Evaluation of a Community-Based Outreach Worker Program for Children With Asthma

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ABSTRACT
Objective: An asthma outreach worker (AOW) can provide home-based education about asthma management and methods to minimize home environmental asthma triggers. A theory-based AOW program was implemented by a community partnership and its effectiveness was evaluated. Design: Baseline and follow-up surveys were used to evaluate the effectiveness of the AOW. Sample: The convenience sample consisted of 60 caregivers whose children received AOW services. Measures: Quality of life, use of asthma management plans, medication use, health care utilization, home environmental behavior changes to reduce triggers, and satisfaction with AOW services were self-reported by caregivers. Results: Caregivers reported significantly higher quality of life at follow-up than at baseline. At follow-up, 93% of the children had asthma management plans as compared with 31% at baseline. Self-reported hospitalizations were significantly reduced. All of the families made changes to minimize household asthma triggers. Caregivers reported high satisfaction with the AOW and 90% of them felt that the home environmental assessment conducted by the AOW helped improve their child’s asthma. Conclusion: Short-term community-based AOW services for children can be effective in enhancing self-management capabilities, improving the quality of life, increasing the use of asthma management plans, and helping families reduce asthma triggers in the home environment.

Key words: asthma, children, environmental interventions, outreach workers, program evaluation.

Asthma, the most common chronic disease in children, is an inflammatory condition of the airways that is triggered by exposure to irritants, including indoor allergens such as tobacco or wood smoke, pet dander, mold, and dust mites (Institute of Medicine, 2000). Asthma prevalence has increased since 1980 and in 2002 was estimated to affect 8.9 million or 122 per 1,000 children under the age of 17 (National Center for Health Statistics [NCHS], 2005). Children with asthma have a higher risk than adults for poor health outcomes such as mortality, activity limitations, and school absences (NCHS, 2005). Health care and indirect costs for school-aged children with asthma were estimated to be almost 2 billion dollars (Wang, Zhong, & Wheeler, 2005).

Inadequate understanding of asthma management has been associated with increased health care utilization and asthma exacerbations (Guevara, Wolf, Grum, & Clark, 2003). Public health interventions that address asthma management, including asthma trigger control, are needed (Wang et al., 2005). Comprehensive programs that incorporate national guidelines, such as using written asthma management plans as self-management tools (National Asthma Education and Prevention Program [NAEPP], 1997, 2002), and involve community partnerships are recommended to improve asthma health (Williams, Schmidt, Redd, & Storms, 2003). Individualized interventions incorporating home visits by outreach workers that can help bridge the gap between health...
care providers and families have been shown to be effective educational strategies to improve asthma health and quality of life (QOL) (Butz et al., 1994; Krieger, Takaro, Song, & Weaver, 2005; Nemcek & Sabatier, 2003; Stout et al., 1998; Swider, 2002). Furthermore, environmental interventions to minimize exposure to environmental triggers have been shown to reduce asthma morbidity (Morgan et al., 2004; Shapiro et al., 1999).

The Clean Air for Kids (CAFK) partnership in Tacoma-Pierce County, Washington, implemented a community-based asthma outreach worker (AOW) program that focused on education about home environmental asthma triggers and asthma management. This paper describes the AOW program and reports findings from research conducted to evaluate its effectiveness. There is limited evidence about the effectiveness of community outreach worker programs that are designed to promote the use of asthma management plans and assist with home environmental changes (Nemcek & Sabatier, 2003; Swider, 2002).

**CAFK® Program Description**

The CAFK® partnership was formed in 1996 to increase the capacity of the community to address asthma and improve health outcomes. Partners included the local and state health departments, the American Lung Association of Washington (ALAW), health care agencies, the tribal health authority, the school district, and the local university. Initially, CAFK® provided continuing education for local physicians on the use of the national asthma guidelines (NAEPP, 1997, 2002). The partnership also implemented the ALAW's Master Home Environmentalist™ (MHE™) program to assist families in reducing home environmental factors that exacerbate asthma and allergies. The MHE™ program utilizes trained volunteers to conduct home assessments with families and assist them in developing and implementing an action plan to improve the home environment. In a study about the program's effectiveness with 36 households who received a home assessment, 31 household residents reported making at least one behavioral change such as controlling dust (Leung et al., 1997). The MHE™ program has been recognized as a “best practice” to address asthma triggers in the home (Breyssse et al., 2004).

With funding from the NAEPP’s “Reducing Asthma Morbidity in High Risk Communities program,” CAFK® built on its success with the MHE™ program and launched an AOW program. The program is unique in that the AOW is employed by the ALAW, community-based rather than clinic-based, and addresses home environmental triggers as well as asthma management. The AOW provides free home visits and phone follow-up to families, and targets low-income, culturally diverse families with children who have moderate to severe asthma.

