

Improving Asthma Conditions for Children and Adolescents by Expanding the Statewide Learning Collaborative Model Through Health Homes

Matthew Fifolt, PhD; Heather H. Johnson, MPH; Elizabeth Cason Benton, MD, FAAP

Background and Objectives: Asthma is one of the most common diseases among children in the United States. Increasing provider adherence to national asthma guidelines and connecting patients to Health Homes can increase optimal asthma care. The objectives of this article are to report the results of an asthma learning collaborative and explore the role of Health Homes in contributing to its success. **Methods:** Quantitative and qualitative data were collected regarding the experiences of 14 pediatric primary care practices and 6 Health Homes participating in a 9-month learning collaborative. **Results:** Practices exceeded process aims of 80% compliance with optimal asthma care and the use of an Asthma Action Plan among patients aged 2 to 21 years. Health Home care coordinators also reported improvements in self-management strategies for asthma conditions, including the presence of an Asthma Action Plan, medications, spacers, and proper spacing techniques. Providers and Health Home care coordinators identified role clarity, mitigation of environmental triggers, and management of asthma conditions as benefits of the experience. **Conclusions:** The results of this asthma learning collaborative increased provider adherence to national guidelines and significantly improved optimal asthma care for patients. This multipronged, holistic approach to asthma care proved successful for controlling and maintaining asthma conditions among patients.

Key words: asthma, Health Homes, learning collaborative, quality improvement

Asthma is one of the most common yet manageable diseases among children in the United States. Yet, nearly 3 million children reported having 1 or more asthma episodes or attacks in 2015.¹ Asthma is a chronic inflammatory respiratory condition that, if left uncontrolled, leads to coughing, wheezing, and shortness of breath. Poorly controlled asthma negatively impacts the quality of life in multiple ways for children and adolescents, including missed school days, more than any other chronic disease²; limited participation in sports and other physical activities³; and increased risk for depression and thoughts of suicide.⁴ Furthermore, asthma disproportionately affects individuals with fewer financial resources than their peers.⁵ In

Alabama, asthma is the most prevalent chronic disease among children, affecting more than 120 000.⁶

Despite its pervasiveness, asthma symptoms can be controlled with appropriate medical treatment and self-management and by avoiding exposure to environmental allergens and irritants that can trigger an attack.⁷ Furthermore, Dolins and colleagues⁸ identified improving provider adherence to national asthma guidelines as an effective strategy for managing asthma conditions among patients. According to these authors, adherence can be best accomplished through participation in a statewide quality improvement (QI) project. In 2018, the Alabama Child Health Improvement Alliance (ACHIA) conducted a 9-month learning collaborative among 14 pediatric primary care practices on the topic of optimal asthma care for pediatric and adolescent patients. According to the National Asthma Education and Prevention Program Expert Panel Report 3, "optimal asthma care" requires tracking and documentation of the following 4 conditions: asthma severity, asthma level of control, treatment options based on severity and level of control, and appropriate dosing for age.⁹

QI researchers have identified community partnerships as a key component to successful learning collaboratives,¹⁰⁻¹² yet less is known about strategic collaborations in asthma care for pediatric and adolescent patients.¹³⁻¹⁵ Therefore, this investigation included Health Homes as a key community partner. The objectives of this article are to report the results of the asthma learning collaborative and explore the role of Health Home partners in contributing to its success.

Author Affiliations: Health Care Organization and Policy, School of Public Health (Dr Fifolt and Ms Johnson), and Alabama Child Health Improvement Alliance, School of Medicine (Dr Benton), University of Alabama at Birmingham.

Correspondence: Matthew Fifolt, PhD, Health Care Organization and Policy, School of Public Health, University of Alabama at Birmingham, 330M Ryals Public Health Bldg, 1665 University Blvd, Birmingham, AL 35294 (mfifolt@uab.edu).

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BACKGROUND

ACHIA is a statewide collaboration of public and private partners that uses measurement-based efforts and a systems approach to improve the quality of children's health care.¹⁶ ACHIA supports pediatric and family medicine practices in improving care delivered to infants, children, and adolescents through QI coaching to implement workflow changes, technical assistance in collecting and interpreting QI data, and information about coding the level of care delivered.

ACHIA learning collaboratives are guided by the Model for Improvement¹⁷ and follow the Breakthrough Series (BTS) collaborative model, an approach designed to achieve "rapid, measurable, and sustained improvements, with the intention of weaving QI processes into the everyday work of QIC (Quality Improvement Collaborative) participants."^{11 (p356)} Training sessions alternate between action and learning periods and are designed to disseminate evidence-based practices.¹⁸ For the asthma learning collaborative, learning periods were marked by monthly webinars with a QI coach regarding QI methods and peer sharing. Action periods occurred between learning periods and provided opportunities for practices to implement and test change ideas. Online content regarding practice tools and resources was also available to all practice members. QI and content materials for the asthma learning collaborative are available at the following web address: <https://achia.org/resources/past-projects-resources#breath>.

Description of participating practices

Fourteen pediatric primary care practices self-selected to participate in this asthma learning collaborative. Practices comprised 39 pediatricians and 64 support staff members and represented all regions of the state. Slightly less than half of participating practices ($n = 6$; 43%) described their primary care office setting as small (1-3 physicians), followed by medium (4-6 physicians: $n = 5$; 36%), and large (≥ 7 physicians: $n = 3$; 21%). The majority of practices ($n = 9$; 64%) described themselves as independent, 1 affiliated with a hospital ($n = 1$; 7%), 2 affiliated with a university or medical center ($n = 2$; 14%), and 2 "other" ($n = 2$; 14%). Practice locations were divided between settings: suburban ($n = 6$; 43%), rural ($n = 5$; 36%), and urban ($n = 3$; 21%). Descriptive data are available in Table 1.

The 3 primary payer sources for participating practices included Alabama Medicaid (56.75%), BCBS of Alabama (27.83%), and ALL Kids, Alabama's Child Health Insurance Program (10.50%) (see Table 2). The estimated number of patient visits by all providers varied significantly between practices. The total number of annual patient visits by participating practices was 230 000, with a mean average of 17 580. The lowest number of patient visits was reported as 2500 and the highest as 40 000. The total number of patients (not visits) aged 2 to 21 years in practice panels with a diagnosis of asthma was 11 236, or approximately 10% of children in Alabama with asthma. The average number

Table 1. Description of Participating Practices

	n
Primary care office setting	
Small (1-3 physicians)	6
Medium (4-6 physicians)	5
Large (≥ 7 physicians)	3
Total	14
Best description of practice	
Independent	9
Hospital-affiliated	1
Affiliated with university or medical center	2
Other ^a	2
Total	14
General location of practice	
Rural	5
Suburban	6
Urban	3
Total	14

^aNonprofit community health center; health department.

of patients with a diagnosis of asthma was 907, with the lowest number of patients reported as 150 and the highest as 2000 (see Table 3). As with all self-reported data, caution should be used in drawing inferences.

METHODS

For this investigation, our evaluation team used multiple methods to collect and analyze data regarding the efficacy of the asthma learning collaborative and the role of Health Homes toward its success. We drew data from 4 primary sources: a postcollaborative survey completed by participating practices, practice-level QI data, a Health Home assessment, and interviews with key stakeholders. Under the Common Rule, this evaluation was considered a scholarly activity rather than human subjects research by the institutional review board.

Table 2. Percentage of Practice Patients Currently Covered by Payer Source

Payer Source	Mean %	SD	n
Alabama Medicaid	56.75	15.52	12
BCBS of Alabama	27.83	19.46	12
ALL Kids ^a	10.50	8.50	12
TriCare	5.82	5.72	11
United Health	4.18	3.40	11
Other ^b	8.13	5.06	8

^aAlabama's Child Health Insurance Program (CHIP).

^bAetna, Cigna, Viva, commercial insurance.

Table 3. Estimated Number of Patient Visits by All Providers/Estimated Number of Patients in Practice Panel Aged 2 to 21 Years With a Diagnosis of Asthma

	Mean	SD	n
Patient visits	17 580	11 380	9
Patients with diagnosis of asthma	907	681	9

Postcollaborative survey

At the end of the asthma learning collaborative, a survey was distributed to practices via Qualtrics, an online survey delivery platform. The postcollaborative survey comprised 6 sections: Diagnosis and Management of Asthma (impact of collaborative on knowledge, confidence, and practice of optimal asthma care); Balancing Measure (impact of participation in collaborative on other aspects of practice); Quality Improvement (effectiveness of coaching and impact of collaborative on knowledge, confidence, and application of QI tools and concepts); Community Partners (impact of working with Health Homes); Collaborative Format (effectiveness of collaborative format); and Overall Impact. Based on responses selected, the survey length was between 23 and 25 questions. Practices submitted 1 survey per team ($n = 14$), and analyses included descriptive statistics. For a copy of the survey, see Supplemental Digital Content (available at: <http://links.lww.com/QMH/A38>).

Practice-level QI data

Over the course of the asthma learning collaborative, participating practices established baseline data for 2 process measures: optimal asthma care (ie, severity, level of control, appropriate treatment, proper dosage); and provision or review of an Asthma Action Plan. The target goal for each measure was 80% compliance among patients aged 2 to 21 years with asthma. To control for variance in practice size and to prevent “cherry picking” of cases, baseline data were based on 30 consecutive visits per practice by patients with asthma ($n = 420$). Data for intervention months 2 through 7 were based on approximately 10 consecutive visits per practice by patients with asthma ($n \sim 140$). Practices tracked and recorded data through the Quality Improvement Data Aggregator (QIDA), a Web-based data aggregation system developed and owned by the American Academy of Pediatrics (AAP).¹⁹ Aggregate data were shared with the program administrator to track progress and develop run charts and other data visualizations.

Health Home assessment

One of the key strategies that practices used to meet the aims of optimal asthma care was to coordinate services with Alabama Medicaid Health Home partners. Specifically, providers worked on adherence to national guidelines in the clinical setting⁹ while Health Home care coordinators reinforced the Asthma Action Plan

with families through home visits.²⁰ To close care gaps and support self-management of asthma conditions, Health Home care coordinators documented the presence of an Asthma Action Plan, asthma medications, and spacers. Coordinators also noted the proper use of spacer techniques for the administration of inhaled corticosteroids. Health Home care coordinators reported aggregate data to the program manager.

Alabama Medicaid Health Homes

Alabama Medicaid Health Homes coordinate care for patients with asthma and certain other chronic conditions. Health Home care coordinators connect patients with needed resources, teach self-management skills, provide transitional care, and bridge medical and behavioral health services. For this learning collaborative, ACHIA identified patients with Medicaid from practice referrals of those with poor asthma control and/or data mining of patients with 2 emergency department (ED) visits, 1 hospitalization, and/or 2 or more courses of oral corticosteroids in the previous 12 months. In addition, the Alabama Chapter of the AAP allocated \$45 000 to Health Homes for supplies to mitigate environmental triggers. These funds were disbursed to Health Homes on the basis of a formula that considered the number of annual patient visits for all providers of patients aged 2 to 21 years and the percentage of families that were Medicaid eligible in each practice’s total patient population. Since this learning collaborative aligned with existing job expectations of Health Home care coordinators, there were no additional costs incurred by Health Homes with the exception of time spent on monthly QI webinars and data submission.

Key stakeholder interviews

On the basis of recommendations by the leadership of ACHIA, the primary author conducted key stakeholder interviews with 5 individuals associated with the asthma learning collaborative: the QI coach, 1 lead physician, and 3 Health Home care coordinators. Interviews were conducted by phone and lasted between 30 and 45 minutes. An interview protocol was used to guide these discussions, and all notes were recorded by hand. Questions focused on strengths of the learning collaborative, opportunities for improvement, and topics for future learning collaborative initiatives. The primary author hand-coded data from participant responses, and the evaluation team developed themes based on codes.

RESULTS

In this section, our evaluation team reports the results of the asthma learning collaborative. We pay particular attention to the role of Health Homes in contributing to the success of the initiative. Across data sources, we identify ways in which the asthma learning collaborative helped practices improve asthma conditions for children and adolescents.

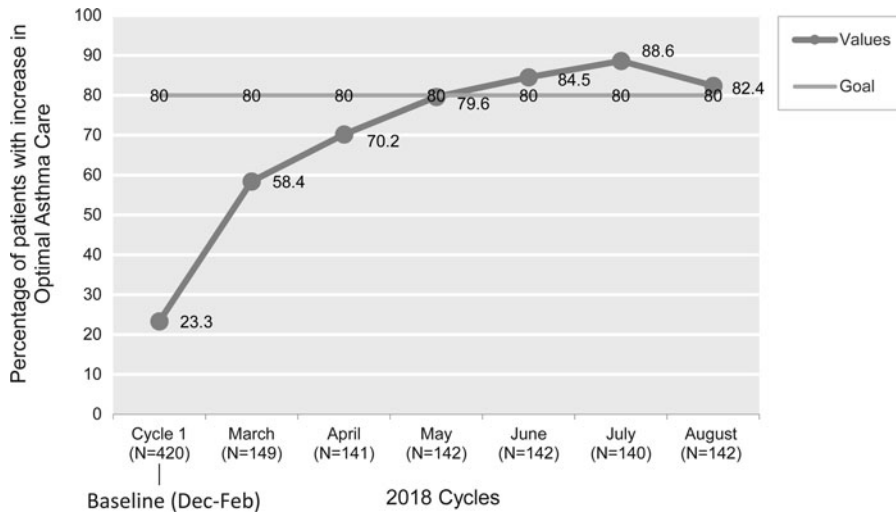


Figure 1. Optimal asthma care.

Optimal asthma care

Based on data collected for the 4 components of optimal asthma care (ie, severity, level of control, treatment, and dosage), the percentage of patients with increases in optimal asthma care improved from 23.3% at baseline to 82.4% at the end of the learning collaborative, exceeding the goal of 80% (see Figure 1). In other words, optimal asthma care delivery increased from 1 in 5 patients to more than 4 in 5 patients. In addition, all practices experienced improvement on this measure. The majority of practices reported high levels of improvement or maintenance of knowledge (n = 13) and confidence (n = 12) related to the diagnosis and management of asthma using national guidelines.⁹

Asthma Action Plan

Similarly, practices exceeded the process aim of 80% of patients receiving an updated Asthma Action Plan

at any asthma visit. Baseline data indicated that only 13.1% of patients received an updated Asthma Action Plan at the beginning of this learning collaborative. At the conclusion of the learning collaborative, this percentage had increased to 83.1% of patients (see Figure 2). Once again, all practices experienced improvement on this measure. All or most practices reported high levels of improvement or maintenance of knowledge (n = 14) and confidence (n = 12) using the Asthma Action Plan.

Health Home assessment

Twelve of 14 practices reported referring patients to Health Homes through the asthma learning collaborative (M = 13.7, SD = 6.8; range, 1-20). Health Home teams reinforced the 2 primary aims of the learning collaborative, optimal asthma care and use of an Asthma Action Plan, by working with patients and families to

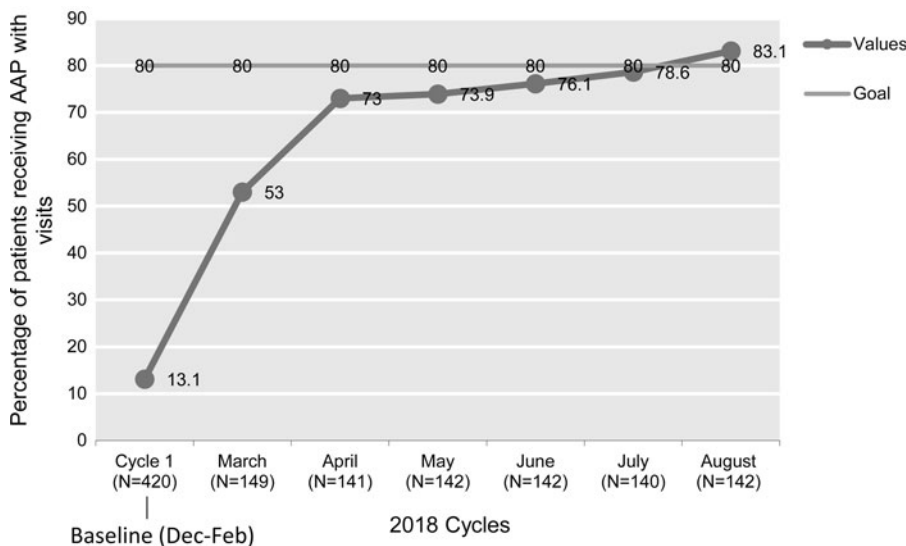


Figure 2. Provide/review Asthma Action Plan.

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improve self-management strategies for asthma conditions. On the basis of practice referrals, care coordinators recorded baseline data for the presence of the following: Asthma Action Plan, medications, and spacers. In addition, care coordinators documented the use of proper spacing techniques for the administration of inhaled corticosteroids. As demonstrated in Figure 3, improvements were seen in all 4 components of care between the first home visit (ie, encounter 1) and the last home visit (ie, typically encounter 5). The presence of an updated Asthma Action Plan in the home more than doubled, and all 4 components reached 90% or greater by the end of the learning collaborative. Data represented patients who had received at least 5 or more encounters (ie, home visit, telephone conference).

Key stakeholder interviews

Practice teams documented the following benefits of referring patients to a Health Home: identifying environmental triggers for asthma in the home, receiving feedback regarding medication use in the home environment, and being proactive in patient care. According to a site-level lead physician, the inclusion of Health Homes was one of the strengths of the learning collaborative because it brought together providers, QI experts, and Health Home care coordinators to address the difficult issue of asthma management and mitigation, an especially acute challenge among vulnerable populations. Similarly, one of the Health Home representatives noted that the learning collaborative allowed everyone to work as a team and provided “role clarity” to families, who frequently received a “warm handoff” from the physician to the embedded care coordinator.

From a practical standpoint, Health Home care coordinators observed that program funding allowed Health

Homes to purchase items to mitigate asthma triggers (eg, bed covers, dust covers, pest control) for individuals on low or fixed incomes. Moreover, Health Home care coordinators suggested that active engagement allowed families to play an active, hands-on role in reducing and eliminating environmental factors that contributed to the severity and frequency of their child’s asthma symptoms.

Notwithstanding its successes, providers and Health Home care coordinators observed differential experiences of asthma patients in rural and urban areas who were served in their catchment areas. In urban areas, practices tend to be more highly concentrated and resource-rich as compared with practices in more rural and geographically distant locations. Because of this, practices in urban areas were able to embed Health Home care coordinators on-site for 1 day a week over the course of this 9-month learning collaborative. Interviewees noted that the physical presence of the care coordinator facilitated greater congruence of care and clarification of roles for families. Conversely, practices serving rural areas relied on technology and telecommunications to accomplish these same goals, which were met with less success. Looking ahead, providers and Health Home care coordinators discussed options for better serving rural patients including less frequent but regular on-site visits to practices, face-to-face technology (eg, Skype), or “floating” a case manager to underserved areas.

DISCUSSION

Participation in the Alabama asthma learning collaborative allowed providers to exceed their stated aims of 80% compliance with optimal asthma care and

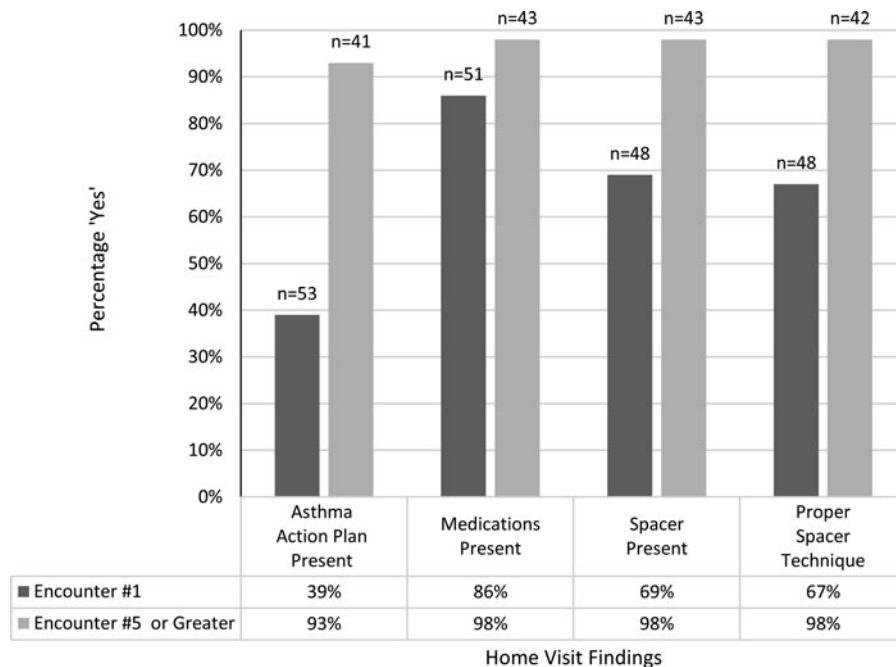


Figure 3. Health Home encounter 1 versus encounter 5.

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provision or review of an Asthma Action Plan among patients aged 2 to 21 years with asthma. Like most learning collaboratives, improvements were made on the basis of QI coaching, content delivery, and cross-practice collaboration.¹¹ Partnering with Health Home care coordinators, however, made this specific learning collaborative noteworthy. Providers and Health Home care coordinators commented on the synergy of the partnership and suggested that addressing asthma among Medicaid patients allowed them to view care coordination from a systems approach rather than one in which individuals operated in silos.

As noted in the research literature, patients with low socioeconomic status are at high risk for persistent asthma, repeat exacerbations, and increased hospitalization and ED visits.^{21–23} Therefore, concentrating improvement efforts on individuals who are at the greatest risk for asthma attacks lessened the overall financial burden for patients and families and addressed a Healthcare Effectiveness Data and Information Set (HEDIS) performance measure for the state. The authors further suggest that improving care for the most vulnerable populations effectively improves care for all patients.

Beyond the asthma learning collaborative, Alabama Medicaid Health Homes will continue to accept practice referrals and provide services to ensure continuity of care between provider visits and the home. Health Home care coordinators remain a vital link between patients and providers by positively reinforcing best practices for optimal asthma care. AAP funding for supplies to remove environmental triggers in the home was limited to this learning collaborative, and decisions about future funding for supplies will need to be addressed at the local or state level. However, environmental assessments and education about medications, spacer use, and patient adherence will continue to be priorities of Health Homes.

LIMITATIONS

Data for this evaluation represented the experiences of 14 practices and 6 Health Homes that voluntarily participated in this asthma learning collaborative; therefore, findings cannot be generalized beyond the context in which this evaluation was conducted. Responses from other practices and care coordination services may have yielded different results. In addition, the evaluation team did not systematically collect data from patients and families. These perspectives may have strengthened the overall evaluation design but placed an additional data burden on practices participating in QI. The evaluation team interviewed a small number of key stakeholders regarding their experiences with the asthma learning collaborative, which may be considered a limitation of this investigation. Nevertheless, responses yielded insights from individuals who could meaningfully describe the inclusion of Health Homes in this initiative. Only 12 of 14 practices made referrals to Health Homes, and Health Home care coordinators reported data to ACHIA through correspondence

rather than the more rigorous QIDA system. Therefore, these data may be less reliable than practice data. Data were also limited to patients who received the anticipated 5 home encounters. Nevertheless, preliminary findings suggest that home visits and telephone calls reinforced best practices for optimal asthma care and may have contributed to the overall aims of this learning collaborative. Based on these results, the evaluation team would encourage future investigators to conduct action research on effective strategies for better integrating care coordination with asthma providers for the purpose of optimal asthma care.

CONCLUSIONS

Despite the prevalence of asthma among children and adolescents, the positive outcomes of this learning collaborative are encouraging. Over the course of this 9-month learning collaborative, optimal asthma care and provision or review of an Asthma Action Plan increased significantly, signaling greater provider adherence to asthma guidelines and improvements in self-management of asthma symptoms by patients and their families. Furthermore, providers and Home Health care coordinators found strategic partners in one another, which resulted in increased role clarity, greater awareness of environmental triggers, and mitigation of environmental factors through simple yet effective interventions. This multipronged, holistic approach to asthma care, which leveraged strategic partnerships, proved successful for controlling and maintaining asthma conditions among some of the state's most vulnerable patients.

REFERENCES

- Centers for Disease Control and Prevention. Asthma in children. <https://www.cdc.gov/vitalsigns/childhood-asthma/index.html>. Published May 10, 2018. Accessed May 20, 2019.
- Hsu J, Qin X, Beavers SF, Mirabelli MC. Asthma-related school absenteeism, morbidity, and modifiable factors. *Am J Prev Med*. 2016;51(1):23–32. doi:10.1016/j.amepre.2015.12.012.
- Lochte L, Nielsen KG, Petersen PE, et al. Childhood asthma and physical activity: a systematic review with meta-analysis and graphic appraisal tool for epidemiology assessment. *BMC Pediatr*. 2016;16:50. doi:10.1186/s12887-016-0571-4.
- Barker E, Kölves K, De Leo S. The relationship between asthma and suicidal behaviours: a systematic literature review. *Eur Respir J*. 2015;46:90–106. doi:10.1183/09031936.00011415.
- Szeffler SJ, Cloutier MM, Villarreal M, et al. Building bridges for asthma care: reducing school absence for inner-city children with health disparities. *J Allergy Clin Immunol*. 2019;143(2):746–754.e2. doi:10.1016/j.jaci.2018.05.041.
- Behavioral Risk Factor Surveillance Survey (BRFSS). Alabama Asthma Program. <http://www.alabamapublichealth.gov/asthma>. Published April 10, 2017. Accessed June 10, 2019.
- National Heart, Lung, and Blood Institute. Asthma. <https://www.nhlbi.nih.gov/health-topics/asthma>. Published September 18, 2014. Accessed December 20, 2019.
- Dolins JC, Powell J, Wise E, et al. Improving asthma care by building statewide quality improvement infrastructure. *Pediatrics*. 2017;140(2):e20161612. doi:10.1542/peds.2016-1612.
- National Asthma Education and Prevention Program Expert Panel report 3. Guidelines for the diagnosis and management of asthma. <https://www.nhlbi.nih.gov/sites/default/files/media/docs/asthsumm.pdf>. Published October 2017. Accessed December 20, 2019.

10. Ayers LR, Beyea S, Godfrey MM, Harper D, Nelson E, Batalden PB. Quality improvement learning collaboratives. *Qual Manag Health Care*. 2005;14(4):234-247.
11. Nadeem E, Olin SS, Hill LC, Hoagwood KE, Horwitz SM. Understanding the components of quality improvement collaboratives: a systematic literature review. *Milbank Q*. 2013;91(2):354-394. doi:10.1111/MILQ.12016.
12. Sergios TR, Fawcett SB. A review of collaborative partnerships as a strategy for improving community health. *Annu Rev Public Health*. 2000;21:369-402. doi:10.1146/annurev.pubhealth.21.1.369.
13. Homer CJ, Forbes P, Horvitz L, Peterson LE, Wypij D, Heinrich P. Impact of a quality improvement program on care and outcomes for children with asthma. *Arch Pediatr Adolesc Med* 2005;159(5):464-469. doi:10.1001/archpedi.159.5.464.
14. Mangione-Smith R, Schonlau M, Chan KS, et al. Measuring the effectiveness of a collaborative for quality improvement in pediatric asthma care: does implementing the chronic care model improve processes and outcomes of care? *Acad Pediatr*. 2005;5(2):75-82. doi:10.1367/A04-106R.1.
15. Weiss-Randall D. A community health approach to asthma in the schools. *KDP Record*. 2014;50(4):164-169. doi:10.1080/00228958.2014.960338.
16. The Commonwealth Fund. Improving health care delivery: the “learning collaborative” approach. <https://www.commonwealthfund.org/publications/publication/2005/jun/improving-health-care-delivery-learning-collaborative-approach>. Published June 29, 2005. Accessed July 6, 2019.
17. Langley G, Moen R, Nolan K, Nolan T, Norman C, Provost L. *The Improvement Guide*. San Francisco, CA: Jossey-Bass; 2009.
18. Crowl A, Sharma A, Sorge L, Sorensen T. Accelerating quality improvement within your organization: applying the model for improvement. *Pharm Today*. 2015;21(7):79-89. doi:10.1331/JAPhA.2015.15533.
19. American Academy of Pediatrics. Quality Improvement Data Aggregator. <https://www.aap.org/en-us/continuing-medical-education/mocportfolio/Pages/getinvolved.aspx>. Published 2019. Accessed December 3, 2019.
20. Asthma and Allergy Foundation of America. Asthma Action Plan. <https://www.aafa.org/asthma-treatment-action-plan>. Published 2019. Accessed December 19, 2019.
21. Madrid E, Mennie GW, Newton PL. Asthma: challenges in vulnerable populations. *JAAPA*. 2006;19(2):41-46. doi:10.1097/01720610-200602000-00006.
22. Cope SF, Ungar WJ, Glazier RH. Socioeconomic factors and asthma control in children. *Pediatr Pulmonol*. 2008;43(8):745-752. doi:10.1002/ppul.20847.
23. Camargo CA, Ramachandran S, Ryskina KL, Lews BE, Legoretta AP. Association between common asthma therapies and recurrent asthma exacerbations in children enrolled in a state Medicaid plan. *Am J Health Syst Pharm*. 2007;10(15):1054-1061. doi:10.2146/ajhp060256.