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Breathe Easy: Helping Parents in Middle Tennessee Prevent Asthma Attacks in Children

with personal reflections from participation in the GE-National Medical Fellowship Primary Care Leadership Program

Background

In June and July of 2013, I was fortunate enough to participate in the GE-National Medical Fellowship Primary Care Leadership Program. As I entered my final year of the Advanced Practice Family Nurse Practitioner program at Indiana University-Purdue University Indianapolis, I was unsure if I would be able to manage placement in such a competitive program at this challenging point in my academic career. I am pleased to report that the learning experience provided by a six-week internship at United Neighborhood Health Services in Nashville, TN, has been extremely beneficial in preparing me for a career in primary care.

One of the most constructive portions of the GE-NMF Primary Care Leadership Program was the opportunity to work alongside providers in various clinics around Nashville. Here, I developed relationships with the patients of United Neighborhood Health Services (UNHS). I witnessed them gratefully receiving treatment—a seventy-two year old woman with blood pressure so high it gave her headaches, an eleven year old boy who fractured his hand in a bicycle accident, a man with a cold living on the streets of downtown Nashville who had waited to be seen for six hours in 100 degree heat thanked us at the end of his visit, saying “I’m not used to people being nice to me.”

This is not to say every patient encounter was pleasant—I also learned first-hand the challenges involved in community health care. I witnessed a patient break down after receiving a positive HIV test result. There were patients who didn’t take their medications as prescribed because they simply couldn’t afford the four-dollar co-pay. Others complained about long wait times. In these events I was fortunate enough to learn from the dedicated providers at UNHS. Many were tireless patient advocates who developed creative strategies to meet the unique needs of their patients. Others treated patients with a care and kindness so genuine that I couldn’t help but want to emulate in my career, while others modeled ways to set boundaries with difficult clients.

Working with the varied patient population at United Neighborhood Health Services gave me a unique perspective on the challenges these persons face. Residents of these East Nashville communities live in a food

desert with few places to buy fresh, nutritious foods. In order to see a specialist for complex medical problems, they must often wait for months after applying for the indigent program at a local hospital. Many demonstrated a knowledge deficit in how to manage chronic diseases. But despite the challenges they face on a daily basis, many patients expressed a desire to make their health a priority.

Many UNHS patients suffer from is asthma. Asthma is a chronic disease of the lungs and bronchioles. During an asthma attack, airways become inflamed, resulting in bronchospasm and reversible airflow obstruction. Common symptoms include wheezing, coughing, chest tightness, and shortness of breath. It is thought to be caused by a combination of genetics and exposure to environmental factors known as "triggers," which include dust, pollen, mold, animal dander, vigorous exercise, strong emotions, second-hand smoke, and harsh chemical odors. Best practice advisories for asthma care are dictated by the National Institute of Health's Expert Panel Report 3: Guidelines for the Diagnosis and Treatment of Asthma (<http://www.nhlbi.nih.gov/guidelines/asthma>). These guidelines recommend treatment of acute symptoms with an inhaled short-acting beta-2 agonist, commonly called a "rescue" inhaler. Depending on the frequency and severity of symptoms, asthma may also be managed with long-acting beta agonists, leukotriene antagonists, and inhaled corticosteroids. Asthma exacerbations often have a seasonal component, with symptoms being least problematic in the summer (Goldberg 419).

National data from the Centers for Disease Control shows that in 2009, 18.7 million people in the United States have asthma, with 7 million of those being pediatric patients (cdc.gov). In Tennessee, 10.7% of male and 8.2% of female patients under the age of 18 have a diagnosis of asthma, giving Tennessee the 22nd highest rate of asthma in the United States (Jones 8). Davidson County, where Nashville is located, has an asthma incidence of almost twice that of surrounding rural counties (Jones 22).

Asthma places patients at significant risk for respiratory distress, which can sometimes be life threatening and require hospitalization. 7,059 patients were hospitalized for asthma related complications in Tennessee in 2010 while another 37,462 were treated in the Emergency Room (Jones 12). In addition to respiratory difficulties, patients with asthma are often diagnosed with a number of other co-morbidities, including rhinitis, sinusitis, gastroesophageal reflux disease (GERD), obstructive sleep apnea (OSA), anxiety, and chronic obstructive pulmonary disease (COPD) (Boulet 1).

Asthma's effects on pediatric patients and their families go beyond medical conditions. Patients with asthma are at risk for poor performance

in school due to frequent absences and reduced attention span (cdc.gov). The CDC estimates that 10.5 million school absences are caused annually by asthma-related complications. Increased visits to the emergency room and primary care provider's office result in increased medical bills and missed days at work, 14.2 million in 2008 according to the CDC. Treating asthma costs our country over 56 billion dollars annually; the state of Tennessee spent almost 179 million dollars in 2010 alone, 44% of those costs paid for by TennCare, the state-funded insurance program. Almost two-thirds of these asthma charges, \$113.6 million, were for inpatient hospitalizations, and \$65.2 million were for outpatient hospital visits. (Jones 8). Given the risk for serious medical complications including death, increased incidence of co-morbidities, and financial burden that asthma exacerbations place on patients in Middle Tennessee, it is imperative to help patients control asthma and prevent acute attacks.

Methodology

The process began with interviews of United Neighborhood Health Services healthcare providers to learn about current practices in pediatric asthma management. UNHS has 18 primary care providers and six of these providers were questioned as part of this initial research regarding patient knowledge deficits, use of an asthma action plan and pulmonary function testing, seasonal trends in asthma exacerbations, and the most effective education delivery methods for UNHS patients. Interviews with twenty-five patients in the community health clinic setting over four weeks were conducted to assess what medications they were prescribed for asthma, medication compliance including spacer use, and perceived exposure to triggers. Data was extracted from the NextGen electronic health record system to examine trends in patient volume related to asthma care.

Based on these findings and recommendations from providers, educational materials were developed to help communicate asthma prevention strategies to patients with low health literacy. Providers were notified of availability of these educational materials on July 8th, 2013 and began implementing them that week.

Results

Examination of data trends reveals that the number of patients using UNHS for asthma care is increasing annually. (See Appendix, Table 1) Providers have seen 159 patients in the first six months of 2013, putting this year on track to meet or exceed the number of asthma-related visits performed the previous year. This is despite the findings in the 2012 study published by the Tennessee Department of Health, *The Burden of Asthma in Tennessee: 2001-2010*, which states that asthma rates in the state of

Tennessee are decreasing. A 2012 study of 7 and 8 year old children in New York City published in the journal *Pediatrics* notes a disparity in the number of patients whose asthma is poorly controlled and frequency of urgent medical visits related to asthma exacerbations based on where the child lived, with children from low-income neighborhoods having a higher number of visits and poorly controlled asthma with many symptomatic days and frequent use of short-acting beta-2 agonists (Manerdi 128). This is of particular note for the patient population served by United Neighborhood Health Services in Nashville, TN, as many of their patients live in low-income neighborhoods of in the East Nashville region of Davidson County.

Data indicated no noticeable trend in the age groups most frequently using UNHS for asthma care, though visits did decrease for children ages sixteen and older. This created a challenge in developing education materials that would be appropriate for both parents who are responsible for administering medications to very young children and adolescents who might begin to take responsibility for some of their own medication administration (See Appendix, Table 2).

Provider interviews revealed several key components that shaped the development of interventions. UNHS providers utilize an asthma action plan based on symptomatology, not daily pulmonary function tests (See Appendix, Table 3). The asthma action plan is not used consistently with every patient, despite this being recommended by the NIH (EPR-3 2010).

Peak flow meters to measure Forced Expiratory Volume are available at some clinic sites; instruction and use is inconsistent among providers, presumably due to increased demands on provider's time and lack of knowledge regarding how use of peak flow meters can aid patients in controlling their asthma (EPR-3). Providers utilize EPR-3 asthma treatment guidelines in classifying patient's asthma and prescribing treatments. They notice a seasonal component to visits related to asthma in this population, with peaks in Spring and late Fall, consistent with data obtained from NextGen.

One of the knowledge deficits providers encountered most frequently is the misuse of short-acting Beta 2 agonist inhalers or "rescue" inhalers used during an acute asthma exacerbation and maintenance inhalers intended to prevent an asthma attack. Ample access to written educational materials is currently available on the patient education function of the NextGen electronic health record; providers requested a way to easily communicate information with patients who have low health literacy during office visits.

Interviews with patients revealed similar findings to those gleaned from provider interviews. They often found that their asthma is worsened by seasonal factors such as elevated pollen counts in Spring and Fall.

(See Appendix, Table 4) Others had increased symptomatology during periods of temperature extremes. Patients exhibited a consistent knowledge deficit in the use of maintenance and rescue inhalers. 10 of the 25 were prescribed both a rescue and an inhaled maintenance medication. Of these patients, 7 were unsure about which of their inhalers is used as a preventative medication and which is designed to open airways during an asthma exacerbation. When asked about how they used their inhalers, 6 of these 10 patients interviewed were using their inhalers incorrectly, with the majority of patients using their short-acting Beta 2 agonist inhaler every day in addition to treat an asthma attack, with the others using both inhalers during an acute exacerbation.

An assessment was performed of the environmental hazards for patients with asthma living in the communities served by UNHS. The Air Quality Index is a measure used by governmental agencies to communicate the level of pollutants in a region's air. During the month of June 2013, the Air Quality Index was above 50%--moderately high—18 out of 30 days. Pollen counts were moderate to moderately high on every day in June other than the five days in which it rained. Temperatures were consistently in the upper 80's, with the highest recorded temperature during the month of June being 96 degrees. These factors are known asthma triggers and put patients with asthma at increased risk for exacerbations simply by breathing the ambient air in Middle Tennessee.

Patients living in the public housing complexes surrounding the UNHS clinics are often at risk for asthma exacerbations from triggers found inside their homes. Leaking roofs, windows, and doors, inadequate plumbing, and window air conditioning units cause mold spores, a trigger for some asthmatics. Cockroach, mouse, and rat infestations were occasionally noted by residents, which are another common cause of asthma attacks. When infestations were reported to landlords, most were treated using chemical pesticides with harsh odors that can also be problematic for those with chronic respiratory conditions. Poor ventilation and aging carpets in these housing units can harbor dust and dust mites, other asthma triggers.

Second-hand smoke is one of the most potent triggers for asthma attacks. The National Survey of Children's Health estimates that 36% of children in Tennessee live in households where someone smokes and 39% are exposed to second-hand smoke on a regular basis (Jones 19). This can be especially problematic for pediatric asthmatic patients who have few ways to avoid exposure to cigarette smoke when their caregivers are using tobacco products. In some months, young patients often have nowhere to go to escape asthma triggers: by staying inside, they are susceptible to indoor triggers like mold, dander, dust mites, and second-hand smoke; stepping outside exposes them to pollen, air pollutants from vehicles and factories, and temperature extremes.

Current research examining trends in patient education indicates that persons with low literacy, an estimated 20% of the adult population in the United States according to a NIH estimate, are at higher risk for asthma exacerbation for a variety of factors. A study published by The American College of Chest Physicians found a strong correlation between low literacy and an increased number of emergency room visits related to asthma, indicating literacy may be a barrier to self-care for persons with asthma (Jones 48). One research study examined 150 children and their parents, twenty-four percent of the parents whom had low literacy. Children of these parents had greater incidence of emergency department visits, hospitalizations, and days missed from school even after adjusting for asthma-related knowledge, disease severity, medication use, and other sociodemographic factors. Parents with low literacy had less asthma-related knowledge, and their children were more likely to have moderate or severe persistent asthma and had greater use of rescue medications (Dewalt 28). The subpopulations with the highest incidence of low literacy are nearly identical to those with the highest prevalence of tobacco use. Low-literacy smokers are more likely to underestimate the risks related to tobacco use, have less social pressure and support to quit smoking, may experience more life stress and consequently rely more heavily on nicotine use for stress reduction and require more assistance in developing a sense of self-efficacy (Ciampa 190). Children of these parents are more likely to be exposed to secondhand smoke as a result.

One of the most effective ways to prevent asthma exacerbations in pediatric patients is educating parents and guardians on trigger avoidance. A review published in the *American Journal of Preventative Medicine* in 2012 showed that in 20 studies examining the use of asthma trigger avoidance education for the parents of children and adolescents, the number of days with asthma symptoms was reduced by 0.8 days per 2 weeks, school days missed were reduced by 12.3 days per year, and the number of asthma acute care visits were reduced by 0.57 visits per year after parents received the education (Croker 26). Studies have found that patients with low literacy who were given individualized education that involves both visual and written instructions were associated with an increased understanding of asthma management techniques (Paasche-Orlow 983).

Based on the recommendations from providers and information obtained from patient interviews and trends in patient education research, it was determined that an educational video would be the best method to communicate educational interventions for preventing asthma attacks for patients with low health literacy. The video was developed to communicate a simplified explanation of the pathophysiology of asthma, common asthma triggers for patients living in Middle Tennessee, the difference between maintenance and "rescue" inhalers, and how to use

an inhaler with a spacer properly. The video was uploaded to YouTube and searchable by the keywords “UNHS asthma” so providers can access the video on a smart phone, allowing patients to watch the video during a visit related to asthma control. Patients could then ask questions of the provider during the encounter. At the end of the visit, patients would be given written information to reinforce learning, as well as continued access to the video on the Internet.

A second intervention addressed the frequency with which patients misuse their inhalers. Often, the prescription information on how to take an inhaler is printed on the box the inhaler arrives at the pharmacy in, but patients carry the inhaler without these boxes for convenience. To prevent patients from carrying their prescription medications without dosing information, pre-printed 1 inch x 3 inch labels were created for both maintenance and rescue inhalers. These labels can be easily affixed to the aerosol chamber of each inhaler to help patients differentiate between these medications. The labels for rescue inhalers read, “Rescue Inhaler: For use ONLY during an asthma attack” while the labels for maintenance inhalers read, “Maintenance Inhaler: Use ____x EVERY DAY to prevent asthma attack.” Providers can affix these labels to the patient’s inhalers to ensure they can differentiate between medications. These labels could also assist caregivers outside of the home who are unfamiliar with a child’s medication regime such as teachers, coaches, or relatives.

Another important step in the intervention process was to have the educational materials available in Spanish. 20% of Tennessee’s Spanish-speaking population resides in Davidson County (Nagle 26), many of them using UNHS for primary healthcare. Working with a native Spanish speaker who is employed as a nurse and has a wide bilingual medical vocabulary, the video was re-recorded in Spanish. Both maintenance and rescue inhaler labels were translated for Spanish-speaking patients. The label intervention was of key importance, as the printed instructions found on the box provided by the pharmacy may only be available in English. Providing the video and inhaler labels in two languages allows the intervention to be of use to more patients.

Discussion

The interventions were designed to help parents of children with asthma identify and avoid common triggers for patients in Middle Tennessee. They also addressed a noted knowledge deficit among patients regarding using inhalers correctly and with a spacer. Though they were designed to assist UNHS patients living in Nashville, TN, these interventions could easily be applied in other settings where patients exhibit low health literacy.

Due to the limited time frame presented by the GE-NMF PCLP

experience, results of the interventions are inconclusive at this time. The six-week timeframe permitted by the internship allowed only the opportunity to perform background research and development of interventions. Ideally, the videos and inhaler labeling interventions would be used by UNHS providers during each visit with a pediatric asthma patient for the next year. Data would be recollected to indicate the number of asthma related office visits, with the expectation that the number would be reduced after consistent use of the educational tools.

While providing the video in both English and Spanish improves access to the information for some patients, UNHS patients speak a variety of other languages. Nashville has a significant number of immigrants from Egypt and Somalia in addition to other persons for whom English is not their primary language. By finding the appropriate resources to accurately translate the video script and labels into other languages common to the region, more patients would have access to the information. This intervention could be important in helping patients who are new Nashville residents become familiar with regional asthma triggers.

Researchers might also consider tracking improved compliance with trigger avoidance and correct medication use by the number of rescue inhaler refills being requested. If a patient's asthma is well controlled, use of a short-acting Beta-2 agonist inhaler should be infrequent. Patients who are requiring prescription refills due to frequent use of the rescue inhaler might need changes to their asthma treatment plan, including further education and medication dosage adjustment. Currently, the NextGen electronic health record does not have functionality to track the number of medication refills requested. Setting up this functionality could give providers more accurate data on the effectiveness of these educational interventions.

As new standards for healthcare are enacted in the coming years, healthcare delivery systems will be held accountable for patient outcomes. Providers will be reimbursed based on the quality of care provided, not simply the quantity of patients they see and number of tests performed. Though there are currently many unknowns, it is possible that providers will see a decrease in reimbursement rates for patients whose asthma is not well controlled. For not-for-profit organizations like United Neighborhood Health Services that operate on strict budgets, helping patients achieve asthma control will ensure that reimbursement remains consistent with the care provided. Prevention of asthma exacerbations through education appropriate for those with low health literacy may be one key to ensuring financial viability in a changing healthcare marketplace.

Recommendations

The current practices for treating asthma utilized at United

Neighborhood Health Services have limited ability to help patients control this problematic disease. Providers are utilizing the EPR-3 treatment guidelines when prescribing medications, but other recommended interventions for controlling asthma such as trigger avoidance, use of a peak flow meter to monitor daily forced expiratory volumes, and consistent and correct spacer use are not regularly employed by providers. Amendments to the current asthma action plan utilized at UNHS should include information on use of peak flow meters. The plan in use advises patients how to manage their asthma based on reported symptoms, a subjective and less consistent measure than FEV as measure by peak flow meters. Based on the forced expiratory volume reading, patients would tailor their medication usage, activity, and trigger exposure to reduce their risk of an asthma exacerbation and have guidelines for when to contact their primary care provider for concerning symptoms. Parents should be encouraged to share their child's asthma action plan with other caregivers, including the school nurse and the child's teacher.

Reinforcement of education is an important part of secondary prevention. UNHS could consider training staff members or volunteers to perform home visits to assess for asthma trigger risk in the home. They could examine the home's vacuum cleaner to ensure that it has a HEPA filter, suggest less-toxic alternatives to conventional cleaning products, and determine the presence of dust, mold, and animal dander. This expanded service could result in billable hours for insurance purposes, creating a new revenue stream for UNHS.

Conclusion

Residents of Middle Tennessee, especially those who use United Neighborhood Health Services for primary care, are at high risk for asthma exacerbation due to the increased number of triggers they are exposed to, both inside and out of the home. Pediatric patients are the most vulnerable subset of this population because their lungs are still developing and they often have no recourse for escaping the asthma triggers surrounding them. Implementation of education programs designed to inform patients with low health literacy how to avoid asthma triggers and take their medications correctly could result in better patient outcomes, fewer acute asthma exacerbations, and a reduced financial burden on the healthcare system.

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Appendix

Total UNHS Asthma Visits, 2010-2012

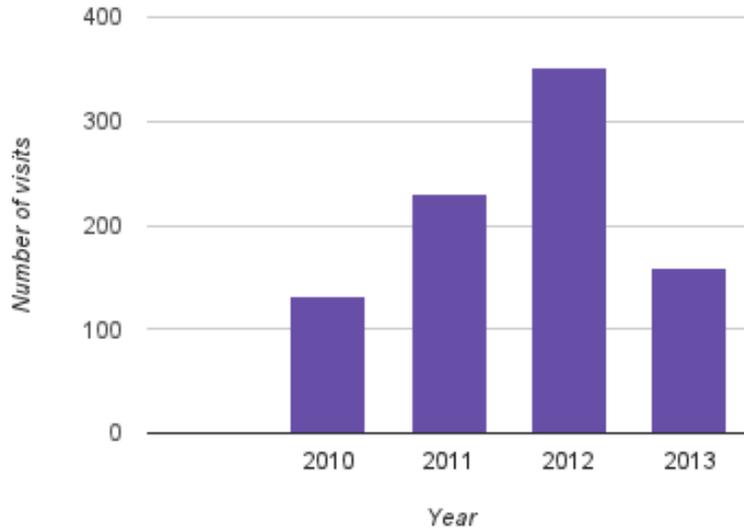


Table 1: Number of pediatric patients who utilized UNHS for medical management of their asthma from the years 2010-June 2013. The number of asthma related visits has steadily increased, with 2013 on target to meet or exceed the numbers seen in 2012.

Asthma Visits by Age Group, 2010-2012

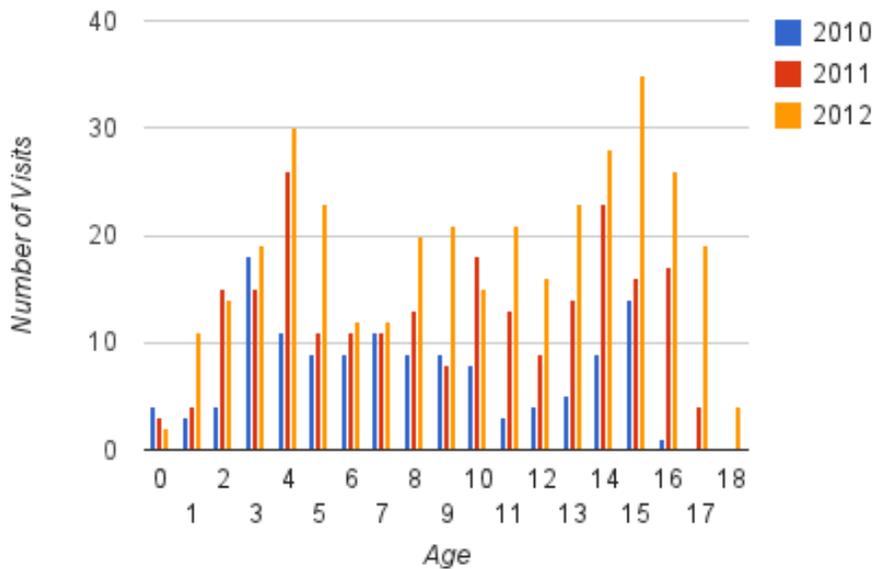


Table 2; Number of UNHS office visits for asthma by age from 2010-2012.

Green Zone: Doing Well

No cough, wheeze, chest tightness, or shortness of breath during the day or night
Can do usual activities

Yellow Zone: Asthma Is Getting Worse

Cough, wheeze, chest tightness, or shortness of breath, or
Waking at night due to asthma, or
Can do some, but not all, usual activities

Red Zone: Medical Alert!

Very short of breath, or
Quick-relief medicines have not helped, or
Cannot do usual activities, or
Symptoms are same or get worse after 24 hours in Yellow Zone

Table 3: UNHS Asthma Action Plan based on symptomatology

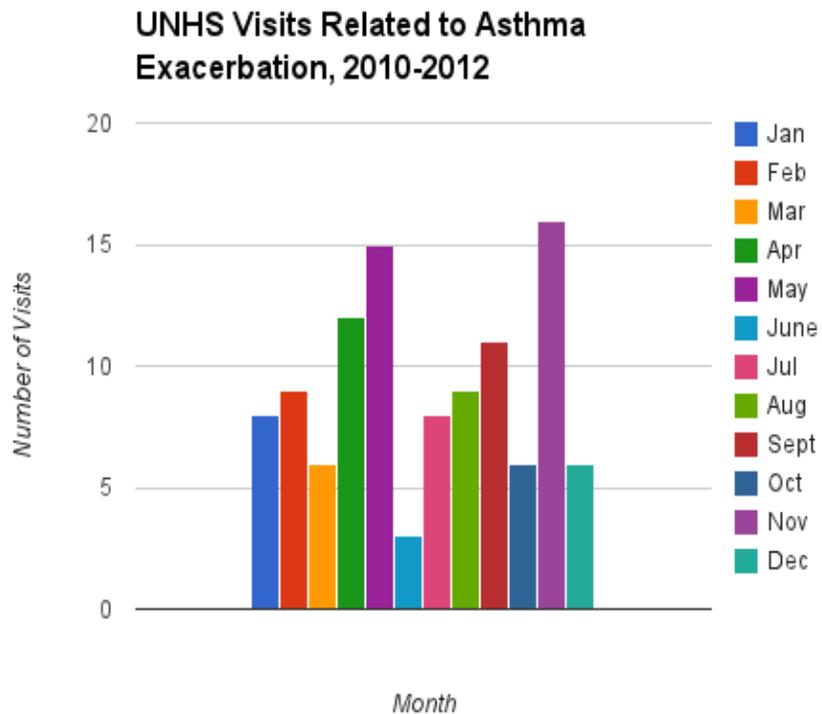


Table 4: Visits related to asthma exacerbations 2010-2012, by month, indicating a seasonal component to asthma symptoms for patients in this population with the highest number of visits seen in May and November. Interviews with providers revealed a perceived seasonal component to asthma exacerbations.