Similar to other outreach worker models, the AOW was trained in conducting home visits, home environmental assessments, and providing asthma education (Butz et al., 1994; Krieger et al., 2005; Stout et al., 1998). Educational topics included the purpose of asthma management plans (individualized information about medications, symptom control, and emergency actions), signs and symptoms of asthma exacerbations and their prevention, medications and their proper use, how to work effectively with health care providers, and ways of reducing exposure to environmental triggers based on the home assessment. Free supplies to better manage asthma and reduce exacerbating factors, such as allergen proof pillow and mattress covers, doormats, spacers with facemasks, and peak flow meters, were provided. Outcomes the partnership hoped to achieve were consistent with asthma management guidelines and Healthy People 2010 goals (NAEPP, 1997, 2002; Williams et al., 2003) and included increasing self-management through the use of written asthma management plans, reducing home environmental exposures that exacerbate asthma, and improving QOL and health status. Furthermore, the program aimed to enhance the “therapeutic alliance” with health care providers (Nemcek & Sabatier, 2003).

Local health providers, hospitals, school nurses, the health department, community agencies, and advertisements promoted the AOW program and referred families, or families could self-refer. The AOW contacted interested families and arranged home visits. Following the visits, letters were sent to the health care provider outlining the home visit findings and recommended home environmental changes. Using a flexible approach, the AOW assessed the family’s understanding of asthma management and determined when they were confident with asthma care. Home visits were then completed with the option of further contact via telephone or e-mail. Program consistency was maintained by using one AOW to serve all families. Between 2001 and 2003, 197 families received services. The mean number of visits per family was
2.24 and an average of 2.6 follow-up phone calls were made. The mean length of outreach services was 5 weeks with a range of 2–26 weeks. A flexible approach with limited home visits and phone follow-up may reduce barriers to service (Brown et al., 2005). This seemed to be the case in our AOW program.

The theoretical underpinnings of the AOW program include individual theories such as the health belief model, interpersonal theories such as social cognitive theory, and community level theory including partnership and collaboration (Parker, Baldwin, Israel, & Salinas, 2004). These theories have been used in other studies to guide interventions that require behavioral changes to better manage asthma and decrease asthma triggers (Krieger et al., 2005; Morgan et al., 2004).

Program Evaluation Methodology

A pre- and postintervention design was used to evaluate program effectiveness. The University of Washington Human Subjects Committee approved the study. Families that received services from the AOW were eligible to participate in the evaluation study if they were able to speak English and had a telephone. The AOW introduced the study during the initial visit and gave caregivers the option of participating. If they agreed, they signed the study consent form and baseline information was collected. Children who were able to read and write completed an assent form. Of the 197 families receiving services, 53% volunteered for the evaluation study.

A research assistant conducted follow-up phone interviews lasting about 20 min approximately 1 month after services were completed. A minimum of three attempts were made to reach the caregiver by phone on various days and times of day. Responses to the survey items were recorded by hand and reviewed for accuracy and completeness immediately following each interview.

Measures

The baseline survey included questions about the age, gender, and perceived severity of children with asthma; asthma-related health care utilization; asthma medications; asthma management plan use; QOL; and caregiver demographics. The follow-up instrument included the same measures as well as items on the perceived benefits of the AOW. Experts in asthma care developed the survey questions and most items were taken from existing instruments. Test–retest reliability for the question about medication use and similar questions about program satisfaction were reported to be 88% based on percent agreement (Baron, 1999). Caregiver QOL was measured with the 13-item Asthma Caregiver’s QOL Questionnaire (Juniper et al., 1996). Cronbach’s $\alpha$ was used to measure the reliability of the scale and was .95 in this study, higher than the .85 coefficient reported by Juniper et al. (1996).

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to summarize central tendency for continuous variables. Percentages were used to describe discrete data such as asthma management plan use. Statistical tests used were selected based on variable type, and after examination of the distribution of the variable and a determination of whether the assumptions for parametric testing were met. For variables where the baseline and follow-up response intervals could overlap, nonparametric testing was used. If caregivers had more than one child with asthma, only data for the child with the most severe asthma were included in the analysis.

Results

Follow-up surveys were completed by 60 of the 105 caregivers who consented to participate in the evaluation study. Only participants with both baseline and follow-up data were included in the analysis.

