitate early clinical intervention, which includes educating patients on the dangers of SABA overuse and facilitate behavioral change among patients (34).

The frequent overuse of SABA among patients with asthma in Malaysia, as well as the known risk of worsened clinical outcomes associated with SABA overuse demonstrated by multiple studies, suggest that the causation between SABA overuse and poor health outcomes cannot be ruled out. As such, it is important for clinicians to be aware of and recognize SABA overreliance and take proactive measures to address this issue.

Eliminating SABA overprescription and overreliance

Statement 4: Patients with asthma on SABA treatment should receive an assessment of risk of SABA overreliance.

Statement 5: The number of SABA canisters utilized by patients with asthma should be controlled and monitored, whereby it should not exceed 2 canisters/year.

SABA overreliance has been associated with an increased risk of exacerbation, asthma-related admissions, ED visits, as well as mortality (1-3). Therefore, SABA overreliance in patients must be identified and eliminated to improve patient outcomes. The risk of SABA overreliance may be assessed using several tools. An example of this is the Reliever Reliance Test (RRT), which is a 5-item self-assessment tool to assess patient perceptions of SABA that lead to overreliance and overuse of SABA (29). The RRT was developed from the validated SABA Reliance Questionnaire (SRQ) (34). Alternatively, the Canadian Thoracic Society's simplified evaluation of SABA overreliance may be utilized to evaluate asthma control, before using the RRT to obtain a better understanding of the drivers behind SABA overreliance (35). However, these questionnaires were not validated in the local population at the point of preparing this manuscript.

The SENTINEL project introduced a series of 'gold standard' asthma prescribing practices to improve adult asthma care in the primary and secondary care settings (36). A reduction in SABA overuse was observed in patients with asthma 12 months after implementing the SENTINEL project in Hull, UK (37). The Malaysian asthma care is anticipated to benefit from similar best practices to monitor and control SABA use.

Currently, control of SABA utilization may be challenging as SABA inhalers may be provided through multiple sources, including upon discharge from ED, at public health clinics or purchased from retail pharmacies. Hence, dispensing of SABA should be controlled and monitored so that patients are prescribed no more than two SABA canisters per year (1, 19). The threshold for SABA overuse was calculated assuming 200 doses per canister, corresponding to an average use of more than once daily (19). Regardless, exceptions to this threshold might be considered for patients with severe asthma. In addition, SABA should also not be prescribed alongside maintenance and reliever therapy (MART), nor should it be provided as a repeat prescription. Patients who require additional SABA should be referred for consultation with their clinician for further assessment.

Understanding patient habits surrounding SABA use may also help eliminate SABA overreliance. Some SABA overusers perceive that their asthma is well-controlled on SABA alone, while unaware that excessive SABA use worsens asthma control without addressing the underlying inflammation (32, 33). As indicated by the expert panel, some patients use inhalers past their expiration date, while others tend to accumulate prescribed SABA canisters and store unused medication at home. Questioning patients about the presence of stored SABA at home may aid in detecting instances where patients have received excess SABA from multiple sources. Measures to cap the maximum number of SABA canisters dispensable to each patient yearly would also help to improve patient awareness and curb SABA overuse.

Prior to considering a regimen with SABA reliever, clinicians should ensure that the patient is likely to adhere to daily controller treatment, and that they are not overreliant on SABA

inhalers. Additional strategies that may help reduce SABA overreliance include placing warning labels on SABA canisters and packages, limiting SABA dispensation without prescription, and establishing SABA-free treatment centers. Following an exacerbation, the patient's asthma history (including SABA use) must be thoroughly examined. Upon discharge from ED, patients should not be discharged with SABA inhaler alone (19). Clinicians are recommended to also review SABA inhaler use during clinic visits and provide patient education about asthma control, with a focus on the appropriate use of SABA medications.

