Is your patient's asthma well controlled? Bridging the gap between perceived and actual control in contemporary asthma management

RM Moosa-Battey

Department of Pharmaceutical Sciences, Tshwane University of Technology, South Africa

Corresponding author, email: batteyrm@tut.ac.za

Abstract

Asthma is a chronic, heterogeneous inflammatory airway disease that remains sub-optimally controlled in a significant proportion of patients despite the availability of effective therapies and evidence-based clinical guidelines. This narrative review explores the contemporary concept of asthma control, shifting the focus from static disease severity to dynamic assessment of symptom burden and future risk. Key barriers to optimal asthma management are examined, including patient–clinician perception gaps, poor adherence to inhaled corticosteroid therapy, incorrect inhaler technique, persistent environmental triggers, and comorbid conditions. The role of validated assessment tools, such as symptom-based questionnaires, is highlighted as a means of reducing subjectivity and improving routine clinical evaluation. Emerging management strategies, including maintenance and reliever therapy, therapeutic patient education, digital health technologies, and biologic therapies for severe disease, are discussed. Emphasis is placed on patient empowerment and self-management, with the inclusion of a practical asthma control checklist to facilitate early recognition of poor control and timely intervention. Overall, this article underscores that well-managed asthma is achievable for most patients through regular assessment, shared decision-making, and integration of guideline-directed care into real-world practice, ultimately aiming to restore normal daily functioning and reduce preventable morbidity

Keywords: asthma control, asthma management, inhaler adherence, patient empowerment, asthma self-management, assessment tools, chronic airway disease

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Introduction

Asthma is a heterogeneous chronic inflammatory disease of the airways characterised by bronchial hyper-responsiveness with respiratory symptoms such as wheeze, shortness of breath, and cough.[1,2] Affecting approximately 260 million people worldwide, its prevalence continues to rise, particularly in low- and middle-income countries.[3,4] While modern pharmacotherapy makes asthma control achievable for the majority of patients, real-world data consistently show a significant gap between clinical goals and patient outcomes.[5,6]

While contemporary pharmacotherapy makes asthma control achievable for most patients, real-world data consistently demonstrate a substantial gap between guideline-defined treatment goals and patient outcomes.[5,6] This disconnect has prompted a fundamental shift in asthma management over the past two decades, moving away from a static severity-based classification toward a dynamic, control-based approach.[1,7] Rather than viewing asthma severity as a fixed characteristic, this paradigm recognises that disease activity fluctuates over time and that even patients with apparently mild asthma may experience severe or life-threatening exacerbations if control is inadequate.[1,2]

Asthma control is now defined by two complementary domains: current symptom control, encompassing daytime and night-time symptoms, reliever medication use, and activity limitation; and future risk, including exacerbations, lung function decline, and treatment-related adverse effects.[1,6] Despite the clarity of these definitions, poor asthma control remains common in routine clinical practice. A major contributor is the discrepancy between patient-perceived control and objective clinical status. In large multinational surveys, most patients report their asthma as well controlled, despite failing to meet objective criteria for control.[5] Many patients develop "low expectations", normalising persistent symptoms and recurrent urgent care visits as inevitable aspects of the disease.[5]

This misperception is not limited to patients. Evidence suggests that healthcare providers may also overestimate asthma control, particularly when structured assessment tools are not routinely used. As a result, the true impact of symptoms on daily functioning and quality of life may be underestimated, leading to missed opportunities for treatment optimisation. In parallel, well-recognised modifiable factors—including poor adherence to inhaled corticosteroid therapy, incorrect inhaler technique, ongoing exposure to environmental triggers, and the presence of comorbid conditions—continue to undermine asthma control across diverse populations.[4]

Against this backdrop, there is growing emphasis on routine, standardised assessment of asthma control using validated tools, coupled with patient-centred management strategies that prioritise education, shared decision-making, and self-

management.[2] This narrative review examines contemporary concepts of asthma control, explores key barriers to optimal management, and evaluates established and emerging strategies aimed at improving outcomes. Emphasis is placed on patient empowerment and structured assessment, including the use of validated questionnaires and a practical asthma control checklist to support early identification of poor control and timely intervention.

Pathological components of asthma can be described as cellular inflammation, including bronchitis, and the remodelling of the structural elements of the airway wall.[1,4] This includes inflammation of the airway, constriction of the airway via smooth muscle contraction, the hypersecretion of mucus, bronchial hyperresponsiveness, and additional narrowing of the airway due to mucosal oedema and sloughing of the epithelial cells.[2,3]

Precipitating factors

Asthma symptoms are characteristically variable, often triggered or worsened by specific precipitating factors.[2] Identifying and avoiding these triggers is a cornerstone of effective self-management.[1]

Environmental and irritant triggers

Exposure to environmental pollutants and irritants is a primary cause of loss of control.

- **Tobacco smoke:** Both active and passive smoking are major precipitating factors that not only increase symptoms but also attenuate the therapeutic response to inhaled corticosteroids.[6,7] Children of parents who smoke face a three-fold higher burden of disease and more frequent chest infections.
- **Air pollution and fumes:** Common irritants include outdoor air pollution, wood smoke from biomass fuels, and strong scents such as perfumes, detergents, and industrial chemicals.[5]
- **Weather changes:** Many patients experience worsening symptoms in response to cold air, humidity, or sudden changes in temperature.[5,]

Allergens

For the majority of patients, especially those with the allergic (extrinsic) phenotype, allergens are a dominant precipitating factor.[2]

- **Common aeroallergens:** Household dust mites, grass and tree pollens, animal dander (fur and feathers), and moulds are frequent triggers for acute symptoms.[5]
- **Occupational sensitisers:** In some adults, asthma is precipitated by specific agents in the workplace, a condition known as occupational asthma.[6]

Clinical and biological factors

Internal biological changes and co-existing medical conditions can also precipitate asthma flares:

- **Viral Infections:** Respiratory viruses, particularly the common cold (Rhinovirus), are the most frequent triggers for severe asthma exacerbations in both children and adults.[7]
- **Comorbidities:** Conditions such as allergic rhinitis, obesity, and gastro-oesophageal reflux disease (GORD) can aggravate airway inflammation and make asthma more difficult to manage.[2]
- **Hormonal changes:** Worsening symptoms can be precipitated by hormonal fluctuations, such as those occurring during the premenstrual period (catamenial asthma) or pregnancy.[2]
- **Medications:** Certain drugs, including beta-blockers (even in eye drops) and aspirin, can precipitate severe bronchospasm in sensitive individuals.[2]

Lifestyle and psychological factors

- **Exercise:** Physical exertion is a well-known trigger, particularly when performing activities in cold, dry air without a proper warm-up.[5]
- **Emotions:** Strong emotional distress, anxiety, and depression can influence symptom perception and act as psychological triggers for asthma attacks.[1]

Signs and symptoms: from acute episodes to chronic impairment

The presentation of asthma is characterised by symptoms that vary over time and in intensity, often associated with variable expiratory airflow limitation.[1,2]

Acute symptoms (exacerbations)

Acute asthma exacerbations represent a change from the patient's usual status and can range from moderate to life-threatening.

- **Moderate exacerbations:** These are events outside the patient's usual day-to-day variation, often lasting two days or more, characterised by a deterioration in symptoms and an increased need for a rescue bronchodilator.[1]
- **Severe signs:** In severe episodes, patients may experience shortness of breath while sitting still and may be unable to speak in full sentences, limited to only a few words at a time.[5]
- **Emergency warning signs:** Severe exacerbations often require urgent medical intervention to prevent respiratory failure or death.[1]

Chronic symptoms

Chronic asthma is defined by persistent respiratory symptoms that interfere with daily life.[2]

- **Cardinal signs:** The classic symptoms include wheezing, shortness of breath, chest tightness, and coughing.[1]
- **Night-time impact:** A common sign of poor chronic management is nocturnal waking due to cough or breathlessness.[5]
- **Activity limitation:** Chronic poorly managed asthma frequently prevents patients from participating in exercise or routine physical activities.[5]

Table I: Asthma severity subcategories[1,7]

Severity Classification	Symptom Frequency	Nighttime Awakenings	Reliever Use	Interference with Activity
Intermittent	≤ 2 days/week	≤ 2 times/month	≤ 2 days/week	None
Mild Persistent	> 2 days/week	3–4 times/month	> 2 days/week	Minor limitation
Moderate Persistent	Daily	> 1 time/week	Daily	Some limitation
Severe Persistent	Throughout the day	Often 7 times/week	Several times/day	Extreme limitation

- **Systemic indicators:** Frequent reliance on a reliever (blue) inhaler (more than twice a week) and recurrent chest infections are clear indicators that the underlying inflammation is not being addressed.

Classification of asthma severity

Historically, asthma was classified by its underlying severity based on the level of symptoms and airflow limitation before the start of treatment. While clinical practice has shifted toward a control-based management strategy, the initial classification of severity remains a useful tool for establishing starting therapy. Table I indicates the classification of severity.

From severity to clinical control

Historically, asthma management was based on a static classification of severity (intermittent, mild, moderate, or severe persistent). However, clinical guidelines have shifted toward a control-based management strategy.[1,7] This transition recognises that severity is not a fixed feature; a patient with "mild" underlying disease can still experience life-threatening exacerbations if poorly controlled.[1,2]

In response to these limitations, contemporary clinical guidelines have shifted toward a control-based management strategy that prioritises ongoing assessment of disease status rather than retrospective categorisation.[1,7] This paradigm recognises that asthma severity is not an inherent or immutable characteristic but rather a reflection of the intensity of treatment required to achieve and maintain control. Consequently, a patient with apparently "mild" asthma may still be at substantial risk of severe or life-threatening exacerbations if control is poor, while a patient with historically severe disease may achieve excellent outcomes when optimally managed.[1,2] This shift has profound implications for clinical practice, emphasising the need for regular review and treatment adjustment rather than reliance on baseline severity alone.

Asthma control is defined by two domains: symptom control (daytime and night-time symptoms, reliever use, and activity limitation) and future risk (exacerbations, lung function decline, and medication side-effects).[1,6] According to the Global Initiative for Asthma (GINA), asthma is considered well-controlled if a patient has daytime symptoms ≤ 2 times a week, no night waking, and no activity limitations.[1,5]

The transition from severity-based to control-based management has therefore reframed asthma care from episodic symptom treatment to proactive, longitudinal disease management. By focusing on real-time assessment of control and risk, clinicians are better equipped to identify suboptimal management early, personalise therapy, and prevent avoidable morbidity. This evolution underpins modern asthma guidelines and forms the conceptual foundation for subsequent advances in assessment tools, self-management strategies, and multidisciplinary care models.

Diagnosis

A firm diagnosis of asthma is established by identifying characteristic symptom patterns and providing objective evidence of variable expiratory airflow limitation:[1,2]

1. **Clinical history:** Diagnosis is suggested if symptoms are variable, worse at night or early morning, and triggered by factors like exercise or allergens. A personal or family history of atopic disorders (eczema, allergic rhinitis) is supportive.
2. **Physical examination:** The most common sign is an expiratory wheeze on auscultation, though a normal exam does not exclude asthma due to its variable nature.
3. **Lung function testing:**
   - **Spirometry and reversibility:** This is the standard test. A significant response is defined as an increase in Forced Expiratory Volume in 1 second (FEV1) of > 12% and 200 mL after inhaling a bronchodilator.
   - **Peak expiratory flow (PEF):** A 20% improvement in PEF post-bronchodilator or a diurnal variation (morning vs. evening) of more than 10% over two weeks is diagnostic.
   - **Challenge tests:** For those with normal initial tests, a methacholine or exercise challenge test can identify airway hyperresponsiveness.

The perception and specialist gap

A primary barrier to achieving control is the discrepancy between patient perception and objective clinical status. In the multinational Asthma Insight and Management (AIM) survey, 81% of patients perceived their asthma as well-controlled, yet only 18% met objective criteria for control.[5] Many patients have "low expectations", accepting frequent symptoms and urgent care visits as an inevitable burden of the disease.[5,8]

This discordance extends to healthcare providers. Studies indicate that clinicians frequently overestimate asthma control and underestimate the impact of symptoms on a patient's quality of life.[9,10] In one study, specialists rated 54% of patients as "controlled" who were classified as "uncontrolled" by validated tools.[9]

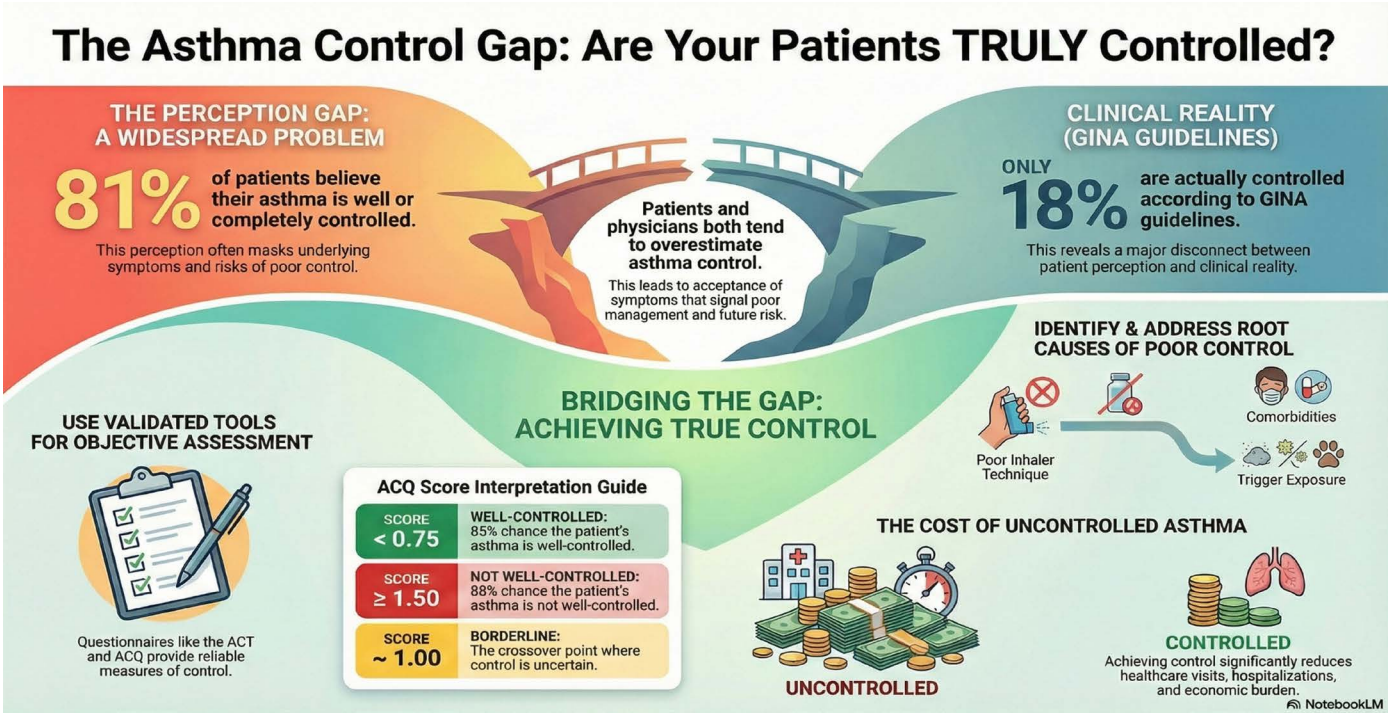

Figure 1: Infographic depicting the asthma control gap

Contributing factors to clinician overestimation include time constraints in clinical consultations, reliance on acute exacerbation history alone, and inadequate incorporation of patient-reported outcome measures into routine practice. Without systematic assessment, subtle but clinically meaningful indicators of poor control—such as nocturnal awakenings, increased reliever use, or activity avoidance—may go undetected.[9,10] This reinforces the need for structured, standardised approaches to asthma review that reduce subjective bias and align clinician and patient understanding of disease status.

The combined effect of patient underestimation and clinician overestimation of asthma control creates a substantial "control gap", in which persistent symptoms and future risk remain unaddressed despite regular healthcare contact. This gap underscores the critical importance of validated assessment tools, patient education, and shared decision-making to harmonise perceptions of control and guide appropriate treatment optimisation. Figure 1 illustrates this discrepancy between perceived and actual asthma control, emphasising the need for objective, routine evaluation in both specialist and primary care settings.[5,9] Figure 1 depicts an infographic on the asthma control gap.

Validated assessment tools

To minimise subjective bias and improve the accuracy of asthma evaluation, the routine use of validated, standardised assessment tools is strongly recommended in every clinical review.[2,9] Reliance on unstructured symptom enquiry alone has been shown to result in substantial misclassification of asthma control, contributing to both patient and clinician overestimation of disease stability. Incorporating validated questionnaires into routine practice provides an objective, reproducible framework for assessing symptom burden, functional impairment, and response to therapy over time.

The Asthma Control Test (ACT) is one of the most widely used patient-reported outcome measures in clinical and community settings. It consists of five simple questions assessing symptoms, reliever medication use, activity limitation, and overall perception of control over the preceding four weeks. Scores range from 5 to 25, with a score of 20 or higher indicating well-controlled asthma, scores between 16 and 19 reflecting partially controlled disease, and scores of 15 or lower indicating very poorly controlled asthma.[11,12] The ACT has been extensively validated across diverse populations and care settings, demonstrating strong correlation with lung function, exacerbation risk, and healthcare utilisation. Its simplicity and ease of administration make it particularly well suited for routine use in primary care and pharmacy-based asthma reviews.

The Asthma Control Questionnaire (ACQ) provides a complementary and more granular assessment of asthma control, incorporating symptom frequency, reliever use, and, in some versions, objective lung function measurements. A score of 0.75 or lower reliably indicates well-controlled asthma, while a score of 1.50 or higher signifies inadequately controlled disease requiring treatment adjustment.[10] The ACQ is especially valuable in specialist and research settings due to its sensitivity to change and ability to detect clinically meaningful differences in control over time.

Importantly, these tools not only facilitate accurate classification of asthma control but also enhance communication between patients and healthcare providers. By translating subjective experiences

Table II: Comparison of validated asthma control assessment tools[13]

Feature	Asthma Control Test (ACT)	Asthma Control Questionnaire (ACQ)
Primary purpose	Rapid assessment of asthma control in routine clinical practice	Detailed assessment of asthma control and treatment response
Number of items	5 questions	6–7 items (depending on version)
Assessment period	Previous 4 weeks	Previous 1 week
Domains assessed	Symptoms, reliever use, activity limitation, patient perception of control	Symptoms, reliever use, activity limitation, ± lung function
Scoring range	5–25	0–6
Interpretation of well-controlled asthma	≥ 20	≤ 0.75
Interpretation of poorly controlled asthma	≤ 15	≥ 1.50
Sensitivity to change	Moderate	High
Need for spirometry	No	Optional (in some versions)
Ease of use	Very simple; self-administered	More detailed; clinician-guided
Typical settings	Community pharmacy, primary care, routine reviews	Specialist clinics, research settings
Strengths	Quick, patient-friendly, suitable for frequent monitoring	Sensitive to small changes, strong validity for longitudinal follow-up
Limitations	Less granular; may miss subtle changes	Slightly longer; less practical in time-limited settings

into quantifiable scores, validated questionnaires support shared decision-making and enable timely treatment escalation or de-escalation in line with guideline recommendations. Regular use of ACT or ACQ has been shown to reduce the perception gap between patients and clinicians and to improve adherence to controller therapy through clearer demonstration of treatment benefit.[2,9]

Despite strong evidence supporting their use, validated assessment tools remain underutilised in routine practice. Integrating brief control questionnaires into standard clinical workflows, including pharmacy-led reviews and primary care consultations, represents a practical and cost-effective strategy to improve asthma outcomes. When used consistently alongside clinical judgement and objective measures, validated tools form a critical foundation for control-based asthma management and long-term risk reduction.[2,9] Table II indicates the comparison of validated asthma control assessment tools.

Barriers to optimal management

When asthma remains uncontrolled despite the availability of effective therapies, the underlying causes are almost always multifactorial and extend beyond pharmacological considerations alone. These barriers operate at patient, treatment, and environmental levels and often coexist, compounding their impact on disease control.

Treatment non-adherence

Suboptimal adherence to inhaled corticosteroid (ICS) therapy remains one of the most significant and persistent barriers to effective asthma management. Reported adherence rates commonly range from 22% to 63%, underscoring the scale of this challenge in routine practice.[4] Many patients adopt an "episodic" model of medication use, reserving preventer therapy for periods of symptomatic deterioration and discontinuing treatment once symptoms improve.[4,8] This behaviour, often referred to as "intelligent non-adherence", reflects deliberate decision-making rather than simple forgetfulness, driven by misconceptions about asthma chronicity, concerns about corticosteroid safety, and a preference for immediate symptom relief over long-term prevention.

The consequences of poor adherence are substantial, including increased symptom burden, higher exacerbation rates, and greater reliance on reliever medication. Importantly, non-adherence may go unrecognised by clinicians, leading to inappropriate escalation of therapy rather than targeted adherence support. Addressing adherence therefore requires not only education but also open, non-judgemental communication that acknowledges patient beliefs and treatment priorities.[4,8]

Incorrect inhaler technique

Even when prescribed appropriately and taken regularly, asthma medication may fail to achieve its intended effect if inhaler technique is incorrect. Studies indicate that up to 70–80% of patients use their inhaler devices incorrectly, significantly reducing pulmonary drug deposition.[4] Common errors include failure to exhale fully before inhalation, poor coordination between actuation and inhalation, insufficient inspiratory flow, and failure to hold breath after inhalation.[4,14] These errors are particularly prevalent among patients using multiple device types or those who have not received repeated technique reinforcement.

Incorrect inhaler technique is a modifiable barrier that responds well to targeted education and hands-on demonstration. However, technique frequently deteriorates over time, highlighting the need for regular reassessment rather than one-off instruction.

Failure to address inhaler technique may result in persistent symptoms despite apparent adherence, contributing to both patient frustration and clinician misinterpretation of treatment failure.[4,14]

The "Reverse Phenomenon"

Emerging evidence from South African populations has identified a paradoxical pattern of medication use termed the "reverse phenomenon", in which patients demonstrate improved adherence during periods of poor control or acute exacerbation but reduce or discontinue controller therapy once symptoms improve.[15] This behaviour reflects a reactive approach to asthma management, in which medication is viewed as a short-term remedy rather than a preventive strategy.

The reverse phenomenon underscores the limitations of symptom-driven care and reinforces the importance of patient education focused on the preventive role of controller therapy. Without sustained adherence during asymptomatic periods, patients remain vulnerable to future exacerbations and progressive loss of control. Recognition of this pattern is particularly important in settings with high disease burden and limited access to specialist follow-up.[15]

Comorbidities and environmental triggers

Asthma control is further complicated by the presence of comorbid conditions and ongoing exposure to environmental triggers. Allergic rhinitis, obesity, gastro-oesophageal reflux disease, and depression have all been shown to adversely affect asthma outcomes, increasing symptom burden and exacerbation risk.[1,16] Failure to identify and manage these comorbidities can result in persistent symptoms despite optimised asthma pharmacotherapy.

Environmental exposures remain a constant challenge, particularly in urban and low-resource settings. Tobacco smoke, indoor and outdoor air pollution, occupational irritants, and aeroallergens such as dust mites and pollen contribute to airway inflammation and symptom instability.[16,17] Effective asthma management therefore requires a holistic approach that extends beyond medication adjustment to include trigger identification, lifestyle modification, and environmental control strategies.

Management approach

Modern asthma management follows a **stepwise approach**, where treatment is progressively increased (stepped up) to achieve control and reduced (stepped down) once control is maintained for a prolonged period.[2,6] Table III indicates the stepwise approach to asthma therapy.

Important clinical considerations[17]

- **Assessment before escalation:** Before stepping up therapy, clinicians must address inhaler technique and patient adherence, as poor technique is a primary cause of lost control.
- **Phenotypic assessment:** Patients who remain uncontrolled at Step 4 should be reviewed by a specialist for phenotypic assessment (e.g. evaluating eosinophils and IgE levels) to determine eligibility for biologic therapies.
- **Biologic therapies:** Targeted treatments such as Anti-IgE, Anti-IL-5/5r, or Anti-IL-4r may be considered in Step 5 for patients uncontrolled on standard inhaled therapies.
- **Bronchial thermoplasty:** This procedure may be considered in Step 5 at specialist referral centres for severe cases unresponsive to medical treatment.
- **Reliever choice:** The use of an ICS-formoterol combination for acute symptom relief is preferred over SABA alone, especially in patients who are not on long-term maintenance therapy.

Achieving control requires more than medication; it necessitates Therapeutic Patient Education (TPE), correct inhaler technique (using a spacer), and a written asthma action plan.

Asthma medications are broadly categorised based on their clinical role—controllers for long-term maintenance and relievers for acute symptom management—targeting the three primary airway changes: inflammation/swelling, excess mucus production, and muscle constriction.[17]

Inhaled Corticosteroids (ICS)

Considered the cornerstone and foundation of asthma treatment, ICS are the most effective long-term controllers.[2]

- **Mechanism of action:** They work by reducing airway inflammation and swelling, which in turn decreases the risk of

Table III: Stepwise approach to asthma therapy[1,2,4]

Step	Preferred Controller and Reliever Treatment	Alternative Treatment Options
Steps 1 and 2	**As-needed low-dose ICS-formoterol**.	**Option A:** As-needed SABA plus a separate low-dose ICS taken on each occasion the SABA is used. **Option B:** Regular daily low-dose ICS with as-needed SABA as a reliever.
Step 3	**Low-dose ICS-formoterol** used as both regular maintenance and for acute relief (MART).	**Option A:** Regular low-dose ICS-LABA maintenance with as-needed SABA reliever. **Option B:** Regular medium-dose ICS maintenance with as-needed SABA reliever.
Step 4	**Medium-dose ICS-formoterol** used as regular maintenance and low-dose ICS-formoterol as a reliever (MART).	**Option A:** Regular medium-dose ICS-LABA maintenance with as-needed SABA reliever. **Option B:** Consider adding a LAMA, LTRA, or sustained-release theophylline to the existing regimen.
Step 5	**High-dose ICS-formoterol** maintenance with low-dose ICS-formoterol reliever, with or without a separate LAMA.	**Option A:** High-dose ICS-LABA with as-needed SABA. **Option B:** Medium- or high-dose triple therapy (ICS-LABA-LAMA) with as-needed SABA. **Additional:** Consider adding azithromycin, LTRA, theophylline, or low-dose oral corticosteroids.

severe attacks.[17] On a molecular level, they inhibit inflammatory cytokines; however, their efficacy can be reduced in active smokers due to decreased histone deacetylase 2 activity, which is necessary for the anti-inflammatory response of steroids.[7,19]

- **Examples:** Budesonide, Fluticasone, and Beclomethasone.

Beta-2 Agonists (SABA and LABA)

These drugs act as bronchodilators to address bronchoconstriction (muscle tightening).[17]

- **Short-Acting Beta-2 Agonists (SABA):** These are reliever medications used for rapid relief of sudden symptoms. They provide quick relaxation of the smooth muscles around the airways to improve airflow.[19]
  - *Example:* Salbutamol.
- **Long-Acting Beta-2 Agonists (LABA):** These have a 12-to-24-hour duration and are used for maintenance.[2] They should never be used as monotherapy; they must be paired with an ICS to address the underlying inflammation.[1]
  - *Example:* Salmeterol and Formoterol. Notably, Formoterol has a fast onset of action, allowing it to be used in some regimens as both a controller and a reliever (MART).

Long-Acting Muscarinic Antagonists (LAMA)

LAMAs are used as adjunctive controller therapies for patients whose symptoms remain uncontrolled on ICS-LABA combinations.

- **Mechanism of action:** They work by blocking muscarinic receptors, which inhibits vagally mediated bronchoconstriction, effectively keeping the airways open for extended periods.[2]
  - *Example:* Tiotropium.

Leukotriene Receptor Antagonists (LTRA)

LTRAs are oral medications used as third- or fourth-line controller agents.

- **Mechanism of action:** They inhibit the leukotriene pathway, a specific chemical signalling route that drives airway inflammation and mucus production.[2]
  - *Example:* Montelukast.

Biologic therapies

Biologics are reserved for severe, refractory asthma that does not respond to traditional high-dose inhalers.[19]

- **Mechanism of action:** These monoclonal antibodies target specific inflammatory pathways by blocking cells or proteins (cytokines) like IgE, IL-4, IL-5, or IL-13 that trigger the immune system's overreaction in the lungs.[19]
  - *Examples:* Omalizumab (anti-IgE), Mepolizumab (anti-IL-5), and Dupilumab (anti-IL-4r).

Advancing management strategies

The concept of achieving "total asthma control" was most clearly demonstrated in the landmark Gaining Optimal Asthma ControL (GOAL) study, which showed that a substantially higher proportion of patients could achieve guideline-defined control with combination therapy using inhaled corticosteroids (ICS) and long-acting β_2-agonists (LABAs) compared with ICS monotherapy.[18] This study provided pivotal evidence that persistent symptoms and exacerbation risk often reflect insufficient anti-inflammatory treatment rather than intrinsic disease refractoriness, reinforcing the need for proactive treatment optimisation in patients with ongoing impairment.

Building on these findings, modern asthma management strategies increasingly emphasise personalised, control-based approaches that integrate pharmacological innovation with education, monitoring, and multidisciplinary care.

Maintenance and Reliever Therapy (MART)

Maintenance and reliever therapy represents a significant evolution in asthma pharmacotherapy by simplifying treatment regimens and aligning symptom relief with anti-inflammatory protection. This strategy employs a single inhaler containing ICS and formoterol for both daily maintenance and as-needed symptom relief.[2,6] By delivering additional corticosteroid doses at times of symptom worsening, MART reduces reliance on short-acting β_2-agonists and addresses airway inflammation early in the course of deterioration.

Clinical evidence demonstrates that MART reduces severe exacerbations, emergency healthcare utilisation, and overall corticosteroid exposure compared with fixed-dose maintenance regimens with separate reliever inhalers.[2,6] Importantly, the simplicity of a single-inhaler approach improves adherence and reduces patient confusion, making MART particularly advantageous in real-world settings where treatment complexity often undermines control.

Therapeutic Patient Education (TPE)

Therapeutic patient education is a central pillar of contemporary asthma management and a key enabler of sustained disease control. Structured education programmes focus on improving patient understanding of asthma pathophysiology, the preventive role of controller therapy, correct inhaler technique, trigger identification, and early recognition of worsening symptoms.[1,12]

Multiple studies have shown that TPE significantly improves Asthma Control Test scores, medication adherence, inhaler technique, and health-related quality of life while reducing exacerbation frequency and unscheduled healthcare visits.[1,12] Importantly, education is most effective when delivered as an ongoing process rather than a one-time intervention, reinforcing skills and adapting information to changing disease patterns and patient needs.

Digital solutions and monitoring technologies

Digital health technologies are increasingly being integrated into asthma care to support adherence, monitoring, and personalised

feedback. Electronic monitoring devices (EMDs) and "smart inhalers" objectively record medication use, inhalation technique, and reliever frequency, providing valuable insights into real-world treatment patterns.[4]

These technologies help identify non-adherence, inhaler misuse, and excessive reliever reliance—issues that are frequently underestimated during routine clinical encounters. When combined with clinician review and patient education, digital monitoring has been shown to improve adherence, reduce exacerbations, and facilitate earlier intervention before loss of control becomes clinically significant.[4] Digital solutions therefore represent a promising adjunct to traditional asthma management, particularly in patients with recurrent exacerbations or inconsistent treatment use.

Biologic therapies for severe asthma

For a minority of patients—estimated at 5–10%—asthma remains poorly controlled despite optimised inhaled therapy, adherence support, and trigger management. In these cases, biologic therapies targeting specific inflammatory pathways offer an important therapeutic advance.[2,7] Monoclonal antibodies directed against immunoglobulin E (anti-IgE) or interleukin-5 and its receptor (anti-IL-5/IL-5R) have demonstrated significant reductions in exacerbation rates, oral corticosteroid use, and symptom burden in patients with severe, type 2 inflammatory asthma.

The introduction of biologics has shifted the management of severe asthma toward a precision medicine approach, in which treatment is guided by clinical phenotype and biomarker profiles. While cost and access remain limiting factors, particularly in low- and middle-income settings, biologic therapies represent a transformative option for selected patients when integrated into specialist-led care pathways.[2,7]

Role of patient empowerment and self-management

Patient empowerment is increasingly recognised as central to chronic disease management. Self-monitoring tools, such as symptom checklists and peak flow diaries, foster shared decision-making and enhance treatment adherence. Integrating self-assessment into routine care encourages proactive behaviour, reduces dependence on emergency services, and aligns with preventative healthcare strategies.

A key component of self-management is patient understanding of asthma as a chronic inflammatory condition rather than an intermittent, symptom-driven illness. Misconceptions about the role of controller therapy remain widespread, with many patients perceiving inhaled corticosteroids as optional or necessary only during symptomatic periods.[8] This misunderstanding contributes directly to poor adherence and preventable loss of control. Therapeutic patient education programmes have consistently demonstrated improvements in medication adherence, symptom recognition, inhaler technique, and health-related quality of life, reinforcing the central role of education in empowering patients to manage their disease effectively.[12]

Self-monitoring tools play a pivotal role in translating empowerment into practical action. Symptom diaries, peak expiratory flow monitoring, validated control questionnaires, and written asthma action plans provide patients with objective feedback on disease status and clear guidance on when and how to adjust treatment or seek medical review. These tools reduce reliance on subjective symptom perception alone and promote shared decision-making between patients and healthcare providers. Importantly, regular self-assessment has been shown to reduce emergency healthcare utilisation and improve long-term outcomes when integrated into routine care.[6]

Digital health innovations are increasingly enhancing self-management by providing real-time feedback and behavioural reinforcement. Electronic monitoring devices and smart inhalers can identify patterns of non-adherence, incorrect technique, and over-reliance on reliever medication, enabling earlier and more targeted interventions.[4] When combined with patient education, these technologies shift asthma care from a reactive model toward proactive, preventative management.

