The Patient-Centered Asthma Care Payment (PCACP) Provider-Focused Payment Model Environmental Scan

June 11, 2019

I. Overview

This environmental scan provides members of the Physician-Focused Payment Model Technical Advisory Committee (PTAC) background on The Patient-Centered Asthma Care Payment (PCACP) Provider-Focused Payment Model, a physician-focused payment model (PFPM) emphasizing care coordination and improved care management for Medicare beneficiaries with asthma. This model was proposed to the PTAC by the American College of Allergy, Asthma & Immunology on May 1, 2019.

To help PTAC consider this proposal, the current scan summarizes the epidemiology of asthma and asthma-like symptoms with a focus on Medicare populations; describes issues in delivering asthma care to the elderly; reviews Medicare payment policy regarding asthma services and other payment policy associated with care coordination more broadly; and presents research findings associated with this model and similar payment and delivery models. Section II presents an annotated bibliography of the sources cited in this scan. Section III includes the questions, search terms, and sources used to identify the research summarized below.

Epidemiology of Asthma and Asthma-Like Symptoms

The current proposal applies to three groups of Medicare beneficiaries:

- Beneficiaries newly experiencing asthma-like symptoms,
- Beneficiaries with difficult-to-control asthma who require ongoing care, and
- Beneficiaries with well-controlled asthma who require continued maintenance.

This section synthesizes the existing evidence about the prevalence and impact of asthma and asthma-like symptoms in the general population and among Medicare beneficiaries. It also describes challenges that were identified in the literature as specific to diagnosing and treating asthma in an elderly population.

***Overview and Prevalence*.** Asthma is a prevalent chronic disease, affecting approximately 8 percent of the population in the United States (CDC, 2018). Asthma affects all age groups, including a substantial proportion of the elderly. As of 2017, the lifetime prevalence of asthma among adults age 65 and over was 11.1 percent, and the current prevalence of asthma for the same age group was 7 percent (CDC, 2018). In 2017, approximately 5.1 percent of all Medicare fee-for-service (FFS) beneficiaries, including 5 percent of beneficiaries 65 years or older, had claims with asthma diagnosis (CMS, 2019). As people with asthma are living longer, the prevalence of elderly asthmatics is likely to grow (Budde et al., 2018). The incidence of asthma in the elderly is difficult to estimate due to recall bias that may influence the reliability of self-reported estimates, and there is limited published information describing incidence among Medicare beneficiaries. However, the studies have shown that, overall, the incidence of asthma decreases slowly with age (Battaglia et al., 2016).

Impact of Asthma in Elderly Populations. Elderly patients with undiagnosed or inadequately treated asthma may experience ongoing symptoms that lead to avoidable health care utilization. According to data from the 2014 National Ambulatory Care Medical Survey (NAMCS), asthmatics age 65 and older experience 14.9 emergency department (ED) visits with asthma as the primary diagnosis ("asthma-related") per 10,000 beneficiaries, a lower rate than other age groups (CDC, 2019). However, asthmatics age 65 and older experience a higher rate of asthma-related physician office visits than any age group over the age of 17. Those age 65 years and older also had the highest rate of asthma-related hospital inpatient stays, and hospitalizations among the elderly account for 22.8 percent of all asthma-related hospitalizations (CDC, 2019). Despite the overall decline in asthma mortality over the past years, elderly asthmatic patients suffered disproportionately from the burden of the disease, with a higher asthma death rate compared with younger patients with asthma (Moorman et al., 2012; Tsai et al., 2012; Dunn et al; 2017).

Asthmatics over 65 have the highest rate of asthma-related deaths (29.2 per million) compared with other adult age groups (CDC, 2018). A cohort study, using a nationally representative sample of ED visits by patients with acute asthma, concluded that elderly patients with asthma are five times more likely to die compared to younger patients, after adjusting for comorbidities (Tsai et al., 2012).

Diagnostic Challenges. While the symptoms of asthma among the elderly are similar to those of younger asthmatics, the diagnosis of late-onset asthma among elderly populations can be challenging and delayed (King et al., 2010; Hanania et al., 2010; Ulrik, 2017). The literature attributes this to multiple factors, including a misconception that asthma is a childhood disease. In addition, clinicians perceive asthma symptoms less often in this population due to age and disability (Enright et al.,1999; Bellia et al 2003; King et al; 2010; Hanania et al, 2011; Gonzalez-Garcia et al., 2014; Battaglia et al., 2016). Another complicating factor is the common co-occurrence of asthma and chronic obstructive pulmonary disease (COPD) (Bellia, 2003; Tzortzaki, 2011). Clinicians may confuse asthma symptoms in elderly patients with chronic obstructive pulmonary disease (COPD) or other conditions (Bellia et al., 2003). Results from a systematic literature review indicated that the prevalence of coexisting asthma and COPD was 20.9 percent among patients with obstructive airway diseases (asthma or COPD) and a mean age onset of 33 years old (Gibson and McDonald, 2015). The burden of comorbidities such as COPD, rhinitis, depression, cognitive impairment, and diabetes among the elderly is likely to delay the asthma diagnosis and exacerbate the disease severity (Battaglia et al., 2016).

Issues in Payment Policy

The PCACP APM would replace current evaluation and management (E&M) payments with bundled payments for allergists and pulmonologists. The model is intended to support comanagement of asthma patients by primary care providers and asthma specialists using a shared-risk arrangement; it also would give physicians additional resources and flexibility to more accurately diagnose, treat, and manage patients with asthma. This section includes a review of Medicare payments for asthma-related services similar to those offered in PCACP. This summary can help inform discussion of how this current proposal can improve payment policy. The final portion of this section briefly presents other payment models that incentivize coordination between specialists and primary care providers.

Covered Asthma Services & Supports Under Medicare. Pulmonologists and allergists are eligible to bill Medicare using E&M codes for office visits. They also can bill under FFS Medicare for additional

respiratory care services such as pulmonary function testing (including physician office-based spirometry), demonstration of inhaler techniques, smoking cessation counseling, and fractional exhaled nitric oxide (FeNO) testing. Self-management education and training services (including asthma) are not separately billable codes under Medicare (Arnold 2018; AARC, 2018).

Recent changes to the Medicare Physician Fee Schedule (PFS) may inform the PTAC's consideration of the PCACP proposal. As of November 1, 2018, the Centers for Medicare and Medicaid Services (CMS) changed the Medicare PFS for calendar year 2019 (CMS, n.d.). Changes include:

- *Changes to documentation, coding, and payment E&M codes*. Physicians may focus their documentation on what has changed since the last visit if relevant information is already in the medical record and are no longer required to document reasoning on the medical necessity of a home visit as opposed to an office visit.
- *Technology-based communication services*. Under the new PFS, physicians can bill for three categories of technology-based communications:
    - "Virtual check ins" (i.e., a short meeting with the patient to determine if an office visit is necessary);
    - Remote monitoring through recorded video or images submitted by an established patient; and
    - Longer consultations by video with other care providers.

Medicare Physician Fee Schedule for Chronic Care Management Services. In 2015, Medicare began paying separately under the PFS for Chronic Care Management (CCM) services provided to Medicare beneficiaries with multiple (two or more) chronic conditions.

Currently, the covered CCM services for Medicare FFS beneficiaries with multiple chronic conditions include:

- management of transitions between health care providers (including referrals);
- follow-up after an ED visit or facility discharge;
- creation and exchange of continuity of care documents with other practitioners and providers;
- use of a certified electronic health record (EHR); and
- comprehensive care management and care planning. (ACP, 2017; MLN, 2016)

The CCM codes are intended for use by the clinician who is providing the majority of the care coordination services. Frequently, this is the primary care provider. However, specialists such as pulmonologists who are active participants in a patient's care team and provide coordinated care are eligible to bill CCM codes (Rivera, 2018; ACP, 2017).

Coverage of home environmental supplies. Home intervention supplies for the treatment of asthma are not currently covered under Medicare FFS. Two proposed alternative payment models that would allow for home intervention supplies are: 1) an enhanced FFS model that would cover environmental health supplies related to managing symptoms and preventing exacerbation, or 2) a "payment for lives covered" payment that would allow for a mix of services that would best fit the needs of the patient. These payment models would allow providers to address factors that could adequately control asthma symptoms (Tschudy et al., 2017).

Problems in Asthma Care Delivery

The PCACP model proposes bundled payments that will apply to three separate categories of patients: diagnosis and initial treatment for patients with poorly controlled asthma-like symptoms, continued care for patients with difficult-to-control asthma, and continued care for patients with well-controlled asthma. This section describes the clinical guidelines for asthma treatment, clinical classifications for asthma, and the unique challenges posed by delivering asthma care to the Medicare population.

Clinical guidelines for asthma. Clinical guidelines issued by the National Heart, Lung, and Blood Institute (NHLBI) focus on helping patients achieve control over their asthma. The NHLBI issues two sets of guidelines for children (0–4 and 5–11) and a third set for children over 12 and adults. Guidelines for medication safety and efficacy, drug delivery, lung function measurements, and wheezing phenotypes are age-dependent (NHBLI, 2007).

Asthma control guidelines and standards are consistent across age groups. These guidelines focus on two domains: 1) reducing impairment and functional limitations; and 2) reducing risk of future asthma attacks, decline in lung function or reduced lung growth, and medication side effects. Providers achieve control through appropriate diagnosis, addressing environmental triggers, patient self-management through education, and long-term monitoring (NHBLI, 2007). Issues specific to diagnosis and treatment of asthma among elderly patients include a tendency for seniors to ignore or dismiss their symptoms of asthma and the perception that reduced lung function is either a part of natural aging or stemming from other comorbidities (Braman, 2017).

Severe asthma in the elderly. While there is no universal definition of severe asthma, the International European Respiratory Society and American Thoracic Society Guidelines on Definition, Evaluation and Treatment of Severe Asthma define severe asthma as "asthma which requires treatment with high dose inhaled corticosteroids plus a second controller (and/or systemic corticosteroids) to prevent it from becoming 'uncontrolled' or which remains 'uncontrolled' despite this therapy" (Chung, 2013). Per these guidelines, there are four criteria that qualify a patient as having "uncontrolled" asthma:

1. Poor symptom control;
2. Frequent severe exacerbations (two or more in the previous year);
3. Serious exacerbations (at least one hospitalization, Intensive Care Unit stay or mechanical ventilation in the previous year); and
4. Airflow limitation.

Self-management of asthma through education and treatment compliance are key to controlling severe asthma (NHLBI, 2011). A 2015 study of Severe Asthma Research Program patients found that the probability of severe asthma in older asthmatics is higher than young adults. Therefore, older asthmatics more frequently receive high-dose corticosteroids and long-acting beta agonists relative to other asthmatics (Zein, 2015).

Studies show that well-controlled asthma is associated with reduced use of health care resources and impairment (Sullivan, 2007; Bateman et al., 2007). A prospective cohort study of nearly 5,000 adult patients with severe or difficult-to-treat asthma concluded that poorly controlled asthma is associated with higher risk of severe asthma-related health events, controlling for demographics and other conditions (Sullivan, 2007). Similarly, a 2015 study examined asthma utilization and costs of severe

uncontrolled asthma (SUA), defined as two or more asthma exacerbations, six or more medium- or high-dose dispensed canisters of inhaled corticosteroids (ICS) alone or with a long-acting beta agonist, and three or more dispensed non-ICS controllers in a given year. The authors noted several characteristics of the SUA group; this group was significantly older, had more comorbidities at baseline, used more asthma specialist care and medication, and experienced more exacerbations when compared to asthmatic patients with non-SUA. These patients also reported higher use of short-acting beta agonist, an asthma drug that is added when ICS drugs do not control symptoms. Their all-cause and asthma-related costs were higher than those with non-severe asthma, adjusting for patient characteristics including age, gender, socioeconomic (SES) factors, and comorbidities. The mean cost per patient at follow-up was $2,325 in severe asthmatics, as opposed to $1,261 in non-severe asthmatics. Most of the difference in cost was due to asthma drugs, with the difference being $848 on average (Zieger et al., 2016).

Care delivery gaps and best practices. According to the 2007 NHLBI guidelines, the first step in asthma care is to identify reasons for inadequate control of asthma symptoms. Continuous exposure to triggers and inadequate or poor adherence to medications do not change when higher doses of medications are prescribed (Yawn et al., 2016). A 2014 study of three primary care practice-based networks in Oklahoma and New York showed that 40 percent of patients had control assessed, 28 percent had environmental or allergic triggers assessed, and only 7 percent of patients had action plans (Mold et al., 2014).

Studies have found that gaps in asthma care derive from the lack of guideline adherence and lack of focus on patient-centered outcomes. The patient's severity, comorbidities, and adherence patterns should drive the appropriate course of treatment. A review of patient-centered outcomes research shows that older adults' asthma management plans are more complex than adults and children when taking comorbidities into account. The most successful outcomes are a combination of tailored assessment and monitoring and repeated self-management patient education including an asthma action plan and self-monitoring tools (Qamar et al., 2011).

Social determinants affecting asthma outcomes. Social determinants of health affect care and outcomes for asthma. A 2013 study assessed the interaction between health literacy and moderate-to-severe asthma control among people over 60 years of age. Patients with low health literacy had more than twice the rate of hospitalizations and ED visits as those with higher literacy skills, and their percent predicted values for the forced expiratory volume in 1 second (FEV1) were 11 percent lower (Federman et al., 2014). Socioeconomic status has also been shown to affect asthma outcomes; asthmatics with lower incomes have higher treatment problems as well. In a randomized controlled trial of adults with mild to moderate asthma, households with incomes less than $50,000 a year had a 1.5-fold higher rate in treatment failure and a 1.8-fold higher rate in exacerbation. This is independent of all adjustments and comorbidities (Cardet et al., 2018).

Telehealth. Under the PCACP model, participating providers would be eligible to receive payments to support telephone or telemedicine contacts with patients. Telemedicine is rapidly expanding for both rural and urban populations, and Medicare currently covers telehealth for certain conditions. Currently, covered telehealth services have to originate in a county outside of a Metropolitan Statistical Area, or at a rural Health Professional Shortage Track (CMS & MLN,2019). The Medicare Telehealth Parity Act (H.R.2550), introduced in the House as of June 1, 2017, would expand those services to additional originating sites and to respiratory services, among other services.

Telehealth can be used for asthma in rural populations who are not able to visit their clinic regularly. A 2016 study of children with asthma residing in two remote locations in Kansas were given the choice of an in-person visit or a televisit. The televisit included a Remote Presence Solution with a digital stethoscope, otoscope, and high-resolution camera. The physician provided diagnostic and educational procedures. Both groups achieved similar amounts of improvement in asthma over time (Portnoy et al., 2016).

Results of Other Similar or Proposed Models

This section describes the results of similar payment or delivery reform models for asthma, as well as results for similar or proposed models, including asthma-specific models and models that encourage coordination between specialists and primary care providers. Because there are few models focused on a Medicare population and many asthma-related models focus on a pediatric population, descriptions of models aimed at other populations (e.g., pediatric settings) are included below.

Payment & Delivery Models Addressing Asthma:

- *Evaluation of a pharmacist-managed asthma clinic in an Indian Health Service clinic.* In a Yakama Indian Health Service (IHS) ambulatory care clinic, pharmacists assessed patients with an Asthma Control Test, medical history, and brief physical examination. The pharmacist spent a majority of the time providing education materials, self-management tools, and completing an asthma action plan. The patients were referred to a primary or urgent care provider if they were exhibiting exacerbating symptoms. At subsequent visits to any provider that cares for their asthma, the asthma action plan was reviewed and updated. This intervention led to a reduction of asthma-based hospitalizations and ED visits (Pett and Nye, 2016).
- *Seattle-King County Healthy Homes Project.* A randomized controlled trial of 274 low-income households in Seattle with a child that is between 4 and 12 with asthma were given either a high-intensity plan with seven home visits and full community resources or a low-intensity plan with one home visit and limited resources. The high-intensity group had higher pediatric asthma caregiver quality of life and asthma-related urgent health services. Both groups had a decline in symptom days (Kreiger et al., 2005).
- *Children's Hospital Boston Community Asthma Initiative.* Modeled after the Healthy Homes Project, this community-based initiative of 2 to 18 asthmatics from four low-income Boston zip codes has three major goals. These three goals are education, case management of families, and advocacy policy for these issues with each goal having SMART—specific, measurable, attainable, relevant, and timely—objectives. This program led to a 64 percent reduction in ED visits, 79 percent decrease in hospitalizations, a 32 percent reduction in limited physical activity, and a 56 percent increase in asthma action plans (Sommer et al., 2011).

Payment & Delivery Models Addressing Care Coordination for Specialists:

- *Comprehensive Primary Care Initiative (CPCI) & Comprehensive Primary Care Plus (CPC+).* The CPCI found that participating practices have improved referral tracking and patient information sharing with specialists (Peikes et al., 2018). The CPC+ program is a public-private partnership that includes three payment elements: the Care Management Fee on a quarterly basis per beneficiary-per month, a Performance-Based Incentive Payment, and payments under the Medicare Physician Fee Schedule.

- *Patient-Centered Specialty Practice (PCSP) Recognition Program.* The PSCP is a recognition through the National Committee for Quality Assurance (NCQA), introduced in 2018. The majority of practices are small, fewer than 4.5 clinicians per practice sites. Because this model is new, there are no current evaluation results. At the time of this writing, the NCQA Report Card identifies 503 recognized PCSP practices, 11 of which are pulmonary practices.

Information on the Submitter. The American College of Allergy, Asthma & Immunology is a professional medical organization with over 6,000 members, including allergist/immunologists, medical specialists, allied health and related health care professionals with a special interest in the research and treatment of allergic and immunologic diseases.

II. Annotated Bibliography

American Association for Respiratory Care. *Coding Guidelines for Certain Respiratory Care Services* AARC.org. Retrieved from https://www.aarc.org/wp-content/uploads/2014/10/aarc-coding-guidelines.pdf. Accessed June 9, 2019.

Subtopic(s): Issues in Payment Policy

Type of Source: Clinical resource issued by AARC

Objective: To provide coding guidance for those respiratory care services most frequently asked about. The guidance is based on the Medicare program's coding and coverage policies.

Main Findings: Coding guidelines can help providers better navigate standardized coding and ensure that they are able to submit claims for payments in a consistent manner. Guidelines provided are included for: smoking cessation, inhaler techniques, self-management education and training services (including asthma), office spirometry, peak flow meter, inhalation treatment for acute airway obstruction, ventilation management (including CPAP), pulmonary rehabilitation, six-minute walk test, pulmonary function test, mechanical chest wall oscillation, and other miscellaneous codes.

Strengths/Limitations: The guidelines provide an overview of the Health Care Common Procedure Coding Set (HCPCS) and general information about Medicare. However, the guidelines also reiterate that it is only an informed opinion of respiratory therapists and advisors who are not coding specialists but have experience and knowledge of codes and coverage policies. They remind physicians to verify the patient's eligibility and payer coding requirements before providing a service as benefits are subject to specific plan policies, which can vary among both public and private payers.

Generalizability to Medicare Population: Yes

Methods: N/A

American College of Allergy, Asthma & Immunology (ACAAI). New Medicare coverage for interprofessional consults and virtual check-ins. ACAAI Member Website. https://college.acaai.org/advocacy/advocacy-insider/new-medicare-coverage-interprofessional-consults-and-virtual-check-ins. Published November 26, 2018. Retrieved June 3, 2019.

Subtopic(s): Issues in Payment Policy

Type of Source: Issue brief

Objective: To review the Medicare changes in billing for physicians.

Main Findings: Physicians can bill for inter-professional consults, as long as there is not a transfer of care within a two-week span, it is longer than five minutes, and over half of the time is dedicated to consultative discussion. Physicians can also bill for virtual check-ins over the phone and through video, to assess if the patient needs an office visit.

Strengths/Limitations: N/A

Generalizability to Medicare Population: Yes

Methods: N/A

American College of Physicians (ACP). *Chronic Care Management Tool Kit: What Practices Need to Do to Implement and Bill CCM Codes*. ACPonline.org. 2017. https://www.acponline.org/system/files/documents/running_practice/payment_coding/medicare/chronic_care_management_toolkit.pdf.

Subtopic(s): Issues in Payment Policy

Type of Source: Clinical Resource/Toolkit
Objective: To provide background information and step-by-step process guidance throughout the coding process that enables practices to implement and bill CCM codes.
Main Findings: The toolkit emphasizes the importance of implementing and coding Chronic Care Management (CCM). The document outlines the creation and revision of electronic care plans that are a key component of CCM.
Strengths/Limitations: Toolkit provides sample documents (e.g., "Sample log of CCM Patients"; "Sample Welcome Letter and Visit Checklist"). Additionally it provides a step-by-step process on CCM Code implementation. The document could benefit from more extensive coding guidelines.
Generalizability to Medicare Population: Yes
Methods: N/A

Arnold RJ, Massanari M, Lee TA, Brooks E. A review of the utility and cost effectiveness of monitoring fractional exhaled nitric oxide (FeNO) in asthma management. *Manag Care.* 2018;27(7):34–41.
Subtopic(s): Issues in Payment Policy
Type of Source: Journal Article
Objective: To summarize the cost-effectiveness data that support the use of FeNO monitoring within the areas related to the diagnosis and management of asthma.
Main Findings: FeNO monitoring has the potential to be cost effective. The associated device used for monitoring is relatively inexpensive and can add clinical value when combined with other clinical tools for managing patients with asthma. Incorporating FeNO into asthma management helps to identify patients at risk for future exacerbations and is associated with substantial cost savings in those patients.
Strengths/Limitations: Adding to existing literature that makes it evident that the value and importance of incorporating objective and biomarkers into improving the diagnosis and management of asthma is important.
Generalizability to Medicare Population: Yes
Methods: The review analyzed existing peer-reviewed research explored: the clinical use of biomarkers in asthma for detecting airway inflammation, asthma diagnosis, steroid responsiveness and dosing of ICS, asthma control monitoring, the role of FeNO monitoring in reducing asthma exacerbations, medication adherence, and asthma biologics.

Bateman ED, Bousquet J, Keech ML, Busse WW, Clark TJH, Pedersen SE. The correlation between asthma control and health status: the GOAL study. *Eur Respir J.* 2007;29(1):56–62. https://doi.org/10.1183/09031936.00128505
Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: To investigate the association between guideline-derived asthma control and health related quality of life, using the Asthma Quality of Life Questionnaire (AQLQ) among patients with uncontrolled asthma.
Main Findings: The study found that the AQLQ scores improved during the study. The proportions of achieving clinically meaningful improvement where higher in patients with total control and well-controlled compared with those in not well-controlled.
Strengths/Limitations: The study did not have any placebo group.
Generalizability to Medicare Population: No
Methods: GOAL was a randomized, double-blinded study. Participants were allocated to three intervention groups (total control, well-controlled, and not well-controlled) based on their dose

of inhaled corticosteroid. AQLQ scores were presented as the mean of each domain, as well as an overall score.

Battaglia S, Benfante A, Spatafora M, Scichilone N. Asthma in the elderly: a different disease? *Breathe*. 2016;12(1):18–28. https://doi.org/10.1183/20734735.002816

Subtopic(s): Epidemiology of Asthma
Type of Source: Review Article
Objective: To determine whether asthma among elderly population maintains the same characteristics as in the young population.
Main Findings: The study concluded that asthma among elderly can be difficult to identify due to "modification of the functional characteristics." Findings from this study suggested clinicians should treat comorbid conditions that are associated with asthma among elderly; asthma management among elderly patients should be a more "dysfunction-oriented" behavior rather than "disease-oriented."
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: A comprehensive review of the literature regarding asthma in the elderly.

Bel EH, Sousa A, Fleming L, Bush A, Chung KF, Versnel J, et al., on behalf of the members of the Unbiased Biomarkers for the Prediction of Respiratory Disease Outcome (U-BIOPRED) Consortium, C. G. Diagnosis and definition of severe refractory asthma: an international consensus statement from the Innovative Medicine Initiative (IMI). *Thorax*. 2011;66(10):910-917. https://doi.org/10.1136/thx.2010.153643

Subtopic(s): Epidemiology of Asthma
Type of Source: Review Article
Objective: To define severe asthma in adults and children
Main Findings: Severe asthma presents differently in adults and children, as well as within the age cohorts. There are sub-phenotype markers that allow for determination of severe asthma and if the disease will respond to various treatments. There is international consensus on the definition of severe asthma and a stepwise algorithm to identify a patient with severe asthma.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: The Unbiased Biomarkers for the Predication of Respiratory Disease Outcomes consulted with existing recommendations, patients, and clinicians to define severe asthma and determine best practices for treatment.

Bellia V, Battaglia S, Catalano F, Scichilone N, Incalzi RA, Imperiale C, Rengo F. Aging and disability affect misdiagnosis of COPD in elderly asthmatics: the SARA study. *Chest*. 2003;123(4):1066-1072. https://doi.org/10.1378/chest.123.4.1066

Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: To determine to what extent the COPD is misdiagnosed or the disease (COPD) remains unrecognized among elderly asthmatic patients.
Main Findings: This study concluded that asthma is commonly confused with COPD among elderly population. Misdiagnosis can be associated with older age and greater degree of disability.
Strengths/Limitations: N/A

Generalizability to Medicare Population: Yes (mean age: 73 ± 6.4 years)
Methods: Participants were selected from a prior cohort study (Salute Respiratoria nell'Anziano). Participants all underwent a clinical evaluation, including: 1) clinical history, and 2) spirometry.

Braman SS. Asthma in the elderly. *Clin Geriat Med*. 2017;33(4):523-537. https://doi.org/10.1016/j.cger.2017.06.005
Subtopic(s): Problems in Care Delivery
Type of Source: Journal Article
Objective: To assess the current state of knowledge relating the asthma in the elderly and provide direction for future research.
Main Findings: New-onset asthma may occur at any age, including the elderly. Individuals of old age who have long-standing asthma usually have a history of atopy. Alternatively, asthma that begins at an advanced age is usually nonatopic and has low rates of remission. While there are no specific protocols for the treatment of asthma in the elderly, individuals can be subject to objective monitoring, avoid asthma triggers, use pharmacotherapy, and observe patient education. Additionally, most elderly asthmatics tolerate asthma medications well with minimal adverse drug reactions.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: A comprehensive review of the literature regarding asthma in the elderly. Assessed the epidemiology, pathophysiology, clinical features, objective measures, and treatment.

Budde, J., & Skloot, G. S. (2018). Is aging a "comorbidity" of asthma? *Pulmonary Pharmacology & Therapeutics*, *52*, 52–56. https://doi.org/10.1016/j.pupt.2018.06.005
Subtopic(s): Epidemiology of Asthma
Type of Source: Review Article
Objective: To discuss the impact of aging on asthma diagnosis and severity.
Main Findings: Aging can be considered as a "comorbidity" of asthma since it impacts the structural and functional changes in the lung. As the aging population is projected to increase, the morbidity and mortality of asthma are expected increased in the elderly population. Therefore, it is crucial to understand the impact of aging on all aspects of asthma presentation and management.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: A comprehensive review of the literature regarding asthma in the elderly. Discussed the factors that justify considering aging as a comorbidity of asthma.

Cardet JC, Louisias M, King TS, Castro M, Codispoti CD, Dunn R., et al. Income is an independent risk factor for worse asthma outcomes. *J Allergy Clin Immunol*. 2018;141(2): 754-760.e3. https://doi.org/10.1016/j.jaci.2017.04.036
Subtopic(s): Problems in Care Delivery
Type of Source: Journal Article
Objective: To determine if low SES would be associated with poor asthma outcomes due to lower vitamin D levels at baseline, an inability to achieve vitamin D sufficiency with supplementation, or a differential effectiveness of vitamin D supplementation.

Main Findings: In the context of a randomized controlled trial, participants with lower income were more likely to experience adverse asthma outcomes independent of education, perceived stress, race, and medication adherence. Observational studies have limitations in their ability to examine these SES disparities in patients with asthma because they too heavily rely on self-reported measures.
Strengths/Limitations: The study suffered from a limited sample size that limited their tests for effect modification by treatment on the income-adverse asthma outcomes association. Additionally, the sample size for the clinical trial was determined by the primary research hypothesis and not by measures included in the secondary analysis.
Generalizability to Medicare Population: Yes
Methods: Analyzed the effect of low SES (an income of under $50k and household education level less than a bachelor's degree) and high perceived stress on asthma morbidity across 381 participants with a mean age of 39.6.

Centers for Disease Control and Prevention. Asthma as the Underlying Cause of Death. CDC.gov. https://www.cdc.gov/asthma/asthma_stats/asthma_underlying_death.html. Published May 18, 2018. Retrieved May 29, 2019.
Subtopic(s): Problems in Care Delivery
Type of Source: Data provided by the CDC
Objective: To assess asthma death trends over time
Main Findings: Asthma deaths have decreased over time and varied by demographic characteristic. The rate of asthma deaths has decreased from 15 per million in 2001 to 10 per million in 2016 across the total population. Adults were nearly five times more likely than children to die from asthma. The asthma death rate was highest among the 65 years and older age group (29.2 (0.8)) compared with all other age groups. Females had a higher death rate and non-Hispanic blacks were two to three times more likely to die from asthma compared with other race groups. Among children, boys and non-Hispanic blacks were more likely to die from asthma. The same is true for adults.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Center for Disease Control and Prevention. Asthma-Related Healthcare Use Data 2014. CDC.gov. https://www.cdc.gov/asthma/healthcare-use/healthcare-use-2014.htm. Published April 3, 2019. Retrieved June 3, 2019.
Subtopic(s): Epidemiology of Asthma
Type of Source: Data tables provided by the CDC
Objective: To inform on the physician office visits, ED visits, and hospitalizations with asthma as the primary diagnosis by patient characteristics.
Main Findings: The data tables present estimates for physician office visits from the 2014 National Ambulatory Medical Care Survey (NAMCS), ED visits from the 2014 National Hospital Ambulatory Medical Care Survey (NHAMCS), and hospitalizations from the 2014 HealthCare Cost and Utilization Project (HCUP). These tables are stratified by patient characteristics, including age. Elderly asthmatics age 65 or older had: 1) the highest rate of hospitalization, and 2) the third highest rate of physician office visits.
Strengths/Limitations: N/A

Generalizability to Medicare Population: Yes
Methods: NAMCS collects information from the physician, rather than from the patients on information about the provision and use of ambulatory medical care services in the US. Data are obtained on patient demographics and visit characteristics. HCUP gathers data from the hospital associations, state data organizations, private data organization and federal government to create information resource of encounter level health care data, including information on in-patient stays.

Centers for Medicare and Medicaid Services. Chronic Conditions Charts: 2017. CMS.gov. https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/chronic-conditions/chartbook_charts.html. Published April 5, 2019. Retrieved May 30, 2019

Subtopic(s): Epidemiology of Asthma
Type of Source: Chronic Conditions Chartbook data tables (spreadsheet) provided by CMS
Objective: To provide an overview of chronic conditions (including asthma and COPD) among Medicare beneficiaries. The chartbook highlights the prevalence of chronic conditions among Medicare beneficiaries and the impact of chronic conditions on Medicare service utilization and spending.
Main Findings: Provides comprehensive data tables for the various figures provided in the chartbook books that include two asthma-related data tables. The percentage of Medicare FFS beneficiaries with asthma across the total population was 5.1 percent, and for individuals 65 years and older, it was 5 percent. Four percent of Medicare FFS beneficiaries with asthma had only one chronic condition; the prevalence and number of co-morbid conditions was 20 percent (1–2 conditions), 28 percent (3–4 conditions), and 49 percent (5+ conditions).
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Centers for Medicare and Medicaid Services. Chronic Care Management Services. CMS.gov. https://www.medicare.gov/coverage/chronic-care-management-services. Retrieved May 24, 2019.

Subtopic(s): Issues in Payment Policy
Type of Source: Medicare Informational Webpage
Objective: To provide information to the Medicare population regarding chronic care management services and related costs.
Main Findings: This website provides Medicare beneficiaries a high-level overview on related costs in Original Medicare, as well as a description of what chronic care management consists of.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Centers for Medicare and Medicaid Services, & Medicare Learning Network. Telehealth Services. https://www.cms.gov/outreach-and-education/medicare-learning-network-mln/mlnproducts/downloads/telehealthsrvcsfctsht.pdf. Retrieved June 7, 2019.

Subtopic(s): Problems in Care Delivery

Type of Source: Training Booklet
Objective: To determine current Medicare telehealth laws
Main Findings: Telehealth services cover a wide range of diseases but must still originate in a county outside a Metropolitan Statistical Area or a Rural Health Professional Shortage Area.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Chung KF, Wenzel SE, Brozek JL, Bush A, Castro M, Sterk PJ, et al. International ERS/ATS guidelines on definition, evaluation and treatment of severe asthma. *Eur Respir J*. 2013;erj02020. https://doi.org/10.1183/09031936.00202013
Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: Supported by the American Thoracic Society (ATS) and European Respiratory Society (ERS), a Task Force reviewed the definition and provided recommendations and guidelines on the evaluation and treatment of severe asthma in children and adults.
Main Findings: When the diagnosis of asthma is confirmed and comorbidities addressed, severe asthma is defined as asthma that requires treatment with high dose inhaled corticosteroids plus a second controller and/or systemic corticosteroids to prevent it from becoming "uncontrolled" or that remains "uncontrolled" despite this therapy. Severe asthma is a heterogeneous condition consisting of phenotypes such as eosinophilic asthma.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: Literature review followed by discussion by an expert committee

Dunn RM, Busse PJ, Wechsler ME. Asthma in the elderly and late-onset adult asthma. *Allergy.* 2017;73(2):284-294. https://doi.org/10.1111/all.13258
Subtopic(s): Description of the Issue
Type of Source: Journal Article
Objective: To review the current knowledge of asthma in the aged, specifically addressing its underlying etiologies, phenotypes, and treatment, and to highlight important areas for future research for this at-risk and growing population.
Main Findings: The article concludes that elderly asthmatics are more likely to be underdiagnosed and undertreated. Additionally, elderly patients with asthma have highest rates of morbidity and mortality from their disease than younger patients. The underlying airway inflammation of asthma in this age group likely differs from younger patients and is felt to be non-type 2 mediated. These elderly patients are often underrepresented in clinical trials, subgroup analysis of large clinical trials suggests they may be less likely to respond to traditional asthma therapies.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: Comprehensive literature review of over 150 studies that relate to asthma in the elderly and late-onset adult asthma.

Enright PL, Mc Clelland RL, Newman AB, Gottlieb DJ, Lebowitz MD. Underdiagnosis and undertreatment of asthma in the elderly. *Chest*. 1999;116(3):603-613. https://doi.org/10.1378/chest.116.3.603

Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: To describe the clinical correlates of asthma in a community-based sample of elderly Individuals.
Main Findings: Participants in the study with fixed or probable asthma were much more likely than other participants to have a family history of asthma, childhood respiratory problems, a history of workplace exposures, hay fever, nocturnal symptoms, dyspnea on exertion, chronic bronchitis, and daytime sleepiness. They were also more likely to report poorer general health that coincided with symptoms of depression and the limitation of daily activities. The study concluded that asthma is underdiagnosed in elderly people in the United States and associated with considerable morbidity, but those who are diagnosed and have existing symptoms are not being treated optimally.
Strengths/Limitations: The diversity of the original cohort included only 5 percent minority subjects—as a result, an additionally cohort of 687 black participants needed to be recruited and examined parallel to the original cohort using the same methods. Additionally, participants involved in the study were also younger, more educated, and more likely to be married and white than those who refused or were ineligible.
Generalizability to Medicare Population: Yes
Methods: Measured the standardized respiratory, sleep, and quality-of-life (QOL) questions, a medication inventory, spirometry, and ambulatory peak flow from a community sample of 4,581 individuals over 65 years old.

Federman AD, Wolf MS, Sofianou A, O'Conor R, Martynenko M, Halm EA, et al. Asthma outcomes are poor among older adults with low health literacy. *Journal of Asthma*. 2014;*51*(2):162-167. https://doi.org/10.3109/02770903.2013.852202

Subtopic(s): Problems in Care Delivery
Type of Source: Journal article
Objective: To examine the association of health literacy (HL) with asthma outcomes among older asthmatics.
Main Findings: The article determined that low health literacy is associated with poor asthma control by objective measure, and greater likelihood of ED visits and hospitalization. Low health literacy is one among several factors that might contribute to the disproportionately poor outcomes experienced by older asthmatics. Addressing low health literacy is an important step in future interventions to improve asthma outcomes in the elderly.
Strengths/Limitations: The study was required to exclude 19 participants because of missing data on health literacy; as a result, their exclusion may have decreased the association between health literacy and the asthma outcomes measured. An additional 20 participants were missing data on percent predicted outcome measures. Next, the data were observational and thus prohibit assumptions about causality. Furthermore, because the cohort was made up of older adults, cognitive dysfunction could account for problems with chronic illness, self-management and subsequently asthma outcomes.
Finally, the sample was drawn from low-income, inner-city communities and the generalization of these findings to other populations should be made with caution.
Generalizability to Medicare Population: Yes
Methods: The study included adults over the age of 60 with moderate to severe asthma in Chicago and New York City. Participant's asthma control and the percent predicted forced

expiratory volume at 1s by spirometry, hospitalizations, and ED visits in the past six months, and quality of life were assessed.

Gibson PG, McDonald VM. Asthma–COPD overlap 2015: now we are six. *Thorax*. 2015;*70*(7):683-691. https://doi.org/10.1136/thoraxjnl-2014-206740

Subtopic(s): Epidemiology of Asthma
Type of Source: Systematic Review
Objective: To review and identify articles examining new insights and treatments and to identify remaining knowledge gaps for asthma-COPD overlap.
Main Findings: Asthma-COPD overlap is consistently identified with a prevalence of around 20 percent of patients with asthma or COPD. Those with asthma-COPD overlap features have increased morbidity, mortality, and potentially more comorbidities. A remaining knowledge gap includes a useful definition of asthma-COPD overlap, and the authors suggest future research to address knowledge gaps in self-management education, pharmacotherapy, risk factor modification, and comorbidities.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: The authors performed a systematic literature review of cluster articles on asthma and COPD from 2009 to 2015.

Gonzalez-Garcia, M., Caballero, A., Jaramillo, C., Maldonado, D., & Torres-Duque, C. A. (2015). Prevalence, risk factors and underdiagnosis of asthma and wheezing in adults 40 years and older: A population-based study. *Journal of Asthma*, *52*(8), 823–830. https://doi.org/10.3109/02770903.2015.1010733

Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: To assess the prevalence, underdiagnoses and risk factors of asthma and wheezing among adults aged 40+ in Colombia.
Main Findings: The study reported the prevalence of asthma and wheezing among its participants. Asthma underdiagnosis was higher in the elderly subject (64+) compared to younger adults. The study also described the risk factors related to asthma and wheezing.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: A cross-sectional study was conducted among 5539 participants, aged between 40 -93 years. Study participants were selected based on a probabilistic sampling in 5 cities of Colombia.

Hanania NA, King MJ, Braman SS, Saltoun C, Wise RA, Enright P, et al. Asthma in the elderly: Current understanding and future research needs—a report of a National Institute on Aging (NIA) workshop. *J Allerg Clin Immunol*. 2011;128(3, Supplement):S4-S24. https://doi.org/10.1016/j.jaci.2011.06.048

Subtopic(s): Epidemiology of Asthma
Type of Source: Workshop Report
Objective: To identify what is understood about care of asthma in the elderly, to identify knowledge gaps that remain, and suggest future research directions.
Main Findings: Data suggests that asthma in older adults is phenotypically different than in younger patients, which can have an effect on the diagnosis, assessment, and management in

older adults. Many research knowledge gaps were identified, which also contributed to the areas of future research identified within the categories of aging lungs, epidemiology, epigenetics, and environmental and microbiological triggers.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

King MJ, Hanania NA. Asthma in the elderly: current knowledge and future directions. *Curr Opin Pulm Med*. 2010;16(1):55. https://doi.org/10.1097/MCP.0b013e328333acb0
Subtopic(s): Epidemiology of Asthma
Type of Source: Review Article
Objective: Review current knowledge of asthma in the elderly, and identify diagnostic and management challenges, which will demonstrate needs for future research.
Main Findings: Review suggests many epigenetic changes and environmental exposures may have a role in causing asthma in elderly populations. Comorbidities are identified as a barrier in diagnosis and treatment of asthma, and further research is needed in exploring the differences between the two phenotypes of asthma in the elderly in clinical presentation, course of disease, and response to therapy.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: Clinical review of asthma knowledge.

Krieger JW, Takaro TK, Song L, Weaver M. The Seattle-King County Healthy Homes Project: A randomized, controlled trial of a community health worker intervention to decrease exposure to indoor asthma triggers. *Am J Public Health*. 2005;95(4):652-659. https://doi.org/10.2105/AJPH.2004.042994
Subtopic(s): Issues in Payment Policy
Type of Source: Journal Article
Objective: Understand the effectiveness of a community health worker intervention for children with asthma focusing on reducing exposure to indoor asthma triggers.
Main Findings: The Healthy Homes high-intensity intervention was seen to reduce urgent health services uses and improve quality-of-life scores in caregivers in comparison to the low-intensity group. Additionally, high-intensity intervention participants demonstrated significant improvements in child asthma symptoms.
Strengths/Limitations: Participants were not blinded to their group assignment, and improvements were shown also in the control low-intensity group. However, subject retention was high in the study, and loss to follow-up did not differ between groups.
Generalizability to Medicare Population: No
Methods: Utilized a randomized controlled trial including a one-year follow up, among 274 low-income households containing a child between age 4 and age 12 who had asthma. The community health workers provided in-home environmental assessments, support for behavior change, education, and resources. The participants were assigned to one of two groups: a high-intensity group receiving seven visits and full resources, or the low-intensity group receiving one visit and limited resources.

Lin MP, Vargas-Torres C, Schuur JD, Shi D, Wisnivesky J, Richardson LD. Trends and predictors of hospitalization after emergency department asthma visits among U.S. adults, 2006-2014. *J Asthma.* 2019;0(ja):1-15. https://doi.org/10.1080/02770903.2019.1621889

Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: Describe trends and predictors of adult asthma hospitalizations originating in EDs.
Main Findings: Total asthma ED visits increased 15 percent over this period, from 1.06 to 1.22 million. Prevalence-adjusted ED visits and ED hospitalization rates have declined. Uninsured patients have disproportionately more ED visits but 30 percent lower odds of hospitalization. Substantial variation implies unmeasured clinical, social, and environmental factors accounting for hospital-specific differences in hospitalization.
Strengths/Limitations: Uses the Nationwide Emergency Department Sample (NEDS), which does not include clinical data on asthma severity or demographic information such as race. Patients are not individually identified, so some may have accounted for multiple visits.
Generalizability to Medicare Population: No
Methods: Observational study of ED visits resulting in hospitalization using a nationally representative sample of ages 18 to 80+. Tested trends in hospitalization rates (2006–2014) using logistic regression, then assessed the association between hospitalization rates and patient and hospital characteristics using hierarchical multivariable regression accounting for hospital-level clustering.

Lommatzsch M, Virchow CJ. (2014). Severe asthma: Definition, diagnosis and treatment. *Deutsches Ärzteblatt International.* 2014;111(50):847-855. https://doi.org/10.3238/arztebl.2014.0847

Subtopic(s): Problems in Care Delivery
Type of Source: Review Article
Objective: To define severe asthma and address guidelines for diagnosis and treatment
Main Findings: Severe asthma is not controlled by high-dose treatment with inhaled corticosteroids and long acting beta agonists, by oral corticosteroids, or if control is lost with decreased treatment.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: A literature and clinical review of severe asthma around the world and a review on severe asthma treatment and diagnosis.

Medicare Learning Network. (December 2016). Chronic Care Management Services. Department of Health and Human Services, Centers for Medicare & Medicaid Services. Retrieved from https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/ChronicCareManagement.pdf

Type of Source: Fact Sheet
Objective: Background on payable chronic care management service codes, eligible practitioners and patients, and details Medicare Physician Fee Schedule billing requirements.
Main Findings: N/A
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Mold JW, Fox C, Wisniewski A, Lipman PD, Krauss MR, Harris DR, et al. Implementing asthma guidelines using practice facilitation and local learning collaboratives: A randomized controlled trial. *Ann Fam Med*. 2014;12(3):233-240. https://doi.org/10.1370/afm.1624

Subtopic(s): Issues in Payment Policy

Type of Source: Journal Article

Objective: To compare the effectiveness of three kinds of interventions on the completion of several asthma-related assessments, the prescription of asthma controller medication, and if the clinician recommended follow up visits for asthma.

Main Findings: Only the practice facilitation (PF) group proved more effective than the control group for assessments of asthma severity and level of control, though other groups such as the PF+ local learning collaboratives (LLCs) group improved on more measures than the other groups, followed by the LLCs-only group, the PF-only group, and then the control group.

Strengths/Limitations: The study had a strong ability to compare each intervention the control group and to the other interventions. However, each practice average 25 patients, although it was estimated that 60 were needed for multivariable modeling adjusting for clustering by practice. Additionally, the study did not consider the cost-effectiveness of the interventions and estimate the PF intervention to cost between $7,500 and $15,000 per practice, whereas the LLCs are approximated to cost half as much.

Generalizability to Medicare Population: No

Methods: A six-month, cluster randomized controlled trial was used, assigning based on geographic proximity the interventions. Each practice was assigned one of four trial groups: utilizing PF alone, LLCs alone, both PF and LLCs, or a control group. The three interventions outcomes were measured by the completion of: assessments of asthma severity, assessments of environmental triggers, asthma action plans, assessments of level of control, in addition to the prescription of asthma controller medications, and whether the clinician recommended asthma follow-up visits. All practices were given summaries of the NHLBI asthma guidelines, academic detailing, performance feedback, and a toolkit including the Asthma Control Test, Asthma APGAR, and action plan templates in English and Spanish.

Moorman JE, Akinbami LJ, Bailey CM, Zahran HS, King ME, Johnson CA, Liu, X. *National Surveillance of Asthma: United States, 2001-2010.* Washington DC: National Center for Health Statistics; 2012. Retrieved from http://books.google.com/books?id=vRai5e0s5JcC.

Subtopic(s): Epidemiology of Asthma

Type of Source: Government Report

Objective: To detail recent trends in asthma prevalence, health care use, and mortality between 2001 and 2010, and additionally presenting an overview of trends since 1980.

Main Findings: Asthma prevalence increased between 2001 and 2010, though no trend in risk-based rates for ambulatory visits and hospitalization was seen, and risk-based rates for visits to private physician offices and deaths declined.

Strengths/Limitations: N/A

Generalizability to Medicare Population: Yes

Methods: Prevalence and morbidity data were obtained from national surveys conducted by NCHS, including the National Health Interview Survey, the National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey, National Hospital Discharge Survey, and National Vital Statistics System.

National Center for Environmental Health. Asthma - Table 4-1 Current Asthma Prevalence Percents by Age, NHIS, 2017. CDC.gov. https://www.cdc.gov/asthma/nhis/2017/table4-1.htm. Published April 19, 2019. Retrieved May 30, 2019.

Subtopic(s): Epidemiology of Asthma
Type of Source: Data Table
Objective: To inform on the current asthma prevalence percent by age.
Main Findings: The table displays estimates from the 2017 NHIS for the prevalence of asthma among adults ages 65+: 7 percent of all adults ages 65 and older had asthma. The table also presents estimates of asthma prevalence among the 65+ population by gender, race ethnicity, gender and race/ethnicity, region, and family income as a percent of poverty.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: Since 1997, the NHIS has gathered information about lifetime asthma and asthma attacks or episodes from the Sample Adult Core and Sample Child Core questionnaires. A positive response to the question: "Has a doctor or other health professional ever told you that you had asthma?" determined lifetime asthma. To determine the prevalence of asthma episodes or attacks, persons answering "yes" to the lifetime asthma question were then asked, "During the past 12 months, have you had an episode of asthma or an asthma attack?" Since 2001, current asthma status has also been collected. To determine current asthma, persons answering "yes" to the lifetime asthma question were then asked, "Do you still have asthma?"

National Heart, Lung, and Blood Institute (NHLBI). Guidelines for the Diagnosis and Management of Asthma (EPR-3). National Heart, Lung, and Blood Institute website. https://www.nhlbi.nih.gov/health-topics/guidelines-for-diagnosis-management-of-asthma. Published August 28, 2007. Retrieved May 28, 2019.

Subtopic(s): Epidemiology of Asthma
Type of Source: NIH-issued Guidelines
Objective: To address the essential components of asthma care: assessment and monitoring, patient education, control of factors contributing to asthma severity, and pharmacologic treatment.
Main Findings: This document provides updates to the 1997 EPR-2 guidelines and the 2002 update on selected topics, making recommendations for asthma care.
Strengths/Limitations: N/A
Generalizability to Medicare Population: N/A
Methods: N/A

National Heart, Lung, and Blood Institute (NHLBI). (2011, February). Treating Asthma: Health Care Professionals Are the First Line of Defense. National Heart, Lung, and Blood Institute website. https://www.nhlbi.nih.gov/health-pro/resources/lung/naci/audiences/health care-professionals.htm. Published February 2011. Retrieved June 3, 2019

Subtopic(s): Problems in Care Delivery
Type of Source: Issue Brief
Objective: To determine best practices by physicians for asthma control
Main Findings: Asthma control is achieved by use of inhaled corticosteroids, documented and updated asthma action plans, documenting asthma severity, patient education, monitoring of asthma control, follow-up visits, and environmental trigger control.

Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: This National Heart, Lung, and Blood Institute clinical review examined best practices for patients.

Oraka E, Kim HJE, King ME, Callahan DB. Asthma prevalence among US elderly by age groups: Age still matters. *Journal of Asthma*. 2012;49(6):593-599. https://doi.org/10.3109/02770903.2012.684252

Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: To analyze the association between aging and asthma prevalence within the U.S. elderly population.
Main Findings: Asthma affects a meaningful proportion of the U.S. elderly population, and increased diagnosis of COPD may outweigh the correct diagnosis and treatment in advancing age populations. The authors suggest treatment guidelines should focus on preventable risk behaviors to increase quality of life.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: Studied aggregated data on over 50,000 U.S. adults age 65 and older and calculated adjusted odds ratios (AOR) and 95 percent confidence intervals to identify asthma prevalence patterns in elderly populations.

Peikes D., Anglin G., Dale S., et al. (2018). Evaluation of the Comprehensive Primary Care Initiative: Fourth Annual Report. Mathematica Policy Research.

Subtopic(s): Results from similar models
Type of Source: Report
Objective: To describe the implementation and impacts of CPCI over it is full intervention period (October 2012 – December 2016).
Main Findings: CPCI reduced hospitalizations and ED visits for Medicare FFS beneficiaries attributed to CPC practices more than beneficiaries attributed to comparison practices. Additionally, Medicare expenditures for attributed beneficiaries grew less for CPC practices than for comparison practices, but the savings were not enough to cover Medicare's CPC care management fees. CPC had little impact on beneficiaries' experience of care, except for an increase in transitional care.
Strengths/Limitations: The analysis was limited to Medicare and Medicaid FFS beneficiaries attributed to CPC practices. Additionally, the models used are likely far less complex than any rue relationships. Lastly, the lack of strong incentives under CPC limited the ability to detect relationships between better care delivery approaches and improvements in key outcomes.
Generalizability to Medicare Population: Yes
Methods: Mathematica conducted a five-year, mixed-methods, rapid-cycle evaluation which relied on a variety of survey data, practice- and payer-level qualitative data, and Medicare and Medicaid claims data. To assess CPCI's effects on costs and quality for Medicare and Medicaid FFS patients, and on stakeholder experience, outcomes for CPC practices were compared with a set of practices that were similar before the start of CPCI.

Pett RG, Nye S. Evaluation of a pharmacist-managed asthma clinic in an Indian Health Service clinic. *J Amer Pharmacists Assoc*. 2016;56(3):237-241. https://doi.org/10.1016/j.japh.2015.12.016

Subtopic(s): Epidemiology of Asthma

Type of Source: Journal Article

Objective: To study American Indian and Alaskan Native (AI/AN) patients to see whether their asthma outcomes improve when seen at a pharmacist-managed asthma clinic.

Main Findings: Asthma-related hospitalizations and ED visits were both reduced during this intervention, demonstrating the impact of formal asthma education and asthma care

Strengths/Limitations: The study did not have a control population to compare to, only a baseline rate and an intervention rate. However, the study did utilize a time period of 24 months that allowed for seasonal variation of asthma severity.

Generalizability to Medicare Population: No

Methods: Patients were referred to an asthma pharmacist by a primary care provider or urgent care provider, then the asthma pharmacist provided education and training in: asthma disease state, medication information and technique, and self-management. Patients were given a personalized asthma action plan, a peak flow meter, and a chart to document peak flow results. The charts were assessed over a 24-month period.

Portnoy JM, Waller M, De Lurgio S, Dinakar C. Telemedicine is as effective as in-person visits for patients with asthma. *Ann Allergy Asthma Immunol*. 2016;117(3):241-245. https://doi.org/10.1016/j.anai.2016.07.012

Subtopic(s): Epidemiology of Asthma

Type of Source: Journal Article

Objective: To compare asthma outcomes in children in rural areas when they are managed by telemedicine versus in-person visits.

Main Findings: The two groups were shown to have similar outcomes, leading the researchers to conclude that patients are not sacrificing asthma control by participating in telemedicine. Those in telemedicine filled out a satisfaction survey, and most strongly agreed that it was easy to see and hear the health care professional and that they understood their instructions.

Strengths/Limitations: The study had a large number of dropouts, specifically in the in-person group and did not use random assignment, potentially adding bias. The research is novel in that it addresses a gap in the current literature about using telemedicine as a replacement for in-person visits to see new patients with asthma.

Generalizability to Medicare Population: No

Methods: Children with asthma in two remote locations were given the choice of an in-person clinic visit or a telemedicine appointment at a local clinic. The telemedicine process used a Remote Presence Solution with a digital stethoscope, otoscope, and high-resolution camera. Both groups were assessed initially, after 30 days, and at 6 months. Both groups were assessed on asthma control using validated measures, and the telemedicine group was also assessed on patient satisfaction.

Qamar N, Pappalardo AA, Arora VM, Press VG. Patient-centered care and its effect on outcomes in the treatment of asthma. *Patient Relat Outcome Meas.* 2011;2:81-109. https://doi.org/10.2147/PROM.S12634

Subtopic(s): Problems in Care Delivery

Type of Source: Journal Article

Objective: To determine the outcomes of asthma patients who have been involved in patient-centered care models.
Main Findings: Forty-four of the interventional studies demonstrated improved outcomes, and 14 studies show equivalent outcomes. The studies found that patients wanted to know more about their asthma diagnosis, preferred a tailored management plan, and preferred simplified treatment regiments.
Strengths/Limitations: Many studies were in specific patient populations, making it difficult to generalize outside of asthma. However, the outcomes of these studies are relevant to multiple patient populations.
Generalizability to Medicare Population: Yes
Methods: This systematic literature review examined 58 interventional studies and 75 descriptive studies that define patient-centered asthma outcomes and perspectives.

Reddy AP, Gupta MR. (2014). Management of asthma: The current US and European guidelines. In A. R. Brasier, ed. *Heterogeneity in Asthma*. Boston: Humana Press;2014,795:81-103. https://doi.org/10.1007/978-1-4614-8603-9_6
Subtopic(s): Epidemiology of Asthma
Type of Source: Book Chapter
Objective: To summarize the evolution of asthma management guidelines and summarize the key points and evidence used in the recommendations for the assessment, monitoring, and management of asthma in all ages, with particular emphasis on the NHLBI guidelines.
Main Findings: Initial asthma management guidelines were based on expert opinion in order to employ a severity-based classification system as a guide to treatment. However, advances in asthma research led to the development of evidence-based guidelines and a major paradigm shift to control-based asthma management. Control-based management is central to the published guidelines developed by The National Heart, Lung, and Blood Institute (NHLBI), The Global Initiative for Asthma (GINA), and The British Thoracic Society (BTS), each one using the same volume of evidence but emphasizing aspects particular to their specific patient populations and socioeconomic needs.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Rivera V, DeCherrie LV, Chun A. Review of transitional care management and chronic care management codes for pulmonologists. *Chest*. 2018;154(4):972-977. https://doi.org/10.1016/j.chest.2018.05.031
Subtopic(s): Issues in Payment Policy
Type of Source: Journal Article/Review Article
Objective: To outline transitional and chronic care management codes for pulmonologists.
Main Findings: The Centers for Medicare and Medicaid Services have updated evaluation and management (E/M) codes for the 2019 calendar year. CMS continues to expand chronic care and transitional care management codes. This allows for more providers to be fairly compensated for the work that is done for more complex patients.
Strengths/Limitations: N/A
Generalizability to Medicare Population: N/A
Methods: N/A

Sommer SJ, Queenin LM, Nethersole S, Greenberg J, Bhaumik U, Stillman L, et al. Children's Hospital Boston Community Asthma Initiative: Partnerships and outcomes advance policy change. *Progress in Community Health Partnerships: Research, Education, and Action*. 2011;5(3):327-335. https://doi.org/10.1353/cpr.2011.0044

Subtopic(s): Results of Similar or Proposed Models

Type of Source: Journal Article

Objective: To analyze whether a community-based asthma initiative addresses asthma control disparities in Boston children.

Main Findings: There were significant reductions in ED visits, hospitalizations, days of limited physical activity, missed school days, parental missed workdays, and an increase in updated asthma action plans. Controlling for age, gender, race/ethnicity, income, home visit status, and asthma severity continue to show significant reductions in all categories.

Strengths/Limitations: Similar initiatives implemented in other cities and health systems show similar outcomes for pediatric asthmatics. However, the organization was unable to access complete cost analysis for all health service claims.

Generalizability to Medicare Population: No.

Methods: Asthmatic children between 2 and 18 from four low-income zip codes in Boston enrolled into the project. All children and their families were offered culturally and linguistically competent asthma education and case management through home visits and telephone follow-ups, care coordination with primary care and asthma specialists, environmental assessments and tools to combat triggers, and individual advocacy and referrals to community resources. These included HEPA vacuums, bedding encasements, and IPM materials; some families were offered pest control services.

Sullivan SD, Wenzel SE, Bresnahan BW, Zheng B, Lee JH, Pritchard M, et al. Association of control and risk of severe asthma-related events in severe or difficult-to-treat asthma patients. *Allergy*. 2007;62(6):655-660. https://doi.org/10.1111/j.1398-9995.2007.01383.x

Subtopic(s): Epidemiology of Asthma

Type of Source: Journal Article

Objective: To determine the association between self-reported asthma control and future severe asthma-related health care events.

Main Findings: After adjustment, patients with three or four control problems were at a greater risk for urgent office visits, a new course of oral steroids, emergency room visits, and hospitalizations as opposed to the group with no control problems.

Strengths/Limitations: Patients were representative of the population and were consistent with other studies that found that lower asthma control is associated with increased health care utilization. However, this study only looked at health care utilization at checkpoints and not throughout the study period.

Generalizability to Medicare Population: Yes

Methods: A regression model determined the extent of asthma control problems at baseline, 6 months, and 12 months post visit. The patients, ages 18 and over with a mean age of 49.6 years old, were surveyed using the Asthma Therapy Assessment Questionnaire.

Thompson, M. H.R.2550 - 115th Congress (2017-2018): Medicare Telehealth Parity Act of 2017. 2017.

Subtopic(s): Issues in Payment Policy

Type of Source: Bill

Objective: To provide expansion of telehealth coverage for Medicare patients.
Main Findings: Expansion of originating sites over three phases from Metropolitan Statistical areas under 50,000 residents, to 50,000 to 100,000 residents, and then over 100,000 residents. Telehealth services covered will expand to include services related to diabetes, respiratory therapists, audiologists, physical and occupational therapists, and speech therapists. Medicare would also cover store-and-forward services across the country, and not just for patients in Alaska and Hawaii.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Tsai CL, Lee WY, Hanania NA, Camargo CA. Age-related differences in clinical outcomes for acute asthma in the United States, 2006-2008. *J Allerg Clin Immunol*. 2012;129(5):1252-1258.e1. https://doi.org/10.1016/j.jaci.2012.01.061
Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: To investigate age related differences in ED presentation and clinical outcomes of patients with acute asthma.
Main Findings: Older adults (older than 55), in comparison, had higher rates of near-fatal asthma-related events, incurred higher costs, are more likely to be hospitalized, and had a longer length of stay. After adjustments for comorbidities, older asthmatic patients had a five-fold increased risk of overall mortality.
Strengths/Limitations: The study had a large representative sample size and looked at data from all payers and adjusted for COPD and asthma misdiagnosis with no change in results. However, the study used administrative and not clinical data and looked at visit-level records. The study was also not able to look at asthma medication data.
Generalizability to Medicare Population: Yes
Methods: Analysis of the 2006–2008 Nationwide Emergency Department Sample, which includes all U.S. emergency department and inpatient databases. Patients were divided into 3 age groups: children (under 18), younger adults (18–54), and older adults (55+).

Tschudy MM, Sharfstein J, Matsui E, Barnes CS, Chacker S, Codina R, et al. Something new in the air: Paying for community-based environmental approaches to asthma prevention and control. *J Allerg Clin Immunol*. 2017;140(5):1244-1249. https://doi.org/10.1016/j.jaci.2016.12.975
Subtopic(s): Issues in Payment Policy; Problems in Care Delivery
Type of Source: Journal Article
Objective: To review payment models would be most effective for covering home-based environmental interventions for asthma patients.
Main Findings: In addition to current FFS, alternative payment models include enhanced fee for service, where covered services are expanded, and "payment for lives covered," a bundled payment model that allows the provider to deliver a mix of services tailored to the patient's level of care. Current FFS does not cover home-based environmental interventions for asthma patients.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes

Methods: Review of various payment care models that reduce environmental triggers in asthma patients. This is a work group report from the Environmental Exposures and Respiratory Health Committee of the American Academy of Allergy, Asthma & Immunology.

Tzortzaki EG, Proklou A, Siafakas NM. (2011). Asthma in the elderly: Can we distinguish it from COPD? *Journal of Allergy*. 2011. https://doi.org/10.1155/2011/843543

Subtopic(s): Epidemiology of Asthma
Type of Source: Clinical Review
Objective: To highlight the testing differences to determine asthma or COPD in the elderly.
Main Findings: Both diseases cause airflow obstruction but have distinct pathogenesis, inflammatory patterns, and prognosis. They are difficult to distinguish based on spirometry alone, but lung function testing, bronchial hyper responsiveness and atopy status, scans, and biological techniques and markers can determine distinction.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: The review compared clinical methods used to treat asthma and COPD in the elderly and if practitioners are accurately diagnosing the patient.

Ulrik CS. Late-onset asthma: A diagnostic and management challenge. *Drugs & Aging*. 2017;34(3):157-162. https://doi.org/10.1007/s40266-017-0437-y

Subtopic(s): Epidemiology of Asthma
Type of Source: Clinical review
Objective: To determine how to diagnose and manage late-onset asthma in the elderly.
Main Findings: Diagnosing asthma in the elderly is a challenge due to various comorbidities, and diagnostic procedures should acknowledge those impacts. Management follows clinical guidelines, but clinical guidelines are mainly derived from non-elderly studies.
Strengths/Limitations: N/A
Generalizability to Medicare Population: Yes
Methods: N/A

Wurst KE, Laurent SS, Hinds D, Davis KJ. Disease burden of patients with asthma/COPD overlap in a US claims database: Impact of ICD-9 coding-based definitions. *Chron Obstr Pulm Dis*. 2017;14(2):200-209. https://doi.org/10.1080/15412555.2016.1257598

Subtopic(s): Epidemiology of Asthma
Type of Source: Journal Article
Objective: To assess whether differences in comorbidities, markers of disease burden, and medication treatment patterns exist among various definitions of asthma/COPD overlap.
Main Findings: The cohort contained 1,488,613 adults (18 to 65+) with COPD or obstructive asthma; 316,987 classified as diagnosis asthma/COPD overlap (including obstructive asthma), and 1,171,626 had COPD alone. The asthma/COPD overlap cohort was stratified into obstructive asthma only (14.5 percent, *n*=45,988); COPD and chronic obstructive asthma (15.3 percent, *n*=48,489); and COPD and ≥1 asthma (non-obstructed) code (70.2 percent, *n*=222,510). Patients with obstructive asthma and COPD tended to be older, with greater disease burden compared with other definitions; this population may represent a more severe form of asthma/COPD overlap.

Strengths/Limitations: coding of asthma, COPD, and chronic obstructive asthma may differ across insurance plans.
Generalizability to Medicare Population: Yes
Methods: Using the Truven MarketScan commercial and Medicare databases, patients with ≥1 COPD or chronic obstructive asthma diagnostic code were identified between January 1, 2008, and December 31, 2011. The asthma/COPD overlap group was defined and stratified based upon type and frequency of asthma diagnostic code (chronic obstructive asthma only, COPD and chronic obstructive asthma, and COPD and ≥1 asthma code).

Yawn BP, Rank MA, Cabana MD, Wollan PC, Juhn YJ. Adherence to asthma guidelines in children, tweens, and adults in primary care settings: A practice-based network assessment. *Mayo Clin Proc*. 2016;91(4):411-421. https://doi.org/10.1016/j.mayocp.2016.01.010
Subtopic(s): Problems in Care Delivery
Type of Source: Journal Article
Objective: To determine adherence to 2007 United States asthma guidelines by age.
Main Findings: The guideline adherence was highest for prescription medications and lowest for an asthma action plan. As patients became older, guideline adherence rates decreased.
Strengths/Limitations: The study's large population is diverse and representative, and the same group analyzed the data across all sites. However, patients may have received asthma care outside of their primary care office, so prescriptions may not have come from the same source. Some types of care, such as patient education, may not have been documented in electronic medical records, as they are not clinical data.
Generalizability to Medicare Population: Yes
Methods: This study examined 22 primary care practices nationwide of persistent asthma patients ages 5 to 65 years old (1,176 patients).

Zeiger RS, Schatz M, Dalal AA, Qian L, Chen W, Ngor EW, et al Utilization and costs of severe uncontrolled asthma in a managed-care setting. *J Allerg Clin Immunol Pract*. 2016;4(1):120-129.e3. https://doi.org/10.1016/j.jaip.2015.08.003
Subtopic(s): Problems in Care Delivery
Type of Source: Journal Article
Objective: To determine the clinical characteristics and economic burden of severe uncontrolled asthma.
Main Findings: The severe uncontrolled asthma cohort at baseline was older and had more comorbidities, asthma specialist care, controller medicine dispensed, and asthma exacerbations. They also had higher all-cause and asthma-related costs than patients without severe uncontrolled asthma. The major difference in costs were asthma drugs.
Strengths/Limitations: Findings were consistent with prior studies on costs of severe and non-severe uncontrolled asthma. However, this study was in a closed medical system, which limits its generalizability.
Generalizability to Medicare Population: Yes
Methods: This observational study examined patients (12 to 65+) with persistent asthma over 12 using ICD-10 codes. The SUA subgroup was determined if the patients had two or more asthma exacerbations, six or more medium- or high-dose dispensed canisters of inhaled corticosteroids (ICS) as treatment alone or with a long acting beta-agonist, and three or more dispensed non-ICS controllers.

Zein JG, Dweik RA, Comhair SA, Bleecker ER, Moore WC, Peters SP … Program, on behalf of T. S. A. R. Asthma is more severe in older adults. *PLOS ONE*. 2015;10(7):e0133490. https://doi.org/10.1371/journal.pone.0133490

Subtopic(s): Problems in Care Delivery
Type of Source: Journal Article
Objective: To determine the association between age and probability of severe asthma
Main Findings: There is an inflection point at age 45 for risk of severe asthma; prevalence of severe asthma continued to increase every year after age 45 but at a slower rate than the annual increases among those under age 45. Aging was the main contributor to severity, followed by duration of asthma. Asthmatics older than 45 had the greatest probability for severe asthma.
Strengths/Limitations: The study has limited external validity, as the patients were in a Severe Asthma Research Program, and recall bias as the patients with longer asthma duration may have trouble remembering when their symptoms began. However, the study was large and adjusted for both aging and asthma duration with increased probability of severe asthma.
Generalizability to Medicare Population: Yes
Methods: This cross-sectional study of data examined adult participants (1,130,454 with severe asthma) in the Severe Asthma Research Program between 2002 and 2011.

Zhao J, Zhai Y, Zhu W, Sun D. (2014). Effectiveness of telemedicine for controlling asthma symptoms: A systematic review and meta-analysis. *Telemedicine and E-Health*. 2014;21(6):484-492. https://doi.org/10.1089/tmj.2014.0119

Subtopic(s): Results of Proposed or Similar Models
Type of Source: Literature Review/Journal Article
Objective: To examine the effects of telemedicine for the management of asthma symptoms.
Main Findings: Advantages of telemedicine include home-care via video and Internet-based conferencing, education, and reminders for medications, therapies, and appointments. Telemedicine can also allow for earlier detection of disease, continuity of care, and lower costs. The study did not show that telemedicine alone improved asthma symptom scores.
Strengths/Limitations: The study reviews representative literature that is applicable to many patient populations. However, many studies did not look at raw clinical scores.
Generalizability to Medicare Population: Yes
Methods: This systematic review examined 813 articles with quantitative synthesis on 11 studies and 6 meta-analysis studies.

III. Research Questions, Data Sources, Key Words, and Search Term Table

The environmental scan includes a review of information from existing peer-reviewed and non-peer-reviewed publications. We conducted a formal search of major medical, health services research, and general academic databases. We also conducted targeted searches of content available in the grey literature. We reviewed the websites of professional associations/societies and CMS for relevant evaluation reports and program documentation. We focused our search on domestic literature, unless otherwise noted. Where possible, we limited our search to recent literature published in the previous five years. The table below lists the research questions motivating this environmental scan as well as the sources and search terms used.

Research Questions	Preliminary Search Terms	Sources
Epidemiology of asthma and asthma-like symptoms		
Clearly define the issue / population by addressing the following: 1. What is the prevalence of asthma/asthma-like symptoms among Medicare beneficiaries? a. To what extent is asthma newly diagnosed after age 65? b. What is the prevalence of poorly-controlled vs. well-controlled asthma in this population? 2. What are the rates of asthma-related hospitalization and ED visits among Medicare beneficiaries? 3. What are the challenges of diagnosing and treating asthma among the Medicare population? (e.g., confounding variables) a. How long does it take to reach an accurate asthma diagnosis in this population? b. What is the average number of asthma-related visits? 4. How frequently is asthma misdiagnosed in Medicare populations? a. What health outcomes are associated with misdiagnosed or incorrectly treated asthma? 5. What are the characteristics (including demographics, socioeconomic status, comorbidities) of Medicare beneficiaries impacted by these conditions? 6. What are trends in asthma prevalence among Medicare beneficiaries? Is there evidence prevalence is increasing?	Medicare beneficiary prevalence (AND): – Asthma – Asthma-like symptoms Medicare beneficiaries + asthma/asthma-like symptoms (AND): – Emergency department (ED) visits – Hospitalization Diagnosis/treatment challenges (AND): – Asthma – Asthma-like symptoms Misdiagnosis/incorrect treatment (AND): – Asthma/Asthma-like symptoms Medicare beneficiaries + asthma (AND): – Demographics – SES – Comorbidities	PubMed Google Scholar National Health Interview Survey (NHIS) National Heart, Lung, and Blood Institute American Lung Association Cited articles from the proposal

Research Questions	Preliminary Search Terms	Sources
Issues in Payment Policy		
7. What are current Medicare FFS payment rules on asthma or asthma-like symptoms (chronic conditions)? a. What services/supports (e.g., spirometry; exhaled nitrous oxide) are currently covered under the Medicare FFS payment model for asthma patients? 8. What are the Medicare payment guidelines for care coordination between PCP and specialists (allergists and pulmonologists)? How does the reimbursement vary between allergists and pulmonologists? 9. What, if any, other payment models exist to address the care integration provided by specialists and PCPs? a. NCQA Patient-Centered Specialty Practice	Asthma/asthma-like symptoms + Medicare Fee-for-service (FFS) (AND): – Payment – Reimbursement – Services/supports/ coverage	Medicare coverage database (MCD) MedPAC CMMI
Problems in Care Delivery		
10. What costs and health outcomes are associated with misdiagnosed or incorrectly treated asthma/asthma-like symptoms? (e.g., medication costs, increased potential side effects, mortality). 11. What are the barriers/gaps to care coordination between PCP and specialists (allergists and pulmonologists) under current payment system? 12. What are the current practices/standards of care/evidence-based guidelines for asthma treatment? a. Are the current practices problematic/leading to poor outcomes? b. What are the innovations in care delivery for asthma treatment?	Medication costs, costs, patient outcomes (AND) – Asthma/asthma-like symptoms Medicare Fee-for-service (FFS) + barriers/gaps (AND): – Care coordination Best practices Treatment guidelines	PubMed Cochrane NCQA MedPAC National Heart, Lung, and Blood Institute American Lung Association Cited references from the proposal
Results of Proposed or Similar Models		
13. What are the results (if any) of other payment and/or delivery models that address asthma care? 14. What are the results (if any) of other payment and/or delivery models that address/promote care coordination between specialists and PCPs? a. NCQA PSCP Bundled Payments for Care Improvement initiative	Bundled payment (AND): – asthma/asthma-like symptoms Managed care (AND): – asthma/asthma-like symptoms Models (AND): – care coordination	PubMed Google Scholar CMMI