Demographics

The demographic information used to describe the sample was obtained at baseline. Caregiver respondents were predominantly the child’s parent (98%) and female (95%). Over half (62%) attended college or earned a college degree, 33% had a high school education or equivalency exam, and 5% had less than a high school education. About half (49%) of the caregivers worked outside of the home. One-third (34%) of the caregivers worked outside of the home. One-third (34%) reported an annual household income of less than $20,000, another third (32%) had incomes between $20,000 and $39,999, 16% had incomes between $40,000 and $59,999 per year, and 18% reported an annual income of $60,000 or greater. The caregivers who participated in the evaluation study described themselves as Caucasian (68%), African American (19%), Samoan (5%), Hispanic (3%), Native American (3%), Chinese (3%), and 2% Korean or Filipino, Japanese, Southeast Asian, or Pacific Islander. Some
(n = 3) selected more than one category. In contrast, only 49% of the families served by the AOW program were Caucasian. Although the evaluation study sample represents fewer African American (27%) and non-Caucasian caregivers than those served by the AOW program, the sample still represents more diversity than Pierce County, which is 7% African American.

Most caregivers (83%) had one child with asthma (range 1–8, mean = 1.07), four reported two children with asthma, and one reported eight children with asthma for a total of 71 children. The sample of children was equally representative of boys and girls (56%, 44%, respectively). The ages of the children ranged from less than 1 to 18 years and the mean age was 6 (SD = 4.41).

Perceived asthma severity was measured using one item with responses as follows: mild (wheezing, cough, and one to two asthma attacks per year), moderate (seasonal with weather changes and colds, and three or four attacks per year), or severe (hospitalizations, school absences, activity limitations, and more than four attacks per year). Caregivers reported their child’s asthma severity similarly at baseline and follow-up: mild (20%, 21%, respectively), moderate (51%, 47%), or severe (29%, 31%). Paired tests did not reveal differences in severity following the intervention (Z = −.459, p = .65). At baseline 45% of children were reported to have allergies.

**QOL**
Total and subscale scores on the Asthma Caregiver QOL Questionnaire significantly increased following AOW services (see Table 1), signifying an improvement in QOL. The items with the greatest difference were the caregiver’s need to change plans due to the child’s asthma, feeling helpless or frightened by the child’s asthma symptoms, sleepless nights, and being awakened at night. The least change occurred with worry about being overprotective and being bothered because the child’s asthma interfered with family relationships. In response to a global question about their child’s QOL, 85% (n = 51) of caregivers felt that AOW services helped to improve their child’s QOL, 10% (n = 6) felt there was some improvement, and 5% (n = 3) reported AOW services had no effect.

**Use of asthma management plans**
The use of asthma management plans was measured by a one-item dichotomous question for each child who had asthma. There was a significant increase in the number of children that had asthma management plans at follow-up as compared with baseline (see Table 1). Asthma management plan usefulness was measured using one item with a five-choice Likert-type scale that was later recoded into two categories: useful and not necessarily useful. The neutral response was coded as not necessarily useful. At follow-up, 88% of caregivers felt that the asthma management plan was useful in improving their child’s asthma. About 33% reported talking with their health care providers about the plan a lot, 29% a fair amount, 27% at least a little, and 7% did not talk with their providers about the plan. Finally, nearly 70% reported giving the plan to others such as child-care providers or family members.
Medication use
Caregivers reported the names of prescribed asthma medications at baseline and follow-up, and these were categorized according to quick relief or long-term control medications. There was a significant decrease in the use of quick-relief medications at follow-up as compared with baseline (see Table 1). Although a greater number of children were using long-term control medications at follow-up than at baseline, the difference was not statistically significant. These results suggest that the AOW prompted caregivers to see their health care providers regarding asthma medications.

Health care utilization
Caregivers retrospectively reported health care utilization in the year before the data collection point. There was a significant difference between the number of children hospitalized at baseline and follow-up (see Table 1); however, there was no difference in emergency room or unscheduled physician visits.

Perceived benefits
To measure the perceived helpfulness of various aspects of the AOW’s services, a five-choice Likert-type scale was used. Responses were recoded into two categories: helpful and not necessarily helpful, with the neutral response coded as not necessarily helpful. Almost all caregivers reported that supplies (doormats) and information to control asthma triggers (97%), help with correct use of inhalers, spacers, masks, peak flow meters, or nebulizers (93%), information about signs and symptoms of asthma (91%), information about asthma as a disease (86%), home visits (86%), and information on when to seek medical advice (86%) was helpful. AOW’s communication with providers (86%), help with asthma medications (85%), help with the written asthma management plan (78%), information on how to work better with health care providers (78%), and AOW phone calls (70%) were also helpful. When asked if they felt that the home environmental assