Demographics and Outcomes of a School - Based Breathmobile Program in Orange County California

Silvia Amaro RN, Vivian Derr RNP, Otto Liao MD and Stanley Galant, MD

Children's Hospital of Orange County, Orange, CA

Introduction

Asthma is the most common chronic disease in childhood affecting approximately 6 million children nationwide[1]. These epidemic rates have only been rising with an estimated increase of 160% in children younger than 5 and 74% in children 5-14 years old from 1980 to 1994. In terms of morbidity, asthma is the most common cause of hospitalizations and school absenteeism in 1999, there were a reported 2 million emergency room visits due to asthma and about 200,000 hospitalizations for those children[2]. According to one source, the estimated direct costs of asthma care in the United States in 1994 was approximately $6.2 billion, with 80% related to emergency department or hospital ward care. In 1996 asthmatic children missed about 10 million days of school and about 400 million days of school funds from attendance revenue for local schools[3].

Despite the scientific advances over the last decade in the understanding of asthma pathophysiology and the development of expensive novel therapeutic approaches, the morbidity and mortality associated with asthma continues to rise. This is particularly alarming for asthmatic children of the inner-city poor where demographic analyses from numerous cities in the United States consistently show trends that link higher rates of asthma hospitalization and death with poverty, ethnic minorities, and urban living[4]. Studies from large multicenter cities suggest a two to 10-fold higher rate of hospitalization and death in impoverished, minority neighborhoods when compared to adjacent non-inner-city/affluent neighborhoods or to national norms. The prevalence of asthma is also inversely correlated with family income where families with an annual income of less than $10,000 are almost twice more likely to have asthma than those earning greater than $75,000[5]. However, in the current situation, the inner-city child will not "medical home" may be facing a higher prevalence of asthma, greater morbidity and mortality, and fewer resources to deal with such a chronic disease.

Many different models and approaches have been offered as solutions to the difficult problems of inner-city asthmatic care, with varying levels of success[6,7]. It can be concluded from a review of these models that certain key elements needed for a successful asthma program to deal with the inner-city asthmatic child should include (1) accessibility to good medical care, (2) identifiable continuity of care, and (3) expert asthma care. Website-based asthmatic care model, as described by Cassino et al[8], which delivers expert asthma care on a mobile asthma van at the school site, incorporates all of these elements in a comprehensive and cost-effective way to deliver much needed intervention to those high-risk inner-city asthmatic children who are lagging far behind. The Breathmobile™ model has already been utilized in four major cities across the United States: Los Angeles, Chicago, Baltimore, and Phoenix[9,10]. To our knowledge, however, the data about the Breathmobile™ health-based intervention is mostly in the form of case reports. There are reports on other mobile medical van programs as well as different school-based inner-city asthma programs, but none of which combine the use of an asthma specialist with a mobile van that can service children at three schools[11-14]. Therefore, the purpose of this paper is to report the demographics and outcomes of the Orange County Breathmobile™ program in an effort to begin critical evidence based evaluation of this mobile care provider solution to the growing epidemic of inner-city asthma.

Results

BASELINE DEMOGRAPHICS

Since the start of the Orange County Breathmobile™ program in April 2002, a total of 573 patients have been evaluated for asthma. Of these, 75% (434) had a positive diagnosis of asthma with 120 (27%) mild intermittent, 130 (30%) mild persistent, 168 (39%) moderate persistent, and 17 (3%) severe persistent asthmatics as defined by NIH symptom severity classification (Fig. 2). The program recruited 2,273 patient-visit entries with 168 patients having 3 or more visits recorded. As seen in Table 1, our population was made up of slightly more males than females (60% vs. 40%), had a mean age of 9 years old, and was predominately Hispanic/Latino (76%). A large percentage of enrolled asthmatics were also noted to be Hispanic suggesting more severe disease in this population. A positive family history of asthma was found in nearly three times as many asthmatics than non-asthmatics. Analysis of medical insurance coverage for our patients showed the largest proportion (46%) having Medical or Healthy Families/some other income medical insurance. The remaining was distributed between private insurance, no insurance, and other/unknown forms of insurance with each representing about 20%. In Table 2, our task results showed our population to have the highest rate of sensitization to dust mites (25%), followed by mixed grass (18%), and then cockroaches (13%). Further examination by severity revealed a greater percentage of persistent compared to intermittent asthmatics have positive skin tests to dust mites (28 % vs. 20%, p= 0.5). Though any skin test positivity was statistically significant between persistent and intermittent asthma, there were trends in almost all of the allergens tested suggesting a direct correlation between atopy and severity of asthma. Spirometry measures showed statistically significant differences between PEFR/FEV1 in mild intermittent asthmatics and those of moderate or severe asthmatics (Table 3). There were trends indicating poorer lung functions across all categories from mild intermittent down to severe persistent disease. Table 4 shows significant levels of baseline morbidity over the preceding 12 months. Of these 168 children with a positive diagnosis of asthma, 10% had been hospitalized, 31% more than once, 39% had visited the ED (25% more than once), and 61% had missed school due to asthma symptoms (28% having missed more than 10 days). Persistent asthmatics had more hospitalizations, ER visits, and missed school days suggesting that morbidity directly correlates with asthma severity. Only 26% of persistent asthmatics were using daily anti-inflammatory medications at baseline as recommended by the NIH guidelines (Table 5).

OUTCOMES

As noted above, less than one third of asthmatic children were completely anti-inflammatory therapy at baseline (Table 5). Oral steroids were the second most popular (36 days), over 70% of persistent asthmatics were on daily anti-inflammatory therapy. This high percentage was sustained over the average 4700 days with the Breathmobile™ visit (Fig. 3). Significant trends were found in asthma symptoms (cough, chest tightness, wheezing, dyspnea, and nocturnal awakenings), ER visits, hospitalizations, and school days missed. By the third visit (average 90 days), almost half of the patients who had reported asthma symptoms at baseline were symptom free (Fig. 4). In patients with 3 or more visits, almost half of them reduced use of the emergency room over the average 3 months period after starting the program, compared to 36% of those children having baseline emergency care in the preceding year (Fig. 5). Likewise, there were only 2% of asthmatics that required hospitalizations during the average 4 months after joining the program, compared to over 14% of patients in the year before (Fig. 6). The number of school days missed in children with 3 or more visits fell significantly from 30% of patients reporting more than 5 school days missed in the year prior at baseline to 4% by their third visit (Fig. 7). Alternatively, only 36% of patients reported not having missed any days of school without baseline compared to 80% reporting no missed school days by their third visit.

Tables and Figures

Table 1
Baseline Demographics

	Intermittent	Persistent	Total
Gender			
Male	[illegible]	[illegible]	[illegible]
Female	[illegible]	[illegible]	[illegible]
Ethnicity			
Hispanic/Latino	[illegible]	[illegible]	[illegible]
Caucasian	[illegible]	[illegible]	[illegible]
Other	[illegible]	[illegible]	[illegible]
Age (years)	[illegible]	[illegible]	[illegible]
Family Hx of Asthma	[illegible]	[illegible]	[illegible]

Table 2
Skin Test Performed

	Intermittent	Persistent	Total
Dust Mites	[illegible]	[illegible]	[illegible]
Mixed Grass	[illegible]	[illegible]	[illegible]
Cockroaches	[illegible]	[illegible]	[illegible]
Cat Dander	[illegible]	[illegible]	[illegible]
Dog Dander	[illegible]	[illegible]	[illegible]
Mold	[illegible]	[illegible]	[illegible]
Pollen	[illegible]	[illegible]	[illegible]

Table 3
Baseline Spirometry

	Intermittent	Persistent	Persistent	Persistent
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 4
Morbidity at Baseline

	Intermittent	Persistent
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Figure 2
Asthma Percentages by Severity
(N=434)

Figure 3
[illegible]

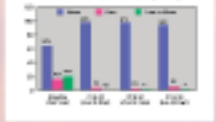


Figure 4
[illegible]

