WHITEPAPER

Improving Outcomes for People with Asthma:

Challenges & A Call to Action

AstraZeneca

NCQA
Measuring quality.
Improving health care.

ncqa.org

Contents

This white paper was produced with financial support from AstraZeneca Pharmaceuticals LP. NCQA does not endorse any AstraZeneca Pharmaceuticals LP products or services.

Executive Summary

Asthma is a complex, chronic disease that affects approximately 24 million people in the United States (U.S.) today. Despite decades of advances in respiratory care that can help make the condition manageable, patients with asthma accounted for nearly one million emergency department visits in 2020 and approximately 95,000 inpatient hospital stays. In 2021, 6.5 percent of children and 8 percent of adults in the U.S. had asthma, and the disease was responsible for 3,517 deaths.[1] The health consequences of uncontrolled asthma are expected to amount to 15.46 million quality adjusted life-years lost and $300.6 billion in direct costs between 2019 and 2038, with per capita costs ranging from $2,209 to $6,132.[2] These figures have a disparate impact across racial groups, socioeconomic status and area of residence in terms of disease burden, rates of exacerbation and access to adequate treatment.[3]

There is a critical gap between best practices for asthma care and patients' reality. The National Committee for Quality Assurance (NCQA) recognizes this gap, and sought a diverse range of expertise to better understand the factors that may enable or inhibit high-quality care for chronic conditions such as asthma. With support from AstraZeneca Pharmaceuticals, LP, in May 2024, NCQA convened an expert panel of clinicians, public/community health experts and patient advocates—the *Asthma Management & Education Roundtable*—to advance this goal. Presented with hypothetical patients with asthma, roundtable participants discussed the components of real-world asthma treatment pathways that are aligned and misaligned with clinical guidelines for high-quality care. The result was a robust conversation on the practicalities of asthma management and opportunities for improving asthma outcomes. This paper is intended to reflect and build on that conversation. The sections that follow synthesize roundtable proceedings to highlight the key drivers of good asthma outcomes that emerged from the discussion, and the policy/societal contexts within which they must operate.

The first driver of positive asthma outcomes is access to appropriate medical care. For patients to receive the comprehensive range of services that drive better asthma outcomes, robust and equitable insurance coverage must exist alongside a workforce trained to deliver these services. This enables the second driver of positive outcomes: clinical care aligned with a quality framework and strong evidence base. Assuming an adequate workforce is accessible by patients experiencing asthma, the health system must provide incentives and resources that enable and facilitate provider adherence to best practices for asthma management. To do so, health system leaders will need to engage with and address the systemic issues of U.S. health system fragmentation that make it challenging for providers to deliver high-quality asthma management services across a patient's lifespan.

Both concepts outlined above must be accompanied by a third and final driver: patient-centeredness. For the clinical guidelines associated with asthma care to produce consistent, optimal and equitable results, their implementation must be informed by patients' reality. Although health care systems and providers—not patients—are ultimately responsible for producing high-quality outcomes, patient self-management strategies and education can leverage individual preferences and capabilities to augment the care delivered.

The sections that follow discuss each driver described by roundtable participants, including the major policy domains of health equity and environmental health within which the clinical realities of asthma care exist. Even if optimized, the potential impact of each driver described is inherently limited (and/or confounded) by the societal drivers of respiratory health. In adhering to the tenor of the roundtable conversation, this paper concludes with a call to action that recognizes the necessary clinical *and* policy work that must be undertaken to improve asthma outcomes on a systemic level. It is the hope of both NCQA and those involved with the roundtable that these actions can be leveraged to bridge the gap between the clinical ideals for asthma care and the disparate lived experiences and outcomes that patients too often face.

Introduction

In May 2024, NCQA convened the *Asthma Management & Education Roundtable* to discuss the realities of asthma care in the U.S. and the policy and clinical interventions that may improve them. This convening—developed with support from AstraZeneca Pharmaceuticals, LP—had three objectives:

Promote a paradigm shift to guideline-directed therapies for asthma control assessment and management.

Identify opportunities to support patients and clinicians with self-management action planning.

Recommend a call to action, including quality accountability approaches such as measures or standards.

NCQA facilitated a robust conversation among roundtable participants on the gaps between best practices for evidence-based asthma care and the clinical realities patients and clinicians face. This paper synthesizes that conversation to present expert perspectives on barriers and challenges to delivering optimal asthma care, and levers and opportunities that hold potential for improving the care and experience of people with asthma.

The need for this work is clear. Clinical practice guidelines have repeatedly identified evidence-based best practices for asthma diagnosis, assessment, treatment and preventive control.[4,5] Still, of the 26.8 million individuals diagnosed with asthma in the U.S., 11.3 million (42.4%) had at least one asthma exacerbation in 2022. Young children bear a disproportionate burden: 67.9% of individuals ages 0–5 diagnosed with asthma experienced at least one asthma exacerbation in 2022.[6] These exacerbations can greatly interfere with daily activities and health-related quality of life (HRQL).[7,8] In 2018, asthma caused 7.9 million missed school days for children aged 5–17, 10.9 million missed workdays for employed adults and 62.8 million missed days of housework for unemployed adults. In 2020, asthma caused 94,560 hospitalizations and over 986,000 emergency department (ED) visits. In 2021, 3,517 people died of asthma in the U.S., with the highest rates experienced by women, individuals in Black racial categories and older adults. Asthma mortality in the U.S. is estimated to account for $29 billion per year in economic costs. Combined with the costs of asthma-driven health care utilization ($50.3 billion) and missed days of school and work ($3 billion), the total economic costs associated with asthma amount to $81.9 billion per year.[6]

That these outcomes persist along with high levels of asthma-related acute care utilization demonstrates both the failure of health care to deliver an adequate level of preventive care for asthma and the gaps between best practices for asthma care and clinical realities.[9,10] Improving these statistics involves preventive care and precise pharmaceutical interventions that align with clinical guidelines for asthma control, driven by a quality and accountability framework to support and incentivize providers.[9–15] Health system leaders must identify and overcome the factors that inhibit best practice implementation and leverage innovative approaches to meet patient needs. Care delivery solutions must be fundamentally grounded in the social, physical and organizational realities patients and providers face.

> **Roundtable Participant:** *"Medications are absolutely necessary, but unless we address the root causes of asthma using hygiene theories and interventions for social determinants, it's not going to matter."*

While this paper does not claim to present a comprehensive list of the social, physical and organizational realities that patients and providers face or of the factors that inhibit the implementation of best practices, it has been informed by a diverse group of experts with real-world experience in asthma care. The sections that follow summarize their insights to provide a north star for leaders willing to improve the current state of asthma care in the U.S.

Methodology

On May 8, 2024, NCQA hosted an in-person roundtable discussion to facilitate dialogue among experts in health care quality measurement, environmental health, patient partnership, clinical pharmacology, family medicine, pulmonology, allergy/immunology, public/community health, health equity and pediatric care. Participants were selected from a diverse array of organization types, roles, geographies and interests to provide in-depth information about challenges and barriers to asthma care in today's health care delivery system and to brainstorm possible solutions and opportunities to improve this care. Participants were asked to consider a broad array of barriers—societal, clinical, personal—that affect people with asthma across their lifespans, as well as the complex issues clinicians face as they attempt to implement evidence-based care and best practices for asthma management.

After a plenary reception, NCQA staff facilitated a robust discussion between participants on the real-world manifestations and implications of best practices for asthma care. The goal of the discussion was to identify areas of consensus about the circumstances in which current best practices and guidelines are difficult to implement. Solution avenues would identify opportunities to improve access and insurance coverage, maximize provider awareness of evidence-based guidelines for asthma management and inform quality accountability approaches such as measures, standards and patient-centered interventions with the aim of improving asthma outcomes and patient HRQL.

To ensure the conversation focused on realistic clinical obstacles and solutions, NCQA asked participants to ground their comments in the context of clinical scenarios for hypothetical patients. The first patient was a 10-year-old Black individual living in Detroit, Michigan, with known dust and pollen allergies, who had monthly symptom flares and often ended up in the ED or hospital. The second was a 60-year-old White individual with a possible history of asthma as a child, but who also smoked for about 20 years and has hypertension, stable coronary artery disease and depression. Throughout the discussion, panelists built on these patient examples to illustrate high-quality versus poor quality care and discuss differences in asthma diagnosis, assessment for both control and exacerbation risk and management in different age groups.

In discussing the discrepancies between the optimal clinical workflows supported by best practice recommendations and the suboptimal workflows that often exist in the real world, participants described their experiences with both challenging components of asthma care and potential levers for enhancing clinician practice and patient support. After hours of robust discussion, participants formed two workgroups, each developing a list of actionable approaches based on the challenges and levers identified. The resulting ideas form the crux of this paper, and are detailed in the sections that follow.

Conceptual Framework

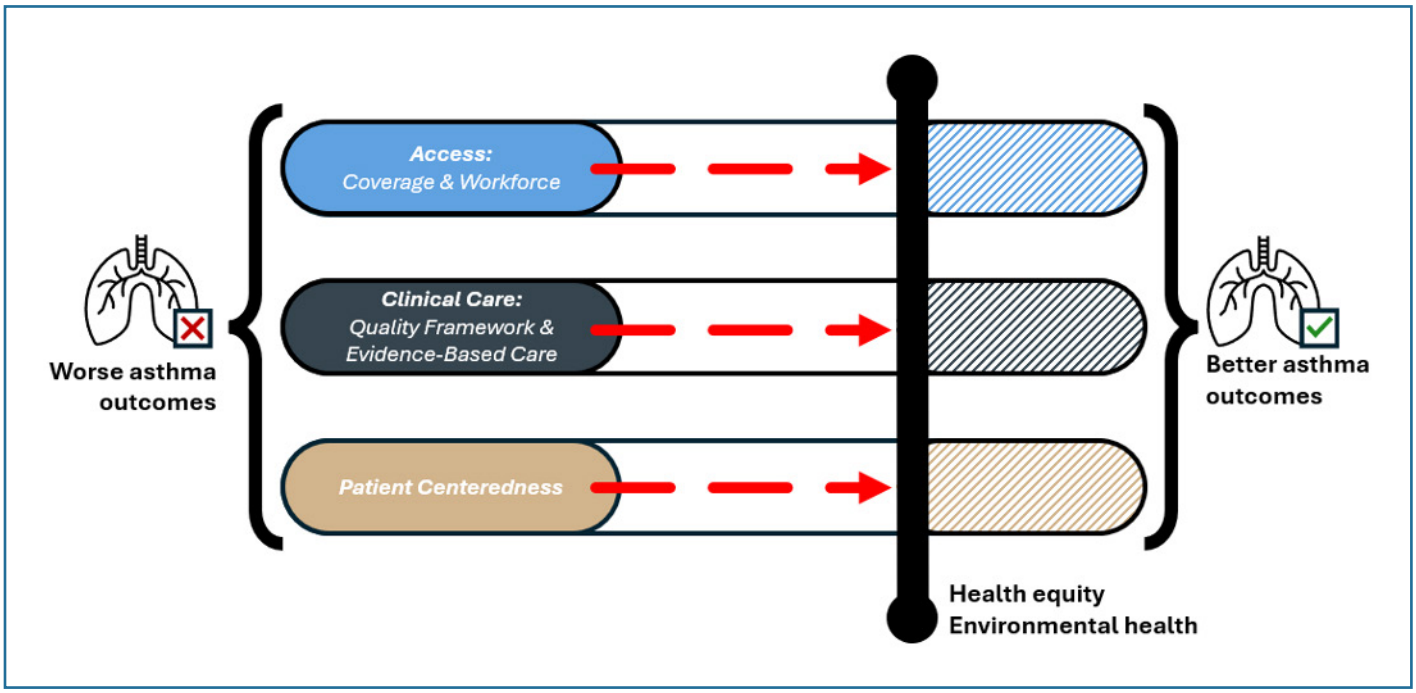
According to the Global Initiative for Asthma (GINA) 2024 Global Strategy for Asthma Management and Prevention, asthma can be defined as follows:

> *"A heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms, such as wheeze, shortness of breath, chest tightness and cough, that vary over time and in intensity, together with variable expiratory airflow limitation. One or more symptoms (e.g., cough) may predominate. Airflow limitation may later become persistent. Asthma is usually associated with airway hyperresponsiveness and airway inflammation, but these are not necessary or sufficient to make the diagnosis."*
>
> *-2024 Global Strategy for Asthma Management and Prevention*

Roundtable participants reached consensus on three major changes needed to improve asthma care: insurance coverage and delivery system access must improve; the fundamental asthma clinical care paradigm must change to guideline-directed medical therapies and evidence-based care; patients and families must be at the center of asthma care. The panel identified major issues and barriers to good care and put forth a call to action for key levers and interventions that can improve care for people with asthma.

Asthma roundtable participants also identified policy and societal barriers and concerns, particularly related to social determinants of health, care inequities and environmental disparities in housing and air quality, all of which influence asthma control, exacerbation triggers and management in today's health care delivery system.[16–20] Although participants spent most of their time probing clinical issues, they strongly acknowledged the role of social and policy problems in influencing asthma outcomes. Figure 1 captures the issues discussed by panel members.

Figure 1: Conceptual Framework



A major driver of asthma outcomes is access to care, based on both insurance coverage and an adequate and appropriate clinical workforce. Two patient scenarios based on a pediatric patient, described in the boxes below, illustrate these issues. In the first scenario, the patient has adequate insurance coverage for both medical care and medications, and primary care is available in her area. This access allows her to have a continuing care clinician, evidence based medical therapy, control of symptoms and exacerbations, access to a specialist and self-management support for her and her parents.

Patient Scenario 1: "Erika"— Good Outcomes

Erika is a 10-year-old Black individual with asthma. Despite both parents working full-time, her family struggles with costs of living, and rents a home near a network of highways in Detroit, Michigan. Her father works in an auto parts factory and has health insurance. For several years, Erika had intermittent shortness of breath and cough during the spring/pollen season, during some sports activities and when she had an upper respiratory infection. She was able to establish care at a nearby pediatrics practice, where her mild episodic symptoms were quickly controlled. When she had her first major exacerbation, she had a pulmonary consultation. Her pediatrician has educated both Erika and her parents about how to monitor asthma symptoms and manage triggers. She uses a peak flow meter to monitor her health and visits her pediatrician when indicated by her asthma action plan.

Erika uses a low-dose inhaled corticosteroid (ICS) daily and steps up to combination therapy with an ICS-long-acting beta agonist (ICS-LABA) when exposed to triggers. She has a short-acting beta agonist (SABA) prescription, and she and her parents have been educated about how to use it, along with her ICS, for surprise exacerbations. Her pediatrician can rapidly consult with the pulmonologist if more aggressive stepped therapy or biological agents need to be considered. At present, Erika is generally symptom-free, with rare, mild asthma exacerbations, and has never had to utilize acute care for her asthma. She routinely participates in school sports and outdoor activities.

In scenario two, despite Medicaid insurance, the patient does not have access to primary care, which could be due to inadequacies in the coverage available, and/or the lack of a local pediatric workforce. The patient's asthma care consists of addressing asthma exacerbations rather than preventing them. In low access situations, patients can come to believe that symptom exacerbations leading to acute care events are inevitable.[21,22] With better access, these events can be avoided.

Patient Scenario 2: "Erika"— Poor Outcomes

Erika is a 10-year-old Black individual with asthma. Despite both parents working full-time, they do not have health insurance through employers, and Erika has Medicaid. Her family struggles with costs of living, and rents a home near a network of highways in Detroit, Michigan. While she often experiences episodic mild wheezing, shortness of breath and cough, Erika's symptoms worsen during the spring, when exercising and when experiencing an upper respiratory infection. Erika does not have a regular pediatrician and sees a clinician in urgent care for asthma flares. Erika and her parents understand that she has asthma, but do not have any insight into symptom monitoring, managing triggers or ideal outcomes for her disease. They tell Erika that she will have to "learn to live with this," and they prevent exacerbations by prohibiting her from participating in school sports and outdoor activities.

At urgent care visits, Erika was prescribed a SABA and an oral corticosteroid (OCS) for asthma emergencies, and she uses them when her wheeze is bothersome. She has 2–4 significant asthma exacerbations per year, depending on dust and pollen allergens and whether she contracts an upper respiratory infection. She manages these by taking her SABA and OCS prescriptions and utilizing acute care when needed.

A second driver is a quality and accountability framework to encourage evidence-based clinical care and to support busy providers with easily accessible, evidence-based guidance. The U.S. healthcare delivery system reflects a predominantly fee-for-service based reimbursement structure based on episodic and fragmented care and provides insufficient support for chronic disease management. Few care standards have been established for asthma, and existing quality metrics are outdated and inconsistent with current guidelines and research on asthma care quality gaps.

Clinicians managing asthma patients in a continuing care setting, which for most patients is primary care, but for complex and high acuity patients, may be pulmonary or allergy specialty care, need to have the time, resources and incentives to engage in best practices for asthma management.[4,5] Unfortunately, in the absence of resources and time, evidence-based practices and guideline-directed medical therapies may sometimes be misinterpreted or not followed. Clinicians may overestimate asthma control or fail to distinguish between symptom control and exacerbation risk. Up-to-date quality measures and standards are not available to steer practice, provide a framework for quality improvement activities and increase resources through accountability driven, value-based care. Practices need such tools and financing to deliver appropriate care, including reimbursement for spirometry and patient self-management support, access to guidelines and time to implement evidenced-based interventions. Primary care clinicians need access to medical specialists such as pulmonologists and allergists, as well as social resources for patients who need additional services.[23–26] In the urgent and acute care settings, the orientations, incentives and knowledge bases of clinicians are different, and often only the acute problems associated with asthma are addressed. This contributes in part to care overuse of OCSs and SABAs.[27–29]

Roundtable Participant: *"We need to simplify what we are doing for young children with asthma. Everyone, including the experts and the guidelines, are all over the place: it's made it very difficult for clinicians to figure out what the right message is."*

The third driver is patient-centeredness. In Patient Scenario 1, the pediatrician educated both the patient and her parents on asthma symptomology and control. The patient was able to obtain evidence-based medications, and the practice and patient had access to specialty care when needed. The practice had tools to enable patient self-management and coaching, leading to patient and family engagement in asthma care, a culture of asthma wellness and an expectation of symptom control and minimal exacerbations.

The sections that follow describe barriers and key recommendations from roundtable participants on how our health care system can improve access, enable providers to align with best practices, provide relevant incentives and resources and empower patients to better understand, advocate for and self-manage their asthma. As policy makers and advocates work to improve health equity and environmental health, their north star must be to improve the outcomes and HRQL of individuals experiencing asthma in the U.S.

Access: Coverage & Workforce

Optimal care and equitable outcomes for patients with asthma are driven by appropriate diagnostics, assessments and treatment. After accurately assessing the severity, persistence and control of an individual's symptoms and risks of exacerbations/adverse outcomes, consistent medication regimens routinely tailored by clinical input and supported by patient self-management are the most effective tools for preventing asthma exacerbations and improving patients' HRQL.[13,14,30–32] Leveraging these strategies requires access to health care, defined by the National Academy of Medicine as the "timely use of personal health services to achieve the best possible health outcomes."[20] Many people experiencing asthma face barriers to health care access, and roundtable participants noted that two contributing factors are inadequate health insurance coverage and gaps in relevant domains of the health care workforce.

HEALTH CARE COVERAGE

In 2023, the Commonwealth Fund conducted the Health Care Affordability Survey, designed to assess the dynamics of health care affordability and use in the U.S. The results illustrate the current state of "adequate" health care coverage experienced by patients with asthma. Of U.S. adults covered by a health plan administered by their employer, 43% indicated that affording health care is "very or somewhat difficult," and 54% reported experiencing negative health outcomes due to cost-driven gaps in care. These statistics worsen for individuals without employer-administered health care coverage. 57% of individuals with marketplace/individual coverage, 45% of individuals with Medicaid and 51% of individuals with Medicare indicated that affording health care is "very or somewhat difficult." Additionally, 61% of individuals with marketplace coverage, 60% of individuals with Medicaid and 63% of individuals with Medicare reported experiencing negative health outcomes due to cost-driven gaps in care.[33]

In the absence of adequate coverage, patients are less likely to receive preventive services and appropriate diagnoses, assessments and treatments. Asthma—particularly pediatric asthma—is often associated with lower socioeconomic status, likely stemming from increased exposure to pollutants and social stressors in the areas individuals reside.[34–37] Patients in this context often experience transportation barriers, which can limit access to follow-up appointments and specialty services such as pulmonology, especially in urban and rural areas.[20,28,35,38,39] Referral requirements, prior authorization practices and inadequate coverage for specialty services can pose further barriers and apply to patients across all socioeconomic statuses.[40] Additionally, most payer policies have not updated their coverage to align with the latest guideline recommended approaches for asthma treatment.[41,42] While services aligned with best practices for asthma care are available within the health care system, they are often realistically inaccessible for large swaths of the population.[9,10,39,43]

WORKFORCE GAPS

The presence of a health care workforce empowered to meet the needs of patient populations is a fundamental prerequisite for health care access.[44–46] Roundtable participants felt this was particularly relevant to asthma outcomes given the level of health care utilization needed to prevent asthma exacerbations. Per current guidelines, asthma care should primarily be conducted by primary care clinicians, with pulmonologists and allergists providing specialty services as relevant.[4,5] Today, the gap between the supply and demand of primary care providers is estimated to amount to as many as 29,700 providers. By 2036, this gap is estimated to widen to as many as 40,400 providers. For specialists such as pulmonologists and allergists, this gap is smaller, but still significant: estimated to be as high as 6,100 providers in 2024.[47] These figures were calculated, given the current status quo of significant health care utilization disparities, based on insurance coverage, geography and race. Success in achieving a better state of health equity in the U.S. will only widen these gaps, requiring the health care workforce to grow in tandem with parallel efforts to improve health equity.[20,39,44,48]

The roundtable's makeup of pulmonologists, primary care clinicians, public health professionals, patient advocates, researchers and pharmacology experts yielded a unique set of ideas that can help to address these shortages. Although it is clear that more primary care clinicians, pulmonologists and allergists must be trained in order to meet the nation's asthma needs, many non-physician health professionals are underutilized, considering their asthma-relevant expertise. **Given the significant/persistent medical workforce needs of the U.S. and the potential these professions hold for improving health outcomes for patients experiencing asthma, roundtable participants recommended that leaders in health care delivery, policy and payment consider appropriate financial support for professionals in the following groups:**

Nurses: While nurses are already critical participants in the asthma care pathway, roundtable participants discussed the robust and varied strength of nurses that tend to be underutilized.[49,50] While school nurses are often under-resourced and unrecognized, they are a constant force for medical care in the lives of nearly every child in the U.S. This has immense potential for improving asthma outcomes, given the prevalence of asthma among children and the unique level of access inherent to the school setting.[51–53] Nurse educators and community health nurses may be similarly impactful and are applicable to all age groups. If used to the top of their credentials, they represent a class of clinicians that are specialized in building patient relationships and conveying health information effectively. Combined with their clinical skills, nurses represent powerful and accessible drivers of medical care and patient engagement who are well trained to engage in both the preventive and emergent aspects of asthma management.

Asthma Education Specialists (AE-C): The National Board for Respiratory Care offers the AE-C credential to most licensed clinicians and individuals with a minimum of 1,000 hours of direct asthma education, counseling or coordinating services. AE-Cs can represent a broad array of disciplines otherwise excluded from the asthma care pathway, including pulmonary function technologists, respiratory therapists, social workers, pharmacists, paramedics and occupational/physical therapists.[54]

If identified and resourced, these specialists can substitute for and bolster the role of physicians in the more routine aspects of asthma management: educating patients about their condition, helping individuals navigate networks of care and identifying signs that may indicate a need for additional medical/ physical interventions.

> **Roundtable Participant:** *"Several of us are certified asthma educators. We don't get the same opportunities for reimbursement that certified diabetes educators get. Why is that not happening?"*

Community Health Workers (CHW): Community health workers are trusted community members that operate at the front lines of health care and social services to translate public health priorities into high-quality, culturally competent practice.[55] If educated on asthma care priorities, these individuals can mirror the role of AE-Cs in the asthma care pathway, albeit from a less clinical perspective.[56–58] CHWs are inherently valuable in that they are trusted community members and enter each patient interaction with a deep understanding of the environmental and social contexts individuals live within. This is critical, given the disproportionate burden of asthma across geographies and communities, and makes CHWs a major asset for initiatives that aim to educate patients, influence health behaviors or understand/address the roots of an individual's asthma.

Pharmacists: Although pharmaceuticals are the centerpiece of clinically recommended asthma care pathways, the role of pharmacists in asthma care is typically limited to dispensing medications. Roundtable participants underscored the missed opportunity this represents. A large part of asthma control derives from an individual's adherence to asthma controller medications and appropriate use of asthma reliever medications. While prescribers typically attempt to educate patients in proper medication usage in the traditional asthma care pathway, their instructions can be misinterpreted or forgotten over the course of treatment.[12,21,59–61] Pharmacists represent a severely underutilized component in this pathway, given their central role as medication experts and patient touchpoints, and there is a growing role for pharmacy clinics that can assist in asthma care. If educated in asthma management approaches (i.e., via AE-C certification) and resourced to act to the top of their credentials, pharmacists can engage with patients on proper controller medication usage; provide recommendations for additional therapeutics, environmental modifications and health behaviors; and educate patients on the risks of reliever overutilization.[62] They have a key potential role in tracking SABA and OCS intake to remain vigilant against overuse.

Community pharmacists are trained to provide these types of services in a manner tailored to the communities they serve. Similar to many other professionals highlighted here, this brings tremendous value to asthma care, given the high prevalence and severity of negative asthma outcomes across setting, socioeconomic status and racial category.[63]

Roundtable participants urged leaders to leverage the opportunities currently at their disposal to improve the quality of asthma care until primary care/pulmonology/allergy physician workforce expansion efforts come to fruition. While they acknowledged that certain standard aspects of asthma care (e.g., spirometry testing) cannot be performed virtually, they noted that many other, more routine aspects of asthma care can easily be performed over asynchronous/synchronous telehealth. Electronic symptom reporting, patient education and medical advice could be critical drivers of improved outcomes for patients who experience physical access difficulties, and would likely be convenient even for patients that do not experience these difficulties.[20] In some cases, telehealth may expand the standard suite of asthma care services. Physical visits by asthma experts can be an effective method of assessing and addressing asthma triggers in an individual's home environment.[64–67] Roundtable participants that had performed these services for patients acknowledged that although helpful, these visits often require significant investment.[40] Virtual visits conducted via video calls confer the same benefits, but require significantly less effort on the provider's part. Leveraging these modalities would require coverage changes for many payer policies updated since the pandemic, but represent a major opportunity for improved patient engagement and asthma control.[67] Virtual and telehealth options can connect available providers with areas experiencing provider shortages, provided that licensing requirements and coverage policies align to allow provision of virtual services. Roundtable clinicians expressed frustration about instances where these policies do not align, citing a need for coverage reform to reflect the needs of individuals served by health care organizations.

Clinical Care: Quality Framework & Evidence-Based Care

Roundtable participants identified many challenges for providers, even if access is improved, to deliver care aligned with best practices for asthma management. Complex guidelines, knowledge deficits—especially regarding newer therapeutic options—mismatched reimbursement, unclear incentives and uneven implementation of chronic disease management principles, including a relative lack of tools for longitudinal and team care, can leave providers "on their own" as they try to deal with chronic conditions such as asthma.[9,10,23,28,41,68,69] Enabling providers to deliver the care needed to produce high-quality asthma outcomes should be a key goal of the health care delivery system.

Clinical guidelines for asthma care recommend a preventive model of care to provide continuing symptom control and to reduce the likelihood and severity of asthma exacerbations. This model entails 1) providing and interpreting empirical diagnostic tests to assess asthma severity; 2) routinely monitoring and measuring patient symptoms; 3) assessing patient risks and triggers for exacerbations and history of exacerbations; 4) counseling patients on trigger exposure reduction and other self-management techniques; 5) implementing and routinely adjusting medication regimens, including use of a controller for symptom control and a reliever for symptom relief/decrease of airway inflammation; 6) specialty referral and newer treatment modalities, including biologics, if symptom control or exacerbation reduction is not achieved.[4,5] Validated instruments that feature the voice of the patient regarding their experience of symptoms, exacerbation risks and exacerbation occurrences must complement the clinician's assessment. The panel noted that although pharmacological tools and management approaches are evidence-based, and clearly effective at improving asthma outcomes, there are challenges in aligning practice with evidence.

The evidence-based care model based on guidelines, particularly the National Asthma Education and Prevention Program Coordinating Committee (NAEPCC) and GINA, has been shown to be effective at reducing the prevalence and severity of poor asthma outcomes.[9,10,13,21,41,50] By basing care on validated instruments that assess symptom impairments, exacerbation risk and exacerbation history, providers can operate from an informed perspective on the drivers and manifestations of an individual's asthma, leading to "right-sized" asthma therapies and management strategies that improve symptoms and prevent asthma exacerbations while minimizing undue burden on patients. This care model relies on clinician assessment of symptoms, exacerbation risks, and exacerbation occurrences, familiarity with available medication classes and their combinations, including multiple brands, monitoring patients' responses to treatment and adjusting medications as needed.[23,70–72]

Different medication regimens are necessary for different age groups. Several panel members suggested that guidelines could be simplified to make them easier for busy primary care providers to follow. They also noted that payment barriers continue to inhibit adherence to clinical guidelines. In both the U.S. and worldwide, current guidelines recommend combined asthma controller and reliever medications medications for asthma symptom relief and control. Various combinations of SABAs and ICSs can be used for rescue, and some patients do well with this approach. Others require LABAs or long-acting muscarinic antagonists (LAMA) with ICSs as maintenance. U.S. pharmaceutical coverage has generally not been updated to align with these clinical guidelines.[9,39–41] As such, prescribers must provide patients with workarounds: prescribing asthma relievers and ICSs concurrently and instructing patients to take both at the same time or, often, multiple puffs at different times of the day. Similarly, LABA or LAMA formulations combined with ICSs are not always covered. This contradicts the simplicity of the combined formulations, confuses and burdens patients and may fail to decrease the risk of SABA overuse.

Similar barriers exist for the biologic agents anti IgE, anti-IL5/5R, anti-IL4R and anti-TSLP, which have been shown to be highly effective at driving long-term asthma control. They improve symptoms and decrease exacerbation occurrence, which leads to less exposure to systemic steroids, decreases the need for and level of chronic OCS use and can result in lower levels of inhaled maintenance therapies. Emerging evidence suggests that early use in many patients may be indicated, but coverage is often referral-dependent and subject to payer scrutiny, imposing additional burdens on patients and clinicians.[32,73–75] In some

instances, even primary care providers with great expertise in asthma care may be unable to prescribe biologics needed for a patient's long-term asthma control, and instead must ask patients to visit specialists to access biologics.

A major concern in asthma management, particularly for exacerbations, is the use of OCSs. The current pharmacological armamentarium, when used according to guidelines, and when biologic agents are used as indicated, can vastly decrease—if not end—the need for OCSs. OCSs are recognized as dangerous medications—particularly for children, but unsafe at any age and for all users—and have multiple side effects and long-term complications. It is important for clinicians to realize that it is not just long-term OCS use that is harmful; even multiple intermittent courses are associated with increased risks. Complications such as diabetes and obesity can lead to multimorbidity and increased health care utilization and costs. Standards and quality measures based on clinical guidelines must promote OCS stewardship and drive a decline in their use.

> **Roundtable Participant:** *"There is increasing evidence of the toxicity of a 'few days, multiple times a year' approach to using oral steroids. Using an ICS as a reliever is far superior to ending up on even a few doses of oral steroids during the year."*

Primary care is a natural fit for high-quality asthma care.[23,24,31] The primary care setting is intended to serve as a patient's "home base" for medical care. Ideally, providers see a patient in many non-emergent encounters over time, learning about a patient's life, medical history and preferences. Roundtable participants with experience in the realities of primary care noted that this situation may not always exist in practice. While primary care clinicians represent an ideal workforce for the care coordination/patient engagement activities associated with asthma best practices, coverage dynamics that maximize caseloads to meet the needs of large patient panels severely limit the time providers can spend with patients. During a rushed encounter, even the most dedicated clinician may find it difficult to engage with patients in robust conversations. This curbs the ability of most primary care providers—especially those in high-volume environments—to deliver the care they want to provide for people with asthma.

Given workforce and access issues, many people with asthma receive fragmented care when exacerbations drive them to urgent care and emergency rooms.[35,76,77] An individual experiencing an asthma exacerbation can summon emergency medical transportation and be rushed to an acute care facility within minutes, regardless of their health care coverage status. There, clinicians have access to a full array of on-demand pharmaceutical therapies, and 24-7 staffing enables constant symptom monitoring and adjustments to a course of treatment.[78] In contrast, even in areas without significant provider shortages, an individual hoping to initiate care with a primary care provider can wait many months to be seen for an introductory visit. For individuals residing in geographically restrictive urban or rural areas, or in areas with health care provider shortages, the problem is much worse.[44] The panel noted this and discussed that sometimes, partnership with acute care providers—through asthma education, co-located asthma care centers and virtual follow-ups—may be necessary to reduce care fragmentation and an inappropriate focus on acute exacerbations.

A key tool for asthma management is office spirometry.[79,80] Multiple roundtable participants noted that primary care practices often lack the equipment and expertise required to conduct spirometry testing needed for asthma diagnosis, when a patient is changing therapies or worsening and even for occasional monitoring when a patient is stable. Although sending a patient for pulmonary function testing outside of the primary care clinician's office can be a substitute, this requires an additional trip to a specialist, and many health care payers require a referral in order to reimburse providers.[9,81] Under these conditions, the only way for a typical primary care provider to align with best practices for asthma care is to make a substantial investment in spirometry testing capabilities and to either forgo reimbursement or develop extensive workarounds to ensure coverage.[82] These solutions are inaccessible to many providers and sustainable for few. Primary care providers can make use of validated patient reported instruments to measure asthma control that have been shown to be important to ongoing asthma management, but this cannot completely substitute for the need for office spirometry.[70,71,83]

> **Roundtable Participant:** *"Less than one in five adults that present with generalized/non-specific respiratory symptoms have ever received spirometry testing. How do we improve getting accurate diagnoses in this adult population? Right now, spirometry testing is the gold standard, but it's not accessible or used routinely."*

For patients with severe asthma, where symptoms, exacerbation triggers and exacerbation episodes are difficult to control, there are benefits to appropriate and timely specialist referrals. Specialists can correctly identify disease phenotypes to ensure appropriate treatment, evaluate for asthma masqueraders (comorbidities that may produce asthma-like symptoms but do not respond well to asthma therapies), maintain symptom control and reduce health care utilization and associated costs. U.S. guidelines recommend appropriate medication escalation and referral of patients with severe asthma to a specialist for consultation or co-management, especially following an exacerbation.[35,43,59,79] Roundtable participants noted many ways that payer policies could change, based on current realities, to make best-practice asthma care more sustainable. Payers should re-examine and enhance current reimbursement structures to provide primary care clinicians the resources and support necessary to deliver a full suite of asthma management services, including reimbursement for office spirometry, patient self-management support, asthma action plan development and care coordination. These relatively inexpensive, but effective, care practices would allow primary care providers to deliver evidence-based care and improve asthma outcomes. Another approach could be value-based care reimbursement that incentivizes clinicians to use the medications and tools available for high-quality asthma care by providing resources through different payment mechanisms.[84,85]

Asthma is fundamentally a chronic disease occurring in all ages, with episodic exacerbations based on triggers. It can be well managed if the powerful pharmacologic tools available are combined with known principles of chronic disease management—continuing care, team approach, patient self-management support, care coordination and reimbursement for such activities. Continuing care facilitates stepped care based on symptom control, decreasing exacerbations, and a therapeutic partnership between patients and clinicians. A team approach has long been recognized as key in other chronic diseases such as diabetes and heart failure, but is not commonly considered in asthma management, even though it is needed just as much.[68,72,86,87] The team, both internal and external to a practice, may include asthma educators, pharmacists, care coordinators, community health workers, behavioral health professionals, specialty clinicians (in the case of asthma, pulmonologists and allergists), urgent care providers and, of course, the patient and family. To coordinate a patient's care plan with relevant team members, tools such as an asthma action plan, care coordination interventions and interoperable electronic health care and care management record systems must be available. Different patients with different needs will interact with different components of the team. Patient Scenario 3 illustrates how asthma could present in older adults.

Patient Scenario 3: "Mr. Coles"

Mr. Coles is a 60-year-old White individual who lives in a small town in northeastern Pennsylvania. He is head of the maintenance department at a large industrial complex. Despite being in "coal country," he has never worked in the mines. Since he was a child, he has had episodic seasonal coughing and occasional wheezing, and visited the emergency room for these symptoms several times during his childhood and teen years. At that point in time, he was told he had mild asthma. He began smoking in his late teens, and smoked off and on for nearly 15 years, and he often had a significant cough. He went to the ED for coughing exacerbations several times over the years, and was again told he might have asthma and that he should quit smoking, which he did. He had an acute coronary event, with 2 stents placed 10 years ago, and he has had no cardiac symptoms since, but continues with a worsening cough and increasing mucous production, which is worse in the fall, in cold weather and when he gets a cold or flu. He has hypertension, is overweight with pre-diabetes and has worsening osteoarthritis in his knees. However, his current major symptom, which is limiting his activities, is his worsening cough and a new shortness of breath.

Older adults with asthma may have multiple chronic conditions, including other pulmonary conditions. Diagnostic testing, specialty consultation and care coordination with specialists and community resources as well as significant self-management support, are needed.[15,76,88–90] Young children with asthma rely on their parents' knowledge and facility with asthma management and support in the schools, while adolescents might benefit from an educator or clinician skilled in social media to interact with this age group.[25,26,61]

Roundtable participants called for action by health care leaders to help bridge the gap between the best practices for asthma care and the current realities that patients and providers face. While national policy changes may be necessary to improve environmental health, health care equity/social determinants of health and interoperable EHR/care management data systems, health system leaders in the care delivery, regulatory and payment spaces must use the levers available to them to make coordinated provision of best practices available to patients. Roundtable participants repeatedly echoed the frustration of primary care clinicians and pulmonologists who want to provide a more comprehensive and engaged level of care to patients experiencing asthma, but face challenges in adhering to organizational and reimbursement requirements, and sometimes to maintaining financial solvency. By enabling clinicians through delivery system changes and reimbursement—particularly clinicians in primary care, but also in specialty and acute care—health system leaders can leverage an existing workforce of individuals who have the will and expertise necessary for improving long-term asthma control.

Patient Centeredness

Best practice for asthma care requires consistent evaluation and management of asthma in the context of an authentic partnership between people with asthma, their care partners and their providers. These activities must be based in a culture of asthma wellness, a "whole person" approach to care and attention to a person's lived experience and environment.[83,91] Care must be centered on people with asthma, empowering them to apply accessible self-management techniques to their condition in the areas where they work, live, play and age.

In the absence of adequate coverage for or access to a coordinated network of health care services and providers, individuals experiencing asthma are effectively left to manage their condition using the resources and expertise available to them.[19,35,36,39] This can severely limit their ability to achieve positive health outcomes. While asthma symptoms mirror those of episodic and infectious diseases, they will not "go away" with time.[92,93] However, if managed optimally and according to evidence-based care, appropriate advanced therapies and shared decision making, asthma symptoms can be controlled, exacerbation risk can be minimized and remission may be achievable.

Roundtable participants pointed out recent research showing that gaps in asthma self-care capabilities can have independent effects on asthma outcomes.[70,83,94–96] Even if patients can access appropriate health care and continuing care clinicians, care can have a limited impact on asthma outcomes without patient-centered approaches to asthma care that enable individuals experiencing asthma to manage their symptoms and the factors that drive them.

Patient Scenario 1 provides an example of the benefits of a patient-clinician partnership focused on evidence-based asthma care. Erika benefitted from a high level of health care access and a network of providers delivering evidence-based care, and she and her family absorbed the idea that asthma is manageable. Many of her positive health outcomes can be attributed to informed care routines at home, empowered by education from repeated conversations with knowledgeable providers.[71,83,97]

Perhaps more important, in "Patient Scenario 1," Erika's pediatrician adopted a culture of wellness regarding asthma and clearly demonstrated to Erika and her family that asthma can be successfully handled. Not all patients and families understand that control of asthma symptoms and exacerbations is achievable.[21,22,60,98,99] As demonstrated in situations like Patient Scenario 2, some patients can lose hope that a better, more manageable reality is possible, potentially leading to anxiety, depression and other negative psychological outcomes.[100,101] People with uncontrolled asthma may come to believe that avoiding outdoor activities, experiencing a constant degree of airway discomfort and having multiple yearly asthma exacerbations is the best outcome available to them, and their families and communities may validate these views.[102–105]

Roundtable participants underscored that negative asthma perceptions can lead to a culture of symptoms and impairment, compounding negative health outcomes. Participants suggested numerous ways in which this negative culture of asthma could be transformed into a wellness culture, many of which leverage the strengths of the communities where individuals reside. Because asthma is a condition with high prevalence in children, it is important to advocate for more asthma-specific health coursework in K-12 education.[53] As a topic relevant to health, science, physical education and the environment, it might fit well into current curricula, especially in areas with high asthma rates among children.

> **Roundtable Participant:** *"There's this assumption that bad asthma is a cross you bear: 'You are never going to be freed of this cross. 'You need to learn how to adapt.' 'You're going to wheeze; you're going to cough. 'It's March: you shouldn't be outside.' I think our asthma patients just don't expect to ever be unburdened of their disease."*

Building a strong public knowledge base about the realities of asthma can help increase the capacity of communities experiencing similar social and environmental realities to advocate for better care and reject the notion that poor outcomes are inevitable. This can also be leveraged to improve self-management approaches for asthma in ways that align with clinical best practices. Across multiple brainstorming sessions, roundtable participants discussed their experiences in attempting to build this knowledge base, and noted the limits imposed by approaches that lack high-quality community engagement. Participants cited important community resources that can increase both general health literacy and the knowledge and engagement of people with asthma. As noted above in the access section, important community providers such as local pharmacists, school nurses and community health workers have a key role to play in both asthma awareness and asthma management.[56–58]

Engaging with people with asthma is fundamentally critical to good asthma outcomes, and panel members noted that it is important to "meet people where they are."[83,97] Many individuals experiencing asthma are children, or adults with low health literacy or interest in health care issues. Presenting them with dry, clinical resources on their condition is often ineffectual; creative methods may be needed to improve self-management support and engagement.[60,71,106] Citing the benefits that enhanced self-management (at any level) would have in improving asthma care, roundtable participants advocated for clinicians, leaders and care partners to explore human-centered design and gamified approaches to asthma education.

> **Roundtable Participant:** *"It's not a one-time fix: it's relationship building. It's sustained partnerships where the results of care build trust over time. Because honestly, patients don't find the evidence we have compelling."*

Human-centered design and gamification, particularly over electronic and social media, were mentioned by many roundtable participants as examples of the necessary patient-centered approach that must accompany larger efforts to expand health care access and enable providers to operate according to best practices. With full time school, jobs and families, as well as stresses around financial security, social needs, inequity, environmental health and health system fragmentation, it is hard to expect people with asthma to remember or conduct independent research on proper medication usage, ideal care pathways and diagnostic tools.[36] Clinicians, health system leaders and other stakeholders committed to improving asthma outcomes should deliver tools and resources that work within patient realities to provide education, engagement, and self-management support.[83]

Although roundtable participants centered much of their discussion on children and adolescents with asthma, they also discussed that asthma is a disease that can co-exist with other lung problems and chronic conditions that accumulate as people age.[43,76,96] As previously mentioned, accurate assessment of lung disease and diagnostic scrutiny, as well as principles of chronic disease management, are important to treat such patients, illustrated in Patient Scenario 3. For those individuals, patient-centered management focused on individual goals, self-management support and care management can provide the whole-patient approach essential to good health outcomes.

Strategies to Improve Care for People with Asthma

Table 1 summarizes the major recommendations of roundtable participants. In aggregate, these form a powerful call to action, and emphasize the many changes needed in insurance coverage, provider workforce enhancement, quality and accountability, clinical care delivery, patient centered approaches and environmental policy to improve the state of asthma in the U.S.

Table 1: Strategies to Improve Care for Patients with Asthma

Coverage	• Modernize pharmacy coverage to align with evidence-based best practices and clinical guidelines: » Reexamine coverage for dangerous medications (should SABA-only prescriptions even be covered?) » Make biologics covered at a lower severity threshold. • Provide reimbursement policies that resource/enable evidence-based best practices and clinical guidelines: » Support multidisciplinary care teams. » Implement appropriate coverage for provider home visits. » Expand coverage for patient education, without requiring that it be conducted by a clinician (this increases access by allowing for more settings/providers). • Encourage time-based coding/billing vs. evaluation and management (E/M) coding/billing. • Implement coverage parity between digital health/telehealth and in-person services.
Workforce	• Enable "top of licensure" practice for clinicians (i.e., pharmacists, nurses, primary care). • Acknowledge the roles of different types of primary care clinicians. • Acknowledge and reimburse community partners such as school nurses, asthma educators and community health workers. • Expand use and coverage of clinical and community pharmacists for asthma care. • Extend COVID-era policies allowing for cross-state/jurisdiction practice. • Enhance graduate medical education (GME) relevant to asthma care. • Invest in the workforce shortages most relevant to asthma care.
Quality Framework	• Develop meaningful measures and scorecards that set standards of care and incentives based on a patient's specific needs. • Implement measures that incentivize key aspects of asthma care such as asthma education and self-management support and that use the patient voice, such as asthma experience questionnaire. • Implement measures with direct correlates to outcomes and clinical best practice. Examples include: » Percent reduction in OCS use. » OCS and SABA stewardship. » Spirometry testing. • Build a suite of measures focused specifically on pediatric care.

Care Delivery	• Adjust standards for asthma medication prescribing practices to start with a combined anti-inflammatory/reliever and then provide other controller medications and biologics as appropriate. • Mandate data sharing and interoperability to enable better communication among providers and between EHR systems. This may be useful in monitoring lifetime steroid exposure. • Standardize care paths aligned with evidence-based best practices and clinical guidelines. » Eliminate the acceptability of providing a SABA on its own. » Enable providers to conduct more home visits. » Enhance patient/family education efforts. » Use biologics first for selected patients, based on emerging evidence. • Develop and support multidisciplinary care teams for chronic conditions. • Implement principles of chronic disease management, including care coordination when needed. • Monitor lifetime steroid exposure. • Consider air quality and exacerbation exposure in asthma screenings.
Person-Centered Care	• Ensure that clinician education includes motivational interviewing and patient-centered care principles. • Ensure that every person has access to insurance, providers and clean and safe housing. • Implement a culture of asthma wellness so patients understand that symptoms and exacerbations can be stopped. • Allow asthma education and self-management support to be linked to community resources, such as school nurses. • Meet patients where they are, using innovative methods for self-management such as social media and games; make use of human centered design.
Policy	**Environmental:** • Define lower acceptable particulate matter thresholds. • Reimburse home visits for asthma trigger investigation/monitoring. • Reimburse asthma trigger remediation activities in patients' homes/communities. • Accelerate the transition to hybrid/electric vehicles. **Other:** • Implement faster regulatory processes for emerging technologies (as in the COVID era). • Encourage public private partnerships (e.g., using tobacco or pollutant taxes to fund some of these solutions work). The higher the offense of the industry, the more they pay to support health remediation and education efforts.

Coverage: All people should have appropriate insurance coverage for medical care, self-management support and education, care coordination, and evidence-based pharmacological treatment. Important interventions such as virtual care and home visits should be covered. Office spirometry has a critical role in asthma care and should be covered. Insurance coverage should be standardized; it is difficult for patients and clinicians alike when different insurance plans have different benefits. Lack of coverage, or insufficient coverage, hinders continuing care and evidence-based treatment. When effective medications are not covered or incompletely covered, clinicians and patients can be limited in their ability to manage asthma according to guidelines, resulting in confusing workarounds for medication use. Intrusive prior authorization methods should be ended; treatment must be based on guidelines and the best interest of the patient experiencing asthma.

Workforce: The clinician workforce for asthma care is inadequate, but reinforcements are available if appropriate and available clinicians are enlisted for asthma care. Primary care clinicians are the mainstay of asthma care, but physicians, nurse practitioners and physician assistants working in primary care are in short supply. In some areas of the county,

RETURN TO TABLE 1

particularly rural areas, primary care can be unavailable. Clearly, increasing primary care availability is a national problem requiring complex solutions. Pulmonary and allergy specialists are also in short supply and can be unavailable in rural areas. Telehealth and licensing across states could assist in bringing needed specialty care to shortage areas. There are also steps that can be taken to allow other types of providers to contribute to asthma care. Urgent care clinicians can be provided with toolkits and programmatic solutions to assist them in delivering appropriate asthma care. School nurses can be an important resource for children. Asthma educators should fill roles analogous to diabetes educators and should be reimbursed appropriately. Clinical and community pharmacists are a major underused resource that could fill a critical role in supporting evidence based pharmaceutical care. Community health workers can be important resources in many areas and can establish meaningful contact and educational assistance for people in underserved or marginalized communities. Regardless, all providers who interact with asthma patients need appropriate training and possibly toolkits to understand current guidelines and best practices.

Quality Framework: Quality metrics and standards for asthma care are underdeveloped compared to those for other chronic diseases, such as diabetes or heart failure. Many are out of date and inconsistent with current guidelines. The measures that exist are not appropriate to support value-based payment and drive evidence-based care. Measure developers need to develop metrics and standards based on current guidelines for medical care that can be used for quality improvement as well as accountability and provider incentives. Important areas for measure development include measures that address the harms of inappropriate asthma care, such as OCS and excessive SABA use and care coordination, particularly as it pertains to emergency department and inpatient utilization. Measurement should consider addressing other important issues, such as the availability of patient self-management support and patient reported outcomes (as referenced in the Asthma Impairment Risk Questionnaire).[107] A suite of measures addressing pediatric asthma care could be considered as well.

Care Delivery: Despite well-known guidelines based on strong evidence, asthma care delivery is inadequate and sometimes dangerous. Strategies include assuring that asthma medication prescribing starts with a combined ICS/reliever and then moves forward as needed to other controller medications and biologics as appropriate. It should be considered inappropriate to prescribe SABAs alone, and the dangers of OCS use should be more widely disseminated and understood. Principles of chronic disease management should be applied to asthma, including patient education and self-management support, care coordination when relevant, use of multidisciplinary teams for management and home visits when needed. EHR interoperability is important to allow different providers to seamlessly communicate and coordinate the delivery of high-quality care.

> **Roundtable Participant:** *"For many people, the biologics are better; safer; more effective. The problem is cost and access."*

Person-Centered Care: Ensuring that all people have access to appropriate insurance coverage, continuing care, needed medications and safe housing is fundamental to patient-centered care. Longstanding disparities in these areas must be addressed. Clinicians should lead the way in implementing a culture of "asthma wellness," so that patients and families understand that asthma symptoms and exacerbations are nearly entirely preventable, and that asthma remission is possible. In addition, clinicians should be trained, including though GME for physicians, in principles of patient-centered care and techniques related to patient engagement, such as motivational interviewing and shared decision making. Human-centered design methods should be employed to meet patients where they are and provide innovative and age-appropriate self-management support, including through social media and games.

Environmental and Other Policies: Key areas of policy are relevant to asthma outcomes. Air quality is critical, and poor air quality is often associated with underserved geographical areas. Policy interventions are needed to address this issue, and may include defining lower acceptable particulate matter thresholds and continuing/accelerating a push towards electric vehicles. Other policy interventions could encourage/reimburse home visits for asthma trigger investigation and monitoring and for home remediation activities. Public private partnerships, such as using pollutant taxes to fund remediation work, should be considered.

RETURN TO TABLE 1

Conclusion: A Call to Action

There is much work to do to make high quality care available to all patients with asthma. As identified by roundtable participants, a broad range of barriers and challenges need to be addressed in order to do so, and all stakeholders must work together to achieve key goals: improved insurance and medication coverage; an accessible workforce; quality metrics driving value based care; evidence-based pharmacological and chronic disease management; and patient centered care. Although some recommendations made by roundtable participants are complex and require major health system changes, many can be implemented immediately in the presence of a broad-based will to improve asthma care. We know what to do – the clinical evidence is clear, highly effective medications to manage asthma are available, and principles of chronic disease management are well known. It will take innovative approaches, forward thinking momentum, and the cooperation and coordination of payers, employers, states, the federal government, and providers to all step up and do their part. Only by stakeholders working together, with the patient at the center, can symptomatic asthma, with its frequent exacerbations, medication toxicity, and increased costs, become a specter of the past.

Acknowledgements

NCQA appreciates the time, knowledge and perspectives of the diverse experts whose thoughtful contributions to the Asthma Management & Education Roundtable led to this report.

Asthma Management & Education Roundtable Participants

WILLIAM C. ANDERSON, III, MD
Associate Professor of Pediatrics, Children's Hospital Colorado and University of Colorado School of Medicine

DAVID AU, MD, MS
Executive Director, Department of Veterans Affairs Center for Care and Payment Innovation; Professor of Medicine, University of Washington

NICOLE CHASE, MD
Allergist/Immunologist, St. Paul Allergy & Asthma and Minneapolis VA Health Care System; Associate Professor of Medicine, University of Minnesota Medical School

ANNE FUHLBRIGGE, MD, MS
Senior Associate Dean for Clinical Affairs and Associate Professor, University of Colorado School of Medicine

MAUREEN GEORGE, PHD, RN, AE-C
Professor of Nursing, Columbia University School of Nursing

NJIRA LUGOGO, MD, MS
Associate Professor of Internal Medicine, University of Michigan; Director, University of Michigan Asthma Program

KRISHNAN NARASIMHAN, MD
Chair, Stamford Health Department of Family Medicine

JUDITH QUARANTA, PHD, RN, CPN, AE-C
Associate Professor of Nursing, Binghamton University; Coordinator, Binghamton University Community Health Nursing Program

SARA THUMA, MPH
Asthma Control Program Manager, Pennsylvania Department of Health

LORI WILKEN, PHARMD
Clinical Associate Professor, University of Illinois, Chicago Retzky College of Pharamacy; Director, University of Illinois Health Tobacco Treatment Center

TONYA WINDERS, MBA
President and Chief Executive Officer, Global Allergy & Airways Patient Platform

WENDY WRIGHT, DNP, ANP-BC, FNP-BC
Owner and Adult and Family Nurse Practitioner, Wright & Associates Family Healthcare

CAROL ZIEGLER, DNP, FNP-C, APHN-BC
Professor of Nursing, Vanderbilt University; Co-Founder, Climate Health and Energy Equity Lab

Scientific Writer

NCQA thanks Darcy Lewis, who supported the composition of this report.

NCQA Staff

Many NCQA staff contributed to the development of the Roundtable and report. We thank the following NCQA staff for their participation on this project.

CAROLINE BLAUM, MD, MS
Assistant Vice President, Chronic Conditions Center

MICHAEL COCCHIOLA, MPA
Health Care Analyst, Chronic Conditions Center

RENEE ETHIER
Assistant Director, Federal Services

JUDY LACOURCIERE
Editor, Accreditation and Recognition Policy

ADRIANNA NAVA, PHD, MPA, MSN, RN
Applied Research Scientist, Health Equity Sciences Center

ERIN OGANESIAN
Assistant Vice President, Corporate and Foundation Relations

DANIEL ROMAN
Director, Chronic Conditions Center

AstraZeneca Pharmaceuticals LP

NCQA acknowledges support from AstraZeneca, which underwrote the Asthma Management & Education Roundtable and the cost of producing and distributing this report. Although AstraZeneca did not participate in the Roundtable discussion or have a role in writing this report, they supported the process and share with NCQA the belief that the future of health care delivery requires greater collaboration among the many diverse health care stakeholders that advocate for improved population health. NCQA thanks AstraZeneca and its staff for sponsoring this project.

References

1 Centers for Disease Control and Prevention. Most Recent National Asthma Data. Asthma. May 10, 2023. Accessed October 15, 2024. https://www.cdc.gov/asthma/most_recent_national_asthma_data.htm

2 Yaghoubi M, Adibi A, Safari A, FitzGerald JM, Sadatsafavi M. The Projected Economic and Health Burden of Uncontrolled Asthma in the United States. Am J Respir Crit Care Med. 2019;200(9):1102-1112. doi:10.1164/rccm.201901-0016OC

3 U.S. Department of Health and Human Services Office of Minority Health. Asthma and African Americans. MinorityHealth.hhs.gov. September 22, 2023. Accessed October 15, 2024. https://minorityhealth.hhs.gov/asthma-and-african-americans

4 GINA-2024-Strategy-Report-24_05_22_WMS.pdf. Accessed August 29, 2024. https://ginasthma.org/wp-content/uploads/2024/05/GINA-2024-Strategy-Report-24_05_22_WMS.pdf

5 National Asthma Education and Prevention Program Coordinating Committee Expert Panel Working Group. 2020 Focused Updates to the Asthma Management Guidelines. U.S. Department of Health and Human Services National Heart, Lung, and Blood Institute; 2020. Accessed September 12, 2024. https://www.nhlbi.nih.gov/resources/2020-focused-updates-asthma-management-guidelines

6 American Lung Association. Asthma Trends Brief: Asthma Trends and Burden. Trends in Lung Disease. July 15, 2024. Accessed August 26, 2024. https://www.lung.org/research/trends-in-lung-disease/asthma-trends-brief/trends-and-burden

7 Mayo Clinic. Asthma: Symptoms & Causes. Diseases & Conditions. April 6, 2024. Accessed August 23, 2024. https://www.mayoclinic.org/diseases-conditions/asthma/symptoms-causes/syc-20369653

8 Asthma attack - Symptoms and causes. Mayo Clinic. Accessed August 26, 2024. https://www.mayoclinic.org/diseases-conditions/asthma-attack/symptoms-causes/syc-20354268

9 O'Byrne PM, Jenkins C, Bateman ED. The Paradoxes of Asthma Management: Time for a New Approach? Eur Respir J. 2017;50(3). doi:10.1183/13993003.01103-2017

10 McIvor A, Kaplan A. A Call to Action for Improving Clinical Outcomes in Patients with Asthma. NPJ Prim Care Respir Med. 2020;30(1):1-5. doi:10.1038/s41533-020-00211-x

11 Wu TD, Brigham EP, McCormack MC. Asthma in the Primary Care Setting. Med Clin North Am. 2019;103(3):435-452. doi:10.1016/j.mcna.2018.12.004

12 Gelzer AD, Gao W, Keleti D, et al. Multifaceted Interventions Improve Medication Adherence and Reduce Acute Hospitalization Rates in Medicaid Patients Prescribed Asthma Controllers. J Asthma. 2019;56(2):190-199. doi:10.1080/02770903.2018.1439954

13 Haughney J, Winders TA, Holmes S, et al. Global Quality Standard for Identification and Management of Severe Asthma. Adv Ther. 2020;37(9):3645-3659. doi:10.1007/s12325-020-01450-7

14 Castillo JR, Peters SP, Busse WW. Asthma Exacerbations: Pathogenesis, Prevention, and Treatment. J Allergy Clin Immunol Pract. 2017;5(4):918-927. doi:10.1016/j.jaip.2017.05.001

15 Menzies-Gow A, Busse WW, Castro M, Jackson DJ. Prevention and Treatment of Asthma Exacerbations in Adults. J Allergy Clin Immunol Pract. 2021;9(7):2578-2586. doi:10.1016/j.jaip.2021.05.016

16 Hakizimana A, Devani P, Gaillard EA. Current Technological Advancement in Asthma Care. Expert Rev Respir Med. 2024;18(7):499-512. doi:10.1080/17476348.2024.2380067

17 Louisias M, Ramadan A, Naja AS, Phipatanakul W. The Effects of the Environment on Asthma Disease Activity. Immunol Allergy Clin North Am. 2019;39(2):163-175. doi:10.1016/j.iac.2018.12.005

18 McCormack MC, Bascom R, Brandt M, et al. Electronic Health Records and Pulmonary Function Data: Developing an Interoperability Roadmap. An Official American Thoracic Society Workshop Report. Ann Am Thorac Soc. 2021;18(1):1-11. doi:10.1513/AnnalsATS.202010-1318ST

19 Asthma & Allergy Foundation of America. Health Disparities. Advocacy: Key Issues. Accessed September 12, 2024. https://aafa.org/advocacy/key-issues/health-disparities/

20 Agency for Healthcare Research and Quality. Access to Healthcare and Disparities in Access. In: 2021 National Healthcare Quality and Disparities Report [Internet]. National Healthcare Quality and Disparities. Agency for Healthcare Research and Quality (US); 2021. Accessed September 13, 2024. https://www.ncbi.nlm.nih.gov/books/NBK578537/

21 Zaeh SE, Ramsey R, Bender B, Hommel K, Mosnaim G, Rand C. The Impact of Adherence and Health Literacy on Difficult-to-Control Asthma. J Allergy Clin Immunol Pract. 2022;10(2):386-394. doi:10.1016/j.jaip.2021.11.003

22 Abrams EM. The Impact of Caregiver Health Literacy on Pediatric Asthma: An Integrative Review. Pediatr Allergy Immunol Pulmonol. 2020;33(3):110-116. doi:10.1089/ped.2020.1192

23 Fletcher MJ, Tsiligianni I, Kocks JWH, et al. Improving Primary Care Management of Asthma: Do We Know What Really Works? NPJ Prim Care Respir Med. 2020;30:29. doi:10.1038/s41533-020-0184-0

24 Williams S, Correia de Sousa J, Khoo EM, et al. How to Make Asthma Right Care 'Easy' in Primary Care: Learnings from the 2023 Asthma Right Care Summit. NPJ Prim Care Respir Med. 2024;34(1):1-7. doi:10.1038/s41533-024-00366-x

25 Tyris J, Keller S, Parikh K. Social Risk Interventions and Health Care Utilization for Pediatric Asthma: A Systematic Review and Meta-analysis. JAMA Pediatr. 2022;176(2):e215103. doi:10.1001/jamapediatrics.2021.5103

26 Kelleher K, Davenport MA. Social Interventions and Health Care Utilization for Child Asthma—What's in a Name? JAMA Pediatr. 2022;176(2):e215100. doi:10.1001/jamapediatrics.2021.5100

27 Majellano EC, Clark VL, Winter NA, Gibson PG, McDonald VM. Approaches to the Assessment of Severe Asthma: Barriers and Strategies. J Asthma Allergy. 2019;12:235-251. doi:10.2147/JAA.S178927

28 Young KC, Meza DA, Khuder B, et al. Care Fragmentation Is Associated with Increased Chronic Obstructive Pulmonary Disease Exacerbations in a U.S. Urban Care Setting. Am J Respir Crit Care Med. 2022;206(8):1044-1047. doi:10.1164/rccm.202112-2807LE

29 Fuhlbrigge AL, Sharma S. Oral Corticosteroid Use in Asthma: A Wolf in Sheep's Clothing. J Allergy Clin Immunol Pract. 2021;9(1):347-348. doi:10.1016/j.jaip.2020.10.014

30 Lee LK, Ramakrishnan K, Safioti G, Ariely R, Schatz M. Asthma Control is Associated with Economic Outcomes, Work Productivity and Health-Related Quality of Life in Patients with Asthma. BMJ Open Respir Res. 2020;7(1):e000534. doi:10.1136/bmjresp-2019-000534

31 Wu TD, Brigham EP, McCormack MC. Asthma in the Primary Care Setting. Med Clin North Am. 2019;103(3):435-452. doi:10.1016/j.mcna.2018.12.004

32 Inselman J, Jeffery MM, Maddux JT, Shah ND, Rank MA. Trends and Disparities in Asthma Biologic Use in the United States. J Allergy Clin Immunol Pract. 2020;8(2):549-554.e1. doi:10.1016/j.jaip.2019.08.024

33 Collins SR, Masitha R. Paying for It: How Health Care Costs and Medical Debt Are Making Americans Sicker and Poorer. The Commonwealth Fund; 2023. doi:10.26099/bf08-3735

34 Erwin EA, Kelleher KJ. Understanding the Highs and Lows of Socioeconomic Status. J Allergy Clin Immunol. 2022;149(5):1585-1586. doi:10.1016/j.jaci.2022.03.007

35 Codispoti CD, Greenhawt M, Oppenheimer J. The Role of Access and Cost-Effectiveness in Managing Asthma: A Systematic Review. J Allergy Clin Immunol Pract. 2022;10(8):2109-2116. doi:10.1016/j.jaip.2022.04.025

36 Grant T, Croce E, Matsui EC. Asthma and the Social Determinants of Health. Ann Allergy Asthma Immunol. 2022;128(1):5-11. doi:10.1016/j.anai.2021.10.002

37 Lotfata A, Moosazadeh M, Helbich M, Hoseini B. Socioeconomic and Environmental Determinants of Asthma Prevalence: A Cross-Sectional Study at the U.S. County Level Using Geographically Weighted Random Forests. Int J Health Geogr. 2023;22:18. doi:10.1186/s12942-023-00343-6

38 Croft JB, Lu H, Zhang X, Holt JB. Geographic Accessibility of Pulmonologists for Adults With COPD: United States, 2013. CHEST. 2016;150(3):544-553. doi:10.1016/j.chest.2016.05.014

39 Jefferson AA. Asthma Access to Care Is Better, But Are Health Disparities? J Allergy Clin Immunol Pract. 2019;7(3):1094-1095. doi:10.1016/j.jaip.2018.11.007

40 American Lung Association. Barriers to Asthma Guidelines-Based Care Coverage. American Lung Association. Accessed September 13, 2024. https://www.lung.org/getmedia/8725ddcf-3d4f-4ed1-bb6a-10ebd1f96044/barriers-to-asthma-glbc.pdf.pdf

41 Arora NS, Zhou S, Baptist AP. Regulatory and Insurance Challenges Must Be Overcome in the United States to Meet Global Standards for Asthma Management. J Allergy Clin Immunol Pract. 2024;12(3):624-626. doi:10.1016/j.jaip.2023.10.027

42 American Lung Association. Single Maintenance and Reliever Therapy (SMART) Implementation in State Medicaid Programs. American Lung Association. Accessed September 13, 2024. https://www.lung.org/getmedia/f6df836a-70d8-4ceb-afde-671d8ff6cd59/ALA-SMART-Issue-Brief.pdf

43 Szefler SJ. Asthma Across the Lifespan: Time for a Paradigm Shift. J Allergy Clin Immunol. 2018;142(3):773-780. doi:10.1016/j.jaci.2018.03.010

44 Pittman P, Chen C, Erikson C, et al. Health Workforce for Health Equity. Med Care. 2021;59(10 Suppl 5):S405. doi:10.1097/MLR.0000000000001609

45 American Hospital Association. Fact Sheet: Strengthening the Health Care Workforce. AHA Fact Sheets. September 12, 2024. Accessed September 13, 2024. https://www.aha.org/fact-sheets/2021-05-26-fact-sheet-strengthening-health-care-workforce

46 Dill M. We Already Needed More Doctors. Then COVID-19 Hit. Association of American Medical Colleges: News. June 7, 2021. Accessed September 3, 2024. https://www.aamc.org/news/we-already-needed-more-doctors-then-covid-19-hit

47 Dall T, Reynolds R, Chakrabarti R, Ruttinger C, Zarek P, Parker O. The Complexities of Physician Supply and Demand: Projections From 2021 to 2036. Association of American Medical Colleges; 2024.

48 Dubaybo BA. The Care of Asthma Patients in Communities with Limited Resources. Res Rep Trop Med. 2021;12:33-38. doi:10.2147/RRTM.S247716

49 Alexandre-Sousa P, Sousa N, Bento J, Azevedo F, Assis M, Mendes J. Nurses' Role in the Control and Treatment of Asthma in Adults: A Systematic Literature Review. Adv Respir Med. 2024;92(3):175-189. doi:10.3390/arm92030019

50 Pudasainee-Kapri S. Providers' Adherence to Evidence-Based Asthma Guidelines in Pediatric Primary Care. J Pediatr Nurs. 2021;57:18-24. doi:10.1016/j.pedn.2020.09.020

51 McCabe EM, McDonald C, Connolly C, Lipman TH. A Review of School Nurses' Self-Efficacy in Asthma Care. J Sch Nurs. 2019;35(1):15. doi:10.1177/1059840518808886

52 Russell A, Nanda A, Bingemann TA. The Vital Role of the School Nurse in Managing Asthma. NASN Sch Nurse. 2021;37(1). doi:10.1177/1942602X21103726

53 American Academy of Pediatrics. Asthma Management in Schools. Management of Chronic Conditions in Schools. March 20, 2022. Accessed September 13, 2024. https://www.aap.org/en/patient-care/school-health/management-of-chronic-conditions-in-schools/asthma-management-in-schools/

54 The National Board for Respiratory Care. Certified Asthma Educator (AE-C). NBRC: Examinations. September 1, 2022. Accessed September 3, 2024. https://www.nbrc.org/examinations/certified-asthma-educator-ae-c/

55 American Public Health Association. Community Health Workers. APHA Communities: Member Sections. Accessed September 3, 2024. https://www.apha.org/apha-communities/member-sections/community-health-workers

56 Basnet S, Wroblewski K, Hansen E, et al. Collaborative Integration of Community Health Workers in Hospitals and Health Centers to Reduce Pediatric Asthma Disparities: A Quality Improvement Program Evaluation. J Community Health. 2024;49(4):682-692. doi:10.1007/s10900-024-01331-y

57 Coutinho MT, Subzwari SS, McQuaid EL, Koinis-Mitchell D. Community Health Workers' Role in Supporting Pediatric Asthma Management: A Review. Clin Pract Pediatr Psychol. 2020;8(2):195-210. doi:10.1037/cpp0000319

58 Shaak S, Brown K, Reichart C, Zimmerman D. Community Health Workers Providing Asthma Education. J Asthma. 2022;59(3):572-579. doi:10.1080/02770903.2020.1862184

59 Cataldo D, Louis R, Michils A, et al. Severe Asthma: Oral Corticosteroid Alternatives and the Need for Optimal Referral Pathways. J Asthma. 2021;58(4):448-458. doi:10.1080/02770903.2019.1705335

60 Han YY, Gutwein A, Apter A, Celedón JC. Health Literacy and Asthma: An Update. J Allergy Clin Immunol. 2024;153(5):1241-1251. doi:10.1016/j.jaci.2023.12.007

61 Rehman N, Morais-Almeida M, Wu AC. Asthma Across Childhood: Improving Adherence to Asthma Management from Early Childhood to Adolescence. J Allergy Clin Immunol Pract. 2020;8(6):1802-1807.e1. doi:10.1016/j.jaip.2020.02.011

62 Bridgeman MB, Wilken LA. Essential Role of Pharmacists in Asthma Care and Management. J Pharm Pract. 2021;34(1):149-162. doi:10.1177/0897190020927274

63 Strand MA. Community Pharmacists' Contributions to Disease Management During the COVID-19 Pandemic. Prev Chronic Dis. 2020;17. doi:10.5888/pcd17.200317

64 Marshall ET, Guo J, Flood E, Sandel MT, Sadof MD, Zotter JM. Home Visits for Children With Asthma Reduce Medicaid Costs. Prev Chronic Dis. 2020;17:E11. doi:10.5888/pcd17.190288

65 Centers for Disease Control and Prevention: National Center for Environmental Health. Home Visits for Trigger Reduction and Asthma Self-Management Education. National Center for Environmental Health. Accessed September 13, 2024. https://www.cdc.gov/national-asthma-control-program/php/exhale/pdfs/EXHALE_H_FactSheet-H.pdf

66 United States Environmental Protection Agency. Asthma Home Visit Programs. August 20, 2014. Accessed September 13, 2024. https://www.epa.gov/asthma/asthma-home-visit-programs

67 Bakshi A, Apantaku E, Kemmerly S, et al. The Utility of Virtual Home Visits to Reduce Asthma Burden in Low-Income Black Communities in Louisiana During the COVID-19 Pandemic. Public Health Rep. 2024;139(1). Accessed September 3, 2024. https://journals.sagepub.com/doi/10.1177/00333549241236090

68 Joo JY. Fragmented Care and Chronic Illness Patient Outcomes: A Systematic Review. Nurs Open. 2023;10(6):3460-3473. doi:10.1002/nop2.1607

69 Zheng DD, McCollister K, Christ S, Lam BL, Feaster DJ, Lee DJ. Chronic Condition Patterns in the U.S. Population and Their Association with Health Related Quality of Life. Prev Med. 2020;136:106102. doi:10.1016/j.ypmed.2020.106102

70 Guarnieri G, Caminati M, Achille A, et al. Severe Asthma, Telemedicine, and Self-Administered Therapy: Listening First to the Patient. J Clin Med. 2022;11(4):960. doi:10.3390/jcm11040960

71 Minnesota Department of Health. Patient-Centered Asthma Care. Asthma Resources and Information for Health Care Professionals. August 19, 2024. Accessed September 13, 2024. https://www.health.state.mn.us/diseases/asthma/professionals/healthcareprofessionals.html

72 University of Rochester Medical Center. Your Asthma Health Care Team. URMC Health Encyclopedia. Accessed September 13, 2024. https://www.urmc.rochester.edu/encyclopedia/content.aspx?contenttypeid=134&contentid=253

73 American Academy of Allergy, Asthma & Immunology. Biologics for the Management of Severe Asthma. Conditions Library: Asthma. October 31, 2023. Accessed September 3, 2024. https://www.aaaai.org/tools-for-the-public/conditions-library/asthma/biologics-for-the-management-of-severe-asthma

74 Asthma & Allergy Foundation of America. Biologics for the Treatment of Asthma. Biologics for Asthma. November 2023. Accessed September 13, 2024. https://aafa.org/asthma/asthma-treatment/biologics-asthma-treatment/

75 Nagase H, Suzukawa M, Oishi K, Matsunaga K. Biologics for Severe Asthma: The Real-World Evidence, Effectiveness of Switching, and Prediction Factors for the Efficacy. Allergol Int. 2023;72(1):11-23. doi:10.1016/j.alit.2022.11.008

76 Chavasse R, Scott S. The Differences in Acute Management of Asthma in Adults and Children. Front Pediatr. 2019;7:64. doi:10.3389/fped.2019.00064

77 Goyal MK, Richardson T, Masonbrink A, et al. Reliance on Acute Care Settings for Health Care Utilization: A Comparison of Adolescents with Younger Children. Pediatr Emerg Care. 2021;37(12):e1128-e1132. doi:10.1097/PEC.0000000000001924

78 Al-Shamrani A, Al-Harbi AS, Bagais K, Alenazi A, Alqwaiee M. Management of Asthma Exacerbation in the Emergency Departments. Int J Pediatr Adolesc Med. 2019;6(2):61-67. doi:10.1016/j.ijpam.2019.02.001

79 Ayuk AC, Uwaezuoke SN, Ndukwu CI, Ndu IK, Iloh KK, Okoli CV. Spirometry in Asthma Care: A Review of the Trends and Challenges in Pediatric Practice. Clin Med Insights Pediatr. 2017;11:1179556517720675. doi:10.1177/1179556517720675

80 Lamb K, Theodore D, Bhutta BS. Spirometry. In: StatPearls. StatPearls Publishing; 2024. Accessed September 3, 2024. http://www.ncbi.nlm.nih.gov/books/NBK560526/

81 Centers for Medicare & Medicaid Services. Billing and Coding: Pulmonary Function Testing (A57216). Medicare Coverage Database. November 4, 2023. Accessed September 9, 2024. https://www.cms.gov/medicare-coverage-database/view/article.aspx?articleId=57216

82 Yamada J, Lam Shin Cheung J, Gagne M, et al. Barriers and Enablers to Objective Testing for Asthma and COPD in Primary Care: A Systematic Review Using the Theoretical Domains Framework. Chest. 2022;161(4):888-905. doi:10.1016/j.chest.2021.10.030

83 Patient-Centered Outcomes Research Institute. Patient-Centered CER Adapts Asthma Treatment to the Patient — Not the Other Way Around. PCORI Stories. March 8, 2024. Accessed September 13, 2024. https://www.pcori.org/impact/pcori-stories/patient-centered-cer-adapts-asthma-treatment-patient-not-other-way-around

84 Iglesia EGA, Greenhawt M, Shaker MS. Achieving the Quadruple Aim to Deliver Value-Based Allergy Care in an Ever-Evolving Health Care System. Ann Allergy Asthma Immunol. 2020;125(2):126-136. doi:10.1016/j.anai.2020.04.007

85 American College of Allergy, Asthma & Immunology. Value-Based Care Task Force Identifies Opportunities for Allergists. Advocacy Resources. November 20, 2023. Accessed September 13, 2024. https://college.acaai.org/value-based-care-task-force-identifies-opportunities-for-allergists/

86 Plain C. Efforts to Transform Health Care Led to Better Asthma Outcomes - School of Public Health - University of Minnesota. News: University of Minnesota School of Public Health. April 3, 2018. Accessed September 13, 2024. https://www.sph.umn.edu/news/efforts-transform-health-care-led-better-asthma-outcomes/

87 Agency for Healthcare Research and Quality. Care Coordination. National Center for Excellence in Primary Care Research. August 2018. Accessed September 3, 2024. https://www.ahrq.gov/ncepcr/care/coordination.html

88 Busse PJ, McDonald VM, Wisnivesky JP, Gibson PG. Asthma Across the Ages: Adults. J Allergy Clin Immunol Pract. 2020;8(6):1828-1838. doi:10.1016/j.jaip.2020.03.044

89 Hartert T, Bacharier LB. An Overview of Asthma Management in Children and Adults. UpToDate. June 14, 2024. Accessed September 13, 2024. https://www.uptodate.com/contents/an-overview-of-asthma-management-in-children-and-adults

90 Trivedi M, Denton E. Asthma in Children and Adults—What Are the Differences and What Can They Tell us About Asthma? Front Pediatr. 2019;7:256. doi:10.3389/fped.2019.00256

91 Patient-Centered Asthma Care - MN Dept. of Health. Accessed September 13, 2024. https://www.health.state.mn.us/diseases/asthma/professionals/healthcareprofessionals.html

92 American Lung Association. Managing Asthma. Lung Disease Lookup: Asthma. July 25, 2024. Accessed September 13, 2024. https://www.lung.org/lung-health-diseases/lung-disease-lookup/asthma/managing-asthma

93 Winders T, Fineman SM, Napolitano N. Access to Care for Allergy and Asthma Patients and Families. J Allergy Clin Immunol. 2017;139(2):AB103. doi:10.1016/j.jaci.2016.12.334

94 Rhee H, Love T, Wicks MN, et al. Long-term Effectiveness of a Peer-Led Asthma Self-management Program on Asthma Outcomes in Adolescents Living in Urban Areas: A Randomized Clinical Trial. JAMA Netw Open. 2021;4(12):e2137492. doi:10.1001/jamanetworkopen.2021.37492

95 Harris B, Silberman J, Sarlati S, et al. Digital Asthma Self-Management Tool Reduced Emergency Visit Rates in a Medicaid Population. Ann Allergy Asthma Immunol. 2023;131(5):S230-S231. doi:10.1016/j.anai.2023.10.021

96 Federman AD, O'Conor R, Mindlis I, et al. Effect of a Self-management Support Intervention on Asthma Outcomes in Older Adults. JAMA Intern Med. 2019;179(8):1113-1121. doi:10.1001/jamainternmed.2019.1201

97 Dawson RM, Heiney SP, Messias DH, Ownby D. A Patient-Centered Asthma Management Communication Intervention for Rural Latino Children: Protocol for a Waiting-List Randomized Controlled Trial. JMIR Res Protoc. 2020;9(12):e18977. doi:10.2196/18977

98 Tzeng YF, Chiang BL, Chen YH, Gau BS. Health Literacy in Children with Asthma: A Systematic Review. Pediatr Neonatol. 2018;59(5):429-438. doi:10.1016/j.pedneo.2017.12.001

99 Poureslami I, FitzGerald JM, Tregobov N, Goldstein RS, Lougheed MD, Gupta S. Health Literacy in Asthma and Chronic Obstructive Pulmonary Disease (COPD) Care: A Narrative Review and Future Directions. Respir Res. 2022;23(1):361. doi:10.1186/s12931-022-02290-5

100 Caulfield JI. Anxiety, Depression, and Asthma: New Perspectives and Approaches for Psychoneuroimmunology Research. Brain Behav Immun - Health. 2021;18:100360. doi:10.1016/j.bbih.2021.100360

101 Stanescu S, Kirby SE, Thomas M, Yardley L, Ainsworth B. A Systematic Review of Psychological, Physical Health Factors, and Quality of Life in Adult Asthma. NPJ Prim Care Respir Med. 2019;29(1):1-11. doi:10.1038/s41533-019-0149-3

102 Louis G, Schleich F, Louis R, et al. How Respiratory Symptoms Impact Asthma-Related Quality of Life in Mild Asthmatics. Respir Med. 2023;207:107098. doi:10.1016/j.rmed.2022.107098

103 Kharaba Z, Feghali E, El Husseini F, et al. An Assessment of Quality of Life in Patients With Asthma Through Physical, Emotional, Social, and Occupational Aspects. A Cross-Sectional Study. Front Public Health. 2022;10:883784. doi:10.3389/fpubh.2022.883784

104 Ilmarinen P, Juboori H, Tuomisto LE, Niemelä O, Sintonen H, Kankaanranta H. Effect of Asthma Control on General Health-Related Quality of Life in Patients Diagnosed with Adult-Onset Asthma. Sci Rep. 2019;9:16107. doi:10.1038/s41598-019-52361-9

105 Leso V, Candia C, Pacella D, et al. Quality of Life and Work Functionality in Severe Asthma Patients: The Impact of Biological Therapies. J Occup Med Toxicol. 2024;19(1):8. doi:10.1186/s12995-024-00406-9

106 Myers L, Murray RK. Overcoming Health Literacy Barriers to Improve Asthma Inhaler Therapy Adherence. Ann Am Thorac Soc. 2019;16(2):182-186. doi:10.1513/AnnalsATS.201805-338PS

107 Wu TD, Diamant Z, Hanania NA. An Update on Patient-Reported Outcomes in Asthma. Chest. 2024;165(5):1049-1057. doi:10.1016/j.chest.2024.02.010

NCQA1294-1024