There are two aspects contributing to SABA overuse in patients that must be addressed: overprescription by clinicians and overreliance by patients. Active efforts to monitor the prescription of SABA inhalers, as well as identifying patients at risk of SABA overreliance, are anticipated to help eliminate SABA overuse.

Eliminating SABA monotherapy from the ED setting

Statement 6: Patients with asthma discharged from hospital/clinic/emergency department following an acute exacerbation should receive ICS-containing treatment and not SABA monotherapy.

The goals for asthma treatment in the ED setting are to reduce the need for hospitalization and mechanical ventilation and the frequency of relapse after discharge from the ED, while improving patient quality of life, minimizing adverse drug events, and maximizing patient safety (38). However, in the expert committee's experience, approximately one-third of patients are presented recurrently at ED with severe or life-threatening asthma exacerbation following discharge. This observation is substantiated by a local study reporting a high rate of SABA use of 70.9%, which found that 49.4% of patients with asthma experienced at least

one exacerbation in the previous year, requiring an average of at least two admissions per year (16). This may be attributed to inappropriate use of SABA, which has been linked to asthma-related hospitalization, ED visits and increased asthma-related costs (3). The GINA 2024 recommends discharging patients with a regular maintenance ICS-containing treatment; SABA monotherapy is not recommended (19). Other international guidelines such as the New Zealand Adolescent & Adult Asthma Guidelines (2020) (21), Australian Asthma Handbook Version 2.2 (2022) (22) and the Emirates Thoracic Society (2021) (39) have also made similar recommendations when discharging patients.

Eliminating SABA monotherapy involves providing ICS-containing treatment and not SABA monotherapy upon discharge. Conversely, the dispensing of both ICS and SABA upon ED discharge may result in non-adherence to follow-up appointments. Therefore, patients should receive proper review and asthma education at discharge, particularly on the importance of keeping their follow-up appointments and adhering to their medication. A written asthma action plan and inhaler technique education may be imparted to patients at discharge to empower patients to continue their treatment properly upon discharge.

Controlling SABA dispensation

Statement 7: SABA should only be dispensed with prescription.

Dispensing of SABA inhalers without a prescription account for a large proportion of SABA inhalers dispensed in Malaysia, with 3.3 million dispensed in 2019 (40). Non-prescription availability of SABA has been linked to the undertreatment of asthma in an Australian study; in the study, nearly 70% of undertreated patients had obtained SABA without prescription, compared to only 50% of adequately treated patients ($p = 0.03$) (41).

Similarly, an Australian community pharmacy-based survey demonstrated an increased proportion of patients with uncontrolled asthma (59.0% vs. 15.4%, $p < 0.001$), increased use of oral corticosteroid to manage symptoms (26.2% vs. 13.5%, $p < 0.01$), and increased doctor visits over the past one year (74.5% vs. 62.5%, $p < 0.01$) among patients who purchased SABA without a prescription and those who overused SABA, compared with SABA non-overusers (9). A systematic review also reported that SABA inhaler purchase without a prescription and SABA overuse often lead to uncontrolled asthma and increased healthcare utilization (42).

To circumvent this issue, a Global Policy Steering Group on Asthma recommends availing SABAs only to patients with a valid prescription or those having a clinical emergency, such as an exacerbation, and that SABA should not be dispensed on its own. Moreover, reassessment should be performed if ≥ 3 SABA inhalers were used in a year (43). The United States, South Korea and Spain have also introduced similar government policies and/or practices to restrict the dispensing of SABA inhalers without a prescription (23, 44, 45).

Given that the dispensing of SABA inhalers has been linked to the undertreatment of asthma, patients in the local settings would similarly benefit from SABA inhalers dispensed only with a valid prescription, but this proposition might be met with several challenges. This includes addressing prescriber habits, educating the prescriber to curb SABA overprescription. Improved clinician and pharmacist awareness also play an integral role in limiting SABA dispensation to prevent potential overuse of SABA.

Implementation of GINA treatment strategy

Statement 8: Where appropriate, Global Initiative for Asthma (GINA) Track 1 practice should be implemented in the management of asthma across all severities.

The recent GINA recommendations provide an option of two treatment tracks for asthma: the 'preferred' Track 1 with ICS/formoterol as an anti-inflammatory reliever (AIR) (Steps 1-2), and an 'alternative' Track 2 either using ICS as needed (Step 1) or daily low-dose ICS (Step 2) and as-required SABA (19). A Cochrane systematic review and meta-analysis has shown that as-required fixed-dose combination inhalers (Track 1) in mild asthma reduced asthma exacerbations requiring systemic steroids ($p < 0.00001$), annual exacerbation rate ($p < 0.00001$), and odds of an asthma-related hospital admission or ED or urgent care visit compared with as-required SABA alone ($p = 0.0001$) (46). In addition, as-required fixed-dose combination inhalers did not lead to a significant difference in the rate of severe asthma exacerbations requiring systemic steroids but instead reduced the odds of an asthma-related hospital admission or ED or urgent care visit compared with regular maintenance ICS ($p = 0.01$) (46).

In a systematic review of 16 randomized clinical trials (15 of which evaluated MART as a combination therapy with budesonide and formoterol in a dry-powder inhaler [DPI]), Track 1 MART regimen was associated with a lower risk of asthma exacerbations compared with the same dose or higher dose of ICS and long-acting beta$_2$-agonist (LABA) controller therapy (Track 2 regimen) (47). Furthermore, switching patients with uncontrolled asthma at GINA steps 3-4 to Track 1 was also shown to be more beneficial compared with maintaining or intensifying Track 2 therapy (48). Switching to MART was associated with longer time to first severe asthma exacerbation as well as 30% lower risk of severe asthma exacerbation compared with remaining at the same treatment step (48). Similarly, the SENTINEL project

also reported that a higher proportion of patients who transitioned to MART were exacerbation-free post-implementation of the SENTINEL quality improvement program (37).

Furthermore, a post-hoc analysis has shown that beta-agonist use within 14 days prior to hospital attendance with a severe asthma exacerbation in GINA Track 2 was more likely to exceed the daily threshold requiring medical review compared with GINA Track 1 approach (49). This may be due to the increasing asthma symptoms nearing asthma exacerbation, which resulted in increased as-needed reliever use (50). Starting patients on a treatment regimen that improves their asthma control would avoid reliance on SABA relievers.

Retrospective studies in the United Kingdom, China and Malaysia have demonstrated a low adherence rate to ICS among patients with asthma (16, 51-53), which suggest that the implementation of GINA Track 2 in clinical practice could be challenging. Furthermore, utilizing ICS/formoterol as a reliever in GINA Track 1 also makes it a simpler regimen. The use of ICS/formoterol may also play an important role in replacing SABA monotherapy and, subsequently, reducing severe exacerbations.

Some centers have successfully implemented a SABA-free policy. The Asthma Centre at the G Baigorria Hospital in Argentina, has implemented an ICS-containing reliever strategy successfully since 2014 by administering budesonide/formoterol via a single inhaler device for all asthma severities, thus eliminating SABA therapy. The MART/AIR regimen in the SABA-free center showed a reduction in the rate of asthma hospitalizations ($p = 0.031$) (54).

Another consideration for the selection of asthma treatment is the environmental impact of the respective treatment device used. There has been increasing interest in reducing the impact of asthma on the environment; the choice of inhaler should consider the life cycle of the device from manufacturing to recycling, as well as the type of propellants used in pressurized metered dose inhalers (pMDIs) (19). Selection of an effective treatment regimen

which enables adequate asthma control not only improves patient outcomes, but also reduces the carbon footprint associated with asthma care (e.g. inhaler overuse, clinic visits due to uncontrolled asthma, hospital or intensive care unit admissions, patient travel). GINA Track 1, due to its potential for better asthma control as well as its use of DPI, may be advantageous in this sense (37, 46, 48, 49, 55, 56). Regardless, besides the environmental implications of an inhaler, it is essential that treatment selection considers the patients' ability to use their devices correctly to achieve good asthma control (56).

GINA Track 1 has been considered the preferred approach as it demonstrates efficacy in reducing exacerbations and provides simplicity by utilizing a single device. Local implementation of GINA Track 1 practice could be accelerated by updating national guidelines to reflect the latest GINA recommendations. Specific programs and initiatives facilitating the adoption of GINA Track 1 from other countries (e.g. the SENTINEL respiratory quality improvement program) (37), SABA-free asthma centers (54)) may also be considered for implementation in Malaysia. Implementation of GINA Track 1 could also address the environmental impact of asthma care, by reducing the carbon footprint resulting from poorly controlled asthma and SABA overuse (55). Broad access to ICS/formoterol in public primary care settings is essential to enable successful implementation of Track 1 regimen. GINA Track 1 should be implemented in the management of asthma across all severities, although the Track 2 approach may also be utilized in carefully selected patients.

Self-management education improves treatment outcomes

Statement 9: Inhaler technique and medication adherence should be optimized in all patients with asthma while empowering them with self-management education.

Incorrect usage of inhaler device is associated with worse disease outcomes, including suboptimal asthma control and increased exacerbations, creating a considerable impact on the burden of asthma (57, 58). Multiple systematic reviews have associated inhaler techniques with treatment efficacy. One such systematic review associated improved inhalation technique with better asthma outcomes across multiple devices (59). Another systematic review has also linked poor inhaler technique, number of inhalation procedure steps and time elapsed since intervention (all $p < 0.05$) with the effectiveness of the intervention (60). Educational interventions to improve inhaler technique were considered effective in the short-term, and periodical intervention reinforcement was recommended to improve treatment efficacy (60). Aside from inhaler technique, medication adherence also plays a role in influencing treatment outcomes; pharmacist-led interventions on medication adherence and inhalation technique in adult patients with asthma were shown to improve inhalation technique in these patients (61). Good medication adherence was also associated with a lower risk of severe asthma exacerbations in several high-quality studies (62). The Test of Adherence to Inhalers (TAI) is a questionnaire that can be used to assess adherence to inhalers in asthma through patient self-report (63), which had been translated into Bahasa Malaysia and validated for use in the Malaysian population (64).

Empowering patients in self-management of asthma has long been recommended by various guidelines (19, 28, 65). A systematic review and meta-analysis had been performed to compare the impact of three different self-management models (multidisciplinary case management, regularly supported self-management, and minimally supported self-management) on reducing healthcare use and improving quality of life against usual care and education (66). For healthcare use, multidisciplinary case management and regularly supported self-management were shown to perform better than usual care (66). For quality of life, only regularly supported self-management showed benefit compared with usual care (66).

Asthma self-management has also been linked with reduced hospitalizations, accident and emergency attendances and unscheduled consultations, as well as improved markers of control and quality of life for people with asthma (65). Self-management was considered the most effective when provided in the context of proactive long-term condition management (65). Reduced hospitalizations and emergency visits would outweigh the costs of providing self-management support to patients (65). Therefore, patients should be empowered to take charge of their asthma treatment by optimizing their inhaler technique and medication adherence, as well as providing self-management education to improve treatment outcomes.

Role of pharmacist-led interventions

Statement 10: Increased healthcare resources should be allocated to expand Respiratory Medication Therapy Adherence Clinic (RMTAC) pharmacists-led interventions in improving patients' inhaler technique and treatment adherence, as well as overall mitigation of the risk of SABA overreliance.

Multiple asthma clinical trials (e.g., FACET, COSMOS, START, and SYGMA 1 and 2 trials) have reported encouraging efficacy of various treatment regimens in reducing exacerbation (67-70). However, this contrasts with real-life scenarios, where a substantial number of patients continue to experience suboptimal asthma outcomes despite treatment. This disparity is evident in Malaysian health clinics, where only 34.1% of adult patients achieved well-controlled asthma (71), which may be attributed to poor treatment adherence and inhaler technique (72).

Pharmacists play an integral role in providing long-term follow-up care for effective management of chronic diseases, including asthma. This is because pharmacists are well-

positioned to provide patient education on asthma, treatments and side effects, inhaler technique, as well as to emphasize adherence to therapy (72).

The RMTAC has been introduced by the Ministry of Health Malaysia to foster collaboration between pharmacists and other healthcare professionals to effectively improve asthma care through patient education, self-management engagement, asthma trigger avoidance, medication adherence review, inhaler technique training, disease monitoring, while proactively identifying and resolving drug-related problems (27, 73). Follow-ups with RMTAC over six months have been shown effective in improving patients' asthma control (21% in standard care vs. 52% with RMTAC), GINA score, and inhaler technique when compared with standard care (74), while improving cost-efficiency of asthma care (73).

In a randomized controlled trial, patients receiving pharmacist-led intervention had better asthma control after 6 months; the mean Asthma Control Questionnaire (ACQ) scores were significantly improved ($p < 0.001$) and more patients had controlled asthma ($p = 0.028$) compared with the control group (75). Furthermore, patients receiving pharmacist-led intervention had seen improved inhaler technique and medication adherence (75). Pharmacist-led interventions can also support the reduction of excessive SABA use among patients; an intervention group providing training on inhaler technique and treatment adherence over a six-month period reduced the need for rescue medicine compared with usual care ($p = 0.012$) (76). Furthermore, a pharmacist-led intervention designed to reduce SABA overdispensing by making a written or verbal request to the prescriber to limit the dispensing of SABA inhaler to < 1 canister per month, if determined appropriate by the prescriber, had been shown successful in reducing SABA prescription (77).

Pharmacist-led interventions have shown success in reducing SABA overuse among patients, as well as overprescription by HCPs. Allocation of healthcare resources to expand RMTAC service to more healthcare settings in Malaysia would improve patients' inhaler technique and treatment adherence, while reducing SABA overreliance.

Research activities to improve asthma care

Statement 11: Research on asthma-related exacerbation and mortality should be a national healthcare priority.

Limited health system surveillance data for asthma limit hinders the planning for the healthcare resources (78, 79). Unfortunately, there has long been a mismatch globally between the rising burden of respiratory diseases and research funding made available (79).

Among the research priorities which have been suggested to help improve asthma care in low-to-middle-income countries include investigation of the local determinants of asthma-related morbidity and mortality, development of feasible and scalable models for long-term asthma care, which includes access to regular clinical review and education on the use of ICS medications, and the pragmatic use of GINA recommendations for as-required ICS/formoterol for Steps 1 and 2 of asthma treatment (78).

Successful research activities play an important role in determining underlying factors that may be associated with asthma hospitalization and mortality. For example, the National Review of Asthma Deaths (NRAD) in the United Kingdom had successfully identified that a considerable proportion of patients had been prescribed > 12 SABA inhalers in the year before they succumbed to asthma, with low numbers of preventer medication prescriptions during the same period (80). In addition, the NRAD also reported that 46% of asthma deaths were deemed avoidable if clinicians had implemented the recommendations from British

Thoracic Society (BTS)/Scottish Intercollegiate Guidelines Network (SIGN) Asthma Guidelines (80). Aside from the NRAD, the Swedish National Airway Register (SNAR), with almost 300,000 individuals registered, provides a unique insight on asthma care in Sweden in evaluating the impact of and adherence to local, national and international guidelines (24).

Recent research efforts on asthma in Malaysia include the RESPIRE research unit, a national audit on asthma management in public health clinics, and the National Health & Morbidity Survey (NHMS) 2023 (25, 26, 81). However, availing data on asthma exacerbation and mortality burden at the national level remains an area that requires further investigation. Furthermore, the launch of an asthma registry in Malaysia allows collection of data which may be valuable in accessing the gaps in asthma care. Therefore, we propose that research on asthma-related exacerbation and mortality should be made a national healthcare priority.

Conclusion

Inappropriate use of SABA in asthma has been associated with several poor patient outcomes. Increased awareness of SABA overreliance is essential to improve asthma management. This national expert consensus discussed the burden of SABA overreliance and provided recommendations to eliminate SABA overprescription and overreliance in the Malaysian context, and is anticipated to increase the awareness of SABA overreliance among Malaysian healthcare providers and improve asthma care in the country.

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Appendix 1

Ten consensus statements on short-acting beta-agonist over-reliance in asthma care in Malaysia distributed for the first round of voting, and the distribution of first-round agreement ratings.

Statements	**First-round voting-Agreement (%)[a]**
Statement 1: SABA over-reliance is highly prevalent in Malaysian asthma care across various healthcare settings, including, but not limited to, primary and specialty care, emergency department, as well as community pharmacy.	100%
Statement 2: SABA over-reliance will lead to poor asthma control and increased risks of asthma exacerbations, hospitalisation and mortality.	100%
Statement 3: SABA over-reliance is a major healthcare issue in asthma care, which warrants proactive, urgent and systematic intervention in the national health systems.	100%
Statement 4: Asthma patients on SABA treatment should receive an assessment of risk of SABA over-reliance.	100%
Statement 5: The number of SABA canisters utilised by asthma patients should be controlled and monitored, whereby it should not exceed 2 canisters/year.	92%
Statement 6: Asthma patients discharged from hospital/clinic/emergency department following an acute exacerbation should receive ICS-containing treatment and not SABA monotherapy. They should receive proper treatment review and asthma disease	92%

education in primary and/or specialty care.	
Statement 7: SABA should only be dispensed with prescription.	83%
Statement 8: GINA Track 1 practice should be implemented in the management of asthma across all severities where appropriate.	67%
Statement 9: Increased healthcare resources should be allocated to expand RMTAC pharmacists-led interventions in improving patients' inhaler technique and treatment adherence, as well as overall mitigation of the risk of SABA over-reliance.	83%
Statement 10: Research on asthma-related exacerbation and mortality should be a national healthcare priority.	100%

[a]The first-round voting was participated by 12 panel experts.

GINA: Global Initiative for Asthma; ICS: inhaled corticosteroids; RMTAC: Respiratory Medication Therapy Adherence Clinic; SABA: short-acting beta-agonist.

Table 1. Consensus statements on SABA over-reliance in asthma care in Malaysia, and the distribution of second-round agreement ratings.

Statements	**Second-round voting agreement (%)[a]**
Burden of SABA over-reliance in Malaysia	
Statement 1: SABA over-reliance is highly prevalent in Malaysian asthma care across various healthcare settings, including, but not limited to, primary and specialty care, emergency department, as well as community pharmacy.	100%
Statement 2: SABA over-reliance will lead to poor asthma control and increased risks of asthma exacerbations, hospitalization and mortality.	100%
Statement 3: SABA over-reliance is a major healthcare issue in asthma care, which warrants proactive, urgent and systematic intervention in the national health systems.	100%
Recommendations to eliminate SABA overprescription and over-reliance	
Statement 4: Patients with asthma on SABA treatment should receive an assessment of risk of SABA over-reliance.	100%
Statement 5: The number of SABA canisters utilized by patients with asthma should be controlled and monitored, whereby it should not exceed 2 canisters/year.	85%
Statement 6: Patients with asthma discharged from hospital/clinic/emergency department following an acute exacerbation should receive ICS-containing treatment and not	92%

SABA monotherapy.	
Statement 7: SABA should only be dispensed with prescription.	85%
Statement 8: Where appropriate, GINA Track 1 practice should be implemented in the management of asthma across all severities.	100%
Statement 9: Inhaler technique and medication adherence should be optimized in all patients with asthma while empowering them with self-management education.[b]	100%
Statement 10: Increased healthcare resources should be allocated to expand RMTAC pharmacists-led interventions in improving patients' inhaler technique and treatment adherence, as well as overall mitigation of the risk of SABA over-reliance.	100%
Statement 11: Research on asthma-related exacerbation and mortality should be a national healthcare priority.	100%

[a]The second-round voting was participated by 13 panel experts.