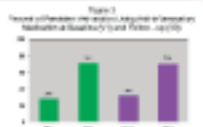
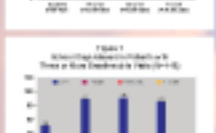


Figure 5
[illegible]

Figure 6
[illegible]

Figure 7
[illegible]



Discussion

Latino children are the largest racial/ethnic group of US children, but they are the group that is consistently delivered poorer medical care[15]. The health of Hispanic children is not only affected by poverty, but also by cultural factors such as lack of access to health care, language, and culturally competent care. Although the Latino population is the fastest growing group in the United States, it is also the group with the most uninsured and underserved population, and where a unique mixture of these factors results in a disproportionately many small children who are hospitalized for asthma. A large share of children who are enrolled in our program had a positive diagnosis of asthma, which indicated a successful outreach and referral process. Alternatively, 10% of our asthmatics had persistent asthma with a larger percentage of them being Latino, suggesting more severe disease in this population. In contrast, only 26% of persistent asthmatics were on daily anti-inflammatory medications, which suggests under-diagnosis of asthma or asthma severity, by the medical practitioner, lack of access to medications, or poor understanding of asthma and medications. This is consistent with many recent papers on poor compliance with NIH guidelines for asthma care[16]. Compared to the rest of Orange County, our subject family had poor asthma care as 20% of our patients had never seen a specialist for asthma care and 27% of our patients had never seen a primary care provider. However, the number of emergency room visits, hospitalizations, and school days missed in our population were found to be considerably lower than previous studies. Nevertheless, the majority of our children were found to be sensitized to dust mites, which has been confirmed as a common allergen in inner-city populations. This may be due to more frequent dust mites, environment, age, or other differences. In addition, spirometry measurements may be helpful in distinguishing moderate and severe persistent asthmatics from mild persistent asthmatics, such as aids in the diagnosis of asthma in children.

The Breathmobile™ model was able to show significant improvements in all areas of morbidity measured, including asthma symptoms, emergency room visits, hospitalizations, and school absences. Comparisons with many ambulatory clinics current reports, including the Kaiser-Permanente study, underscore which areas in this state is fully compared, open-ended, prospective, or an actual study in your basis. Increase clinic-based comparisons, a full year asthma program, an action plan to meet accessibility, compare outcome measures over analysis, enrollment in the program. Currently, data that asthmatics in the program by school is currently continue to evaluate the predominantly and outcomes as described. Another limitation of this research is that it was not patient and parents recall of symptoms, missed school days, emergency room visits, and hospitalizations. Future research methods of comparing the effects of intervention associated such as comparisons of clinical records of attendance in the year before and after beginning the program. In addition, there may be some bias due to increased compliance bias for medication usage for caution bias for children and their parents and intervention medications. Therefore, patients can report usage of medications not in accordance to physician's treatment and were provided in demonstrations. Another period of interest could be the measurement of previous diagnosis of asthma versus a competitive non-diagnosis of asthma. It may be difficult to isolate, gauge the impact of educational teaching and environmental controls apart from the effects of pharmacotherapy, but the cost effectiveness of these such as home visits had to be evaluated. Unfortunately due to time constraints of school visits on a monthly schedule, the Breathmobile™ model does not allow for adequate time to prevent the administration of antiasthmatics as a treatment option. Lastly, there is no gold standard for whether a clinical or the diagnosis of asthma as the diagnosis of asthma is ambiguous a clinical one based on history and physical examination. Hopefully in the future, objective tests to diagnosis asthma could be used to help confirm the diagnosis of asthma[17]. Lastly, future challenges for the program has to develop ways to identify children with asthma who are in crisis but age when the Breathmobile has not yet arrived, thereby underscoring the importance of transportation.

Conclusion

The Orange County Breathmobile™ program provides valuable services and improved outcomes in the care of inner-city asthmatic children.

Supporters

Children's Hospital of Orange County

Allergy and Asthma Foundation of America

Children's Hospital of Orange County