A New Model of Care: Pediatric Asthma Management

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Abstract

Utilization of telehealth services and the provision of chronic care management in school-based clinics have proven to be successful care models in the management of pediatric asthma. Such models of care have also been positively correlated with an improvement in pediatric asthma outcomes. These models of care were historically implemented to improve access to healthcare for patients living in rural populations. During the pandemic, such services were employed to improve access to care to everyone as they practiced social distancing to slow the spread of covid-19. The pandemic leveled the playing field and made access to care a problem for not only rural populations, but a problem for everyone. In order to continue insurer reimbursements for telehealth and school-based healthcare services, research is needed in support of these healthcare models.

Keywords: rural community, pediatric asthma, telehealth, school-based clinic, new models of care, pandemic, covid-19

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Prior to the coronavirus (COVID-19) pandemic, barriers to care for rural and underserved populations included work conflicts and geographical distance. Simply put, parents/legal guardians of working families were unable to obtain time off from work in order to attend asthma-related healthcare visits and encountered difficulties related to living in rural areas where one had to travel far distances to seek healthcare. Barriers to healthcare for patients with asthma did not occur as a result of clinics' refusal to provide care. In March 2020, COVID-19 was identified as a pandemic by the World Health Organization, and a national emergency was declared in the United States (Brown et al, 2021). Brown et al. (2021) completed a retrospective chart audit of four medical institutions in North Carolina (2,144,207 people living in rural areas) and South Carolina (728,561 people living in rural areas)--Wake Forest Baptist Health/Wake Forest School of Medicine, University of North Carolina at Chapel Hill Health, East Carolina University Clinics, and Prisma Health/University of South Carolina School of Medicine Greenville—that manifests there was a decrease of 64.5% in the number of pediatric visits (0 to 18 years old) from 2019 to 2020. By July 2021, the southern region of the United States, which includes North Carolina and South Carolina, was classified as one of several regions with the highest prevalence of COVID-19 (Economic Research Service [ERS], 2021). Additionally, the ERS (2021) noted that farming dependent, nonmetropolitan counties experienced the second highest cumulative cases of COVID-19 per 100,000 inhabitants.

During the pandemic many pediatric primary care clinics were forced to choose which chief complaints to manage in-person (in the office) versus sick visits to manage in makeshift settings outside of clinic areas. The direct and indirect impacts of COVID-19 on children are endless—e.g. decreased primary care visits for routine check and chronic disease management of conditions like

asthma, decreased vaccination uptake leading to an increase risk in the development of infectious diseases, increased number of days missed from school, increased mental health problems like depression and anxiety, etc. Providers prioritized visits based upon chief complaint, patient's age, and risk of morbidity/mortality. Additionally, emergency rooms limited the types of patients they were willing to manage. Asthma patients who were not in a state of exacerbation were refused routine care in primary care clinics. Because asthma patients are at risk for developing severe complications as a result of COVID-19, it became imperative for these patients to undergo routine follow up in an attempt to prevent exacerbations and reduce their risk of developing complications if they were to contract COVID-19. This led to the implementation of different modes of care to replace in-person visits in an attempt to assess for the presence, and reduce the occurrence, of asthma-related impairment and adverse outcomes. Telehealth and school-based clinics are models of care that have historically been explored to provide asthma management to patients in rural communities. This literature review was conducted to gain a better understanding of effective pediatric asthma management interventions in telehealth and school-based settings in the United States in an attempt to provide care for children with asthma during the pandemic and improve access to care in rural communities. Information gleaned from this review can be used to supplement the care that is provided to patients with asthma when patients are unable to complete an in-person visit.

Asthma is a chronic pulmonary condition consisting of hallmark physiologic responses of episodic airway inflammation and constriction as a result of hyperresponsiveness to stimuli (Ish et al, 2020). Symptoms of asthma consist of difficulty breathing, shortness of breath, dyspnea on exertion, chest pain, nighttime awakening with cough, wheezing and other manifestations of airway constriction. In 2018, 7.5% of the population in the United States possessed a diagnosis of

asthma (Centers for Disease Control and Prevention [CDC], n.d.b.). More specifically, 5,530,131 children, defined by age as anyone less than eighteen years of age, were plagued with this chronic yet manageable condition. The management of asthma consists of two parts: reducing the risk of impairment by preventing asthma-related symptoms and reducing the risk of adverse outcomes that are associated with this condition (Ish et al., 2020; National Heart, Lung, and Blood Institute [NHLBI], 2007). Asthma-related impairment is defined as the inability to participate in daily activities as a result of new or recurring symptoms of asthma, and the prescribed use of a short-acting beta2-agonist more than two times per week. Impairment is also defined subjectively as the patient's perceived asthma-related limitations. The following adverse outcomes indicate poor asthma control: an asthma exacerbation, a reduction in lung function, or the need for medical management in an emergent, urgent, or acute healthcare setting. In pediatric populations, asthma related impairment manifests in numerous ways-including missed days from school, and increased expenditures related to the utilization of health care services. The CDC (n.d.a) attested that children with asthma missed approximately 13.8 million school days in 2013. From 2008 to 2013, asthma-related healthcare costs equated to $50.3 billion per year (Kim et al., 2020). In 2019, 178 children died from asthma-related complications (National Center for Environmental Health, 2021).

Effective asthma management consists of the use of appropriate pharmacologic agents prescribed during scheduled visits, leading to a reduction in impairment and risks of adverse outcomes (Kim et. al., 2020). Although pharmacologic interventions at various stages of medicinal management has changed, the overall premise of managing asthma in a stepwise manner based on symptom severity and prevention of exacerbations have remained the same for over a decade (Ish et al., 2020; NHLBI, 2007). During a pandemic, providers must remain focused on the following pillars of asthma management: 1) the reduction in pulmonary inflammation as a result of reduced

exposure to irritants and allergens and the employment of asthma medication, 2) scheduled assessments of patients by providers skilled in the management of asthma, and 3) the ongoing monitoring of medication use and provision of patient education (National Asthma Education and Prevention Program, 2020; NHLBI, 2007). If there is a breakdown in any of the management pillars, patients are placed at risk for impairment and the occurrence of adverse outcomes. The care received by pediatric patients depends on the involvement of their caregiver in managing the patients' condition—e.g. the adherence to prescribed medication practices, employment of proper medication administration technique, and the availability of caregivers to ensure that regular follow-ups occur and at appropriate intervals. Healthcare teams must ensure that access to care does not serve as a barrier to asthma management in pediatric populations while combating the risks that are associated with social determinants of health and subsequent health disparities. Access to care has always been problematic for rural populations and rose to prominence during the pandemic.

Methods

The review for this practice paper was performed with the guidance of a research librarian using Scopus and Medline as search engines. *Intervention* was used as a wildcard search term to broaden the search to include any article that included *intervention* as a term in the title, keywords, or abstract; this was coupled using *and* with several abstract search terms—e.g. *outcomes or benefits or impact, or effectiveness* and *"asthma control."* The search resulted in 650 articles, leading to the addition of *pediatric* as an abstract search term, which yielded 351 articles. Further narrowing of the search by various terms resulted in the seven articles that will be covered in this review of literature about alternative models of care for pediatric patients with asthma and the healthcare needs of this population.

Results

Kim et al. (2020) completed a systematic review of 317 articles, resulting in a review of seven articles, about the impact of telemedicine in school-based clinics on asthma outcomes in pediatric populations. The reviewed articles consisted of the provision of synchronous and asynchronous tele-monitoring of asthma symptoms, paired with in person or online educational sessions, telemedicine provider visits, and/or the administration of asthma medications in a school setting. Five out of seven articles included patients with various degrees of asthma severity and two articles pertained to persistent asthma. The outcomes reviewed consisted of: missed school days (absence of significant findings), values from pulmonary function tests (absence of statistical findings), symptom free days (increase average number of days), use of health services (consisting of, but not limited to, an increase in use of prescriptive medications), and improved results from quality of life questionnaires (findings not significant). Kim et al. (2020) noted that future opportunities consist of the need to develop randomized control trials to assess the impact of telemedicine in school-based clinics on asthma outcomes.

The model of care used by Halterman et al. (2017) consisted of school-based asthma management programs that were sponsored by the Rochester School-Based Asthma Study. The focal intervention of the article was the direct observation of preventative asthma medication, noting an additional intervention of providing student assessments through the employment of audiovisual remote technology was also implemented. Children whose parents agreed to their involvement with the study underwent an evaluation to determine the severity of their asthma, received evidence-based medication management, and were provided with follow up asthma care. The targeted populations were children from lower socioeconomic statuses and those who identified as either Hispanic or non-Hispanic African Americans. Halterman et al. (2017) focused

on the employment of the intervention and the design of the study. The article was not associated with quantitative outcomes, rather based on findings from the Rochester School-Based Asthma Study, which manifested interventions like direct observation and the use of remote technology to assess asthma status resulted in a reduction in days missed from work and school for parents and students respectively.

Anderson et al. (2020) implemented home visits by licensed personnel as a model of care to improve asthma outcomes through the reduction of environmental allergens and providing inhaler use education. The hypothesis behind these interventions was: the current timeframe that is allotted to providers to care for patients does not afford providers with an opportunity to address every aspect of asthma management, especially the provision of education. Families completed the National Environmental Education Foundation's (n.d.) Environmental History Form for Pediatric Patients. Based on findings, guideline-based interventions were employed. Anderson et al. (2020) manifested that home visits were a cost-effective approach to asthma management when compared to the cost of providing emergent, urgent, or acute care to asthma patients.

Perry and Margiotta (2020) discussed implementation of telehealth to improve the management of asthma in the pediatric population and improve access to care for rural populations. Targeted asthma education and continuity of care play an integral role in disease control and management (Perry & Margiotta, 2020). Their systematic review demonstrates the effectiveness of school-based telehealth in the delivery of follow-up encounters and implementation of specific interventions, such as remote spirometry, education. More importantly, patients in geographical locations with poor access to specialty care and limited, or lacking, access to internet services have identified school-based telemedicine as a feasible option to improve asthma self-management and asthma outcomes. However, implementation of a telemedicine program yields the significant

barrier of funding and financial reimbursement. A comprehensive telehealth cart, which can be used during telehealth visits, can range from $10,000 to $35,000 (Perry & Margiotta, 2020). This cost does not include the purchase of Health Insurance Portability and Accountability Act compliance software or additional expenses to ensure adequate internet bandwidth to support high-quality videoconferencing. Additionally, parity in coverage and reimbursement (Pre-COVID-19) was not federally mandated (Perry & Margiotta, 2020). Provider training, readiness, and accessibility also pose as significant barriers in implementation of telehealth. In response to COVID-19, forty-one states implemented waivers to modify the requirements for telehealth (Federation of State Medical Boards, 2021). Although barriers to telehealth exist, financial benefits are associated with the employment of telehealth services. Perry and Margiotta (2020) highlight the potential cost savings associated with conducting follow-up encounters via telehealth.

Bian et al. (2019) conducted a retrospective analysis to explore the relationship of a school-based telehealth program and emergency department (ED) visits made by children in five rural counties in South Carolina. The analysis entailed a review of state Medicaid claims data from 2012 to 2017. In 2014, a school-based telehealth program was established in seven counties to manage acute and chronic diseases. An asthma specific training program was integrated into the program. Study authors created two samples – (1) children (ages 3 to 17 years) enrolled in South Carolina Medicaid for at least one month, and residing in one of 5 counties, and (2) a subsample of children diagnosed with asthma. Children residing in Williamsburg County served as the intervention group and the four surrounding counties without a telehealth program served as the control group (Bian et al., 2019). In Williamsburg County where telehealth services were offered, the mean monthly ED visits for children increased from 3.65% to 3.87%. Whereas the mean monthly ED visits for children in the counties with no telehealth services (control) were 3.37% and 3.56%. For the

children diagnosed with asthma, the mean monthly ED visits increased from 3.16% to 3.38% for those in the intervention county; and, were 3.02% and 3.9% in the counties with no telehealth services. Bian et al. (2019) concluded no overall benefit of a school-based telehealth program to those with limited access to care. However, the author did find a strong association between the presence of school-based telehealth programs and the improvement in health outcomes—e.g. 21% reduction in potential ED visits in children residing in rural areas.

Kakar et al. (2020) conducted participatory research in an attempt to increase the use of asthma action plans in African Americans from lower socioeconomic classes. The team met with a community advisory council to discuss the need to improve asthma outcomes and a community decision was reached to employ the use of asthma action plans as a tool to improve asthma self-management. The goal was to change the model of care that was provided to asthma patients by pediatric providers by increasing the use of asthma action plans (AAP) through the provision of incentives to providers to encourage the use of AAP. Updated AAPs were provided to practices and those who distributed the AAP to patients were provided with free children's books. The provision of asthma education by providers to patients serves as the cornerstone of understanding the chronicity of asthma, medication management, and recognizing symptoms that indicate when to seek additional care. Asthma education is often provided verbally and reinforced in written form through the provision of an asthma action plan. Kakar et al. (2020) updated asthma action plans by adding the names and colored pictures of various inhalers to the back of the asthma action plans with the goal of improving communication between providers and patients about various asthma medications. The goal was to provide an intervention that removed the barrier of inadequate provider-patient communication and increased understanding of asthma medications to improve asthma outcomes.

The fact that asthma outcomes are impacted by social determinants of health and health disparities is general knowledge. Miadich et al. (2020) contributed to the body of knowledge about asthma outcomes by analyzing the impact of stress on asthma outcomes, focusing on adolescents. Stress was defined as growing up in poverty, occurrences of adolescent-caregiver conflict, witnessing or involvement with community or family violence (defined as neighborhood stress), and episodes of social stress in the form of peer-pressure and/or school-related stress. The authors viewed stress through the ecobiodevelopmental and toxic frameworks (Miadich et al., 2020). And, the cumulative risk model was used to assess the stressors experienced by the adolescents and information about stressors was collected from questionnaires that were answered during research sessions. The results were then compiled into a cumulative risk score and compared to the patients' asthma outcomes. Asthma outcomes were defined as visits to the emergency department, asthma control, and quality of life. The study found that an increase in cumulative risk score adversely impacts asthma outcomes. Future opportunities consisted of the implementation of interventions to reduce stress as a method to improve asthma outcomes.

Discussion

In 2020, over 5.5 million children were diagnosed with pediatric asthma (CDC, n.d.b.). Asthma-related healthcare costs over a five-year period were estimated at $50.3 billion per year (Kim et al., 2020). These costs reinforce the importance of disease management and utilization of effective care models that have demonstrated success in patient populations adversely affected by asthma. As providers continue their plight to eradicate problems related to access to care, which so often affects rural communities, and navigate a new era of healthcare that was birthed from the pandemic, they should remain grounded in the foundational knowledge of evidence-based asthma management.

Asthma is a chronic, but manageable, condition consisting of episodic airway inflammation and constriction due to bronchial hyperresponsiveness (Ish et al., 2020). The purpose of asthma management is to decrease risk of 1) impairment by preventing asthma-related symptoms and 2) the occurrence of adverse outcomes (Ish et al., 2020; NHLBI, 2007). Prior to the COVID-19 Pandemic, the primary model of care for pediatric asthma management consisted of face-to-face encounters. For those living in rural areas, such encounters were limited as a result of reduced access to healthcare. In 2020, the CDC issued guidance advising healthcare providers to adopt social distancing practices and encouraged the delivery of clinical services via telehealth. This position supported providers in exploring telehealth as a mitigating strategy to deliver healthcare in rural areas, even after the pandemic. Although this practice paper is limited by the method used to complete the literature search, information was gleaned about effective methods of asthma management outside of traditional in-office encounters.

Clinical Implications

Utilization of telehealth services and the provision of chronic care management in school-based clinics have proven to be successful care models in the management of pediatric asthma. The employment of these methods is positively correlated with improved pediatric asthma outcomes. Such models of care were historically implemented to improve healthcare access to patients living in rural populations. During the pandemic, utilization of telehealth services and the provision of chronic care management in school-based clinics may continue to be employed as a mechanism for improving access to care in the midst of actions to slow the spread of COVID-19, i.e. social distancing. The pandemic levelled the field of healthcare and made access to care a problem for not only rural populations, but a problem for everyone.

Implications for Practice

In order to continue insurer reimbursements for telehealth and school-based healthcare services, research is needed in support of these healthcare models demonstrating their effectiveness on the improvement of 1) clinical outcomes as manifested by a reduction in the frequency and severity of asthma exacerbations and 2) reduction in costs associated with missed days from school and work as a result of asthma exacerbations. The goals of healthcare workers are to prevent a reduction in lung function and impairment in activities of daily living in patients with asthma. Health care workers need to generate research and practice articles in support of the effectiveness of telehealth in the management of pediatric asthma. As COVID-19 continues to mutate and pose a mortal risk to patients with asthma, providers, nurses, and medical assistants must continue to share ideas as we work towards improving access to care and providing the best care possible to the most vulnerable members of our population, our children.

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