[b]Statement 9 was developed following discussions that took place after the first-round voting, and was rated at the second-round voting.

GINA: Global Initiative for Asthma; ICS: inhaled corticosteroids; RMTAC: Respiratory Medication Therapy Adherence Clinic; SABA: short-acting beta-agonist.

Figure legend

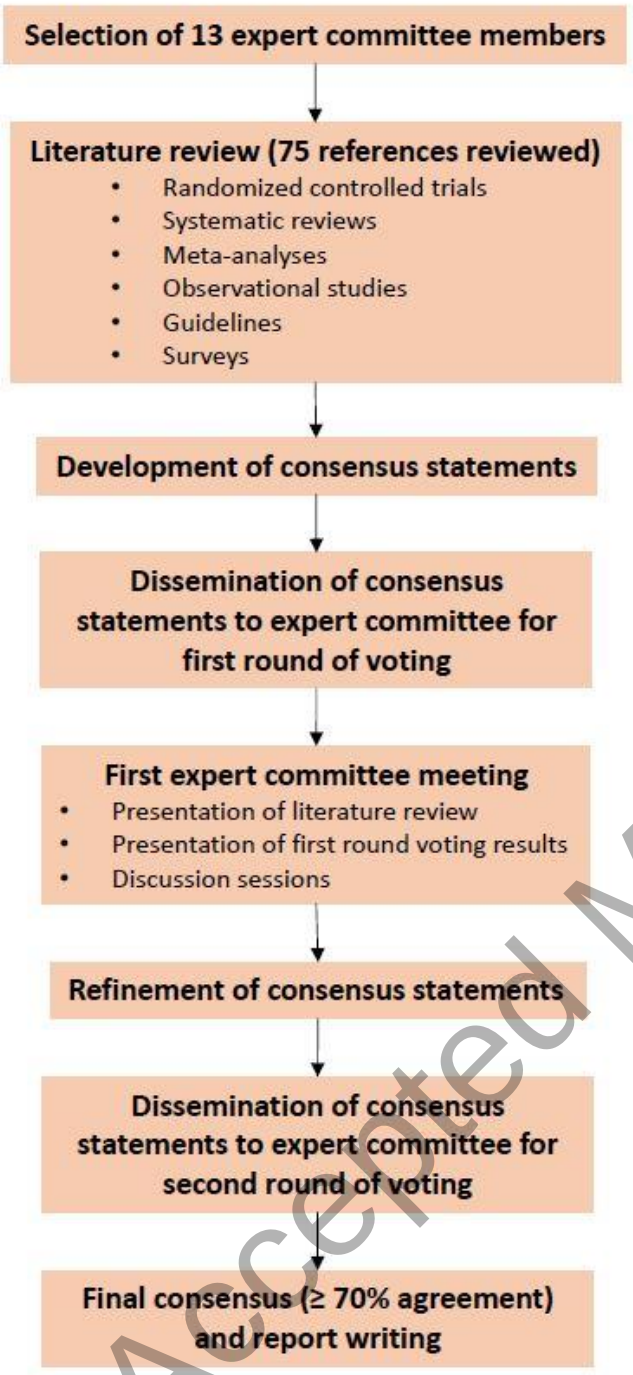

Figure 1. Flow diagram on the development process of the expert consensus on short-acting beta-agonist over-reliance in asthma care in Malaysia.