Empowerment also extends beyond medication use to encompass trigger avoidance, lifestyle modification, and management of comorbid conditions. Patients who understand the relationship between environmental exposures—such as tobacco smoke, air pollution, allergens, and occupational irritants—and asthma control are more likely to adopt protective behaviours.[1,7] Similarly, addressing comorbidities such as allergic rhinitis, obesity, and psychological distress as part of a holistic self-management strategy further enhances disease control and quality of life.[6]

Ultimately, patient empowerment transforms asthma management from clinician-directed prescribing to a collaborative partnership in which patients assume an active role in maintaining control. By fostering health literacy, self-efficacy, and routine self-assessment, empowerment-based approaches reduce preventable exacerbations, optimise treatment effectiveness, and align asthma care with its overarching goal: enabling individuals to live normal, unrestricted lives despite a chronic respiratory condition.[6,8]

Role of the pharmacist in optimising asthma control

Pharmacists are uniquely positioned to play a pivotal role in improving asthma control due to their accessibility, frequent patient contact, and expertise in medicines management. In many healthcare systems, particularly in primary care and community settings, pharmacists represent the most regularly consulted healthcare professionals for patients with asthma. This places them at the frontline of identifying poor control, reinforcing appropriate therapy, and preventing avoidable exacerbations.[6,8]

One of the most significant contributions of pharmacists lies in the assessment and optimisation of medication use. Poor

adherence to inhaled corticosteroid therapy remains a leading cause of uncontrolled asthma, often driven by misconceptions, fear of adverse effects, or misunderstanding of the preventive role of controller medication.[4,8] Pharmacists are well positioned to address these barriers through targeted counselling, clarification of treatment goals, and reinforcement of the distinction between reliever and preventer therapy. Evidence consistently demonstrates that pharmacist-led interventions improve adherence, symptom control, and quality of life in patients with asthma.[12]

Inhaler technique assessment and correction is another critical area where pharmacists have a measurable impact. Incorrect inhaler technique affects the majority of patients and significantly compromises drug delivery and clinical response.[4,14] Routine, hands-on inhaler technique review by pharmacists—supported by device demonstration and teach-back methods—has been shown to result in sustained improvements in technique and asthma outcomes. Given the growing diversity of inhaler devices, pharmacist expertise is essential to ensure correct device selection and patient-specific education.

Pharmacists also play an important role in structured asthma control assessment. The routine use of validated tools such as the Asthma Control Test during pharmacy encounters enables early identification of poorly controlled asthma and facilitates timely referral for medical review.[2,9] By embedding brief control assessments into routine dispensing workflows, pharmacists can help bridge the gap between guideline recommendations and real-world practice.

Beyond medication-focused interventions, pharmacists contribute to broader self-management support by reinforcing written asthma action plans, advising on trigger avoidance, and promoting smoking cessation and vaccination where appropriate. Education delivered by pharmacists has been shown to enhance patient confidence, self-efficacy, and engagement in long-term asthma management.[6,8] This holistic approach aligns with contemporary models of chronic disease care that emphasise prevention, patient empowerment, and interdisciplinary collaboration.

In the context of emerging management strategies, pharmacists are increasingly involved in supporting maintenance and reliever therapy regimens, digital adherence technologies, and biologic therapies for severe asthma.[2,4] Their role in monitoring treatment response, identifying adverse effects, and supporting persistence with complex therapies further underscores their value within the multidisciplinary asthma care team.

Overall, pharmacists are integral to achieving and sustaining asthma control. Through medication optimisation, inhaler technique training, structured assessment, and patient education, pharmacists help translate guideline-directed care into everyday practice. Strengthening pharmacist involvement in asthma management represents a practical and cost-effective strategy to reduce preventable morbidity, improve quality of life, and move closer to the goal of well-managed asthma for all patients.[6,8]

Conclusion

Asthma control is not merely the absence of severe attacks but the restoration of a normal, active life. Success requires a collaborative partnership where clinicians use validated tools to identify "treatable traits" and patients are empowered through education to manage their chronic condition rather than reacting only to acute symptoms.[6,8]

This article highlights that persistent symptoms commonly arise from poor adherence to controller therapy, incorrect inhaler technique, unrecognised environmental triggers, unmanaged comorbidities, and discordance between patient and clinician perceptions of disease control. The transition to a control-based management paradigm has reinforced the importance of regular, objective assessment using validated tools to identify loss of control early and guide timely treatment adjustments.[1,6]

Advances in asthma management—including maintenance and reliever therapy, structured therapeutic patient education, digital adherence technologies, and biologic therapies for selected patients with severe disease—offer significant opportunities

Figure 2: Managing asthma analogy

to close the gap between guideline recommendations and real-world outcomes.[2,6,12,18] However, the effectiveness of these interventions depends on their integration into a patient-centred care model that emphasises continuous monitoring and shared decision-making.

Ultimately, achieving well-managed asthma requires a sustained partnership between healthcare providers and patients, in which individuals are empowered to understand their condition, recognise early signs of deterioration, and engage proactively in long-term management rather than reacting only to acute symptoms.[6,8] Embedding structured assessment tools and self-management strategies into routine care is essential to reducing preventable morbidity and healthcare utilisation and to achieving the fundamental goal of asthma management: enabling patients to live full, active lives across the entire disease spectrum.

Analogy: Managing asthma is like sailing a boat. If you only grab the rudder when a storm hits (an exacerbation), you are at constant risk of capsizing. True management means constantly adjusting the sails (preventer medication) to account for the shifting winds (triggers), ensuring a smooth journey even when the horizon looks clear. Figure 2 depicts this analogy.

ORCID

RM Moosa-Battey https://orcid.org/0000-0002-1953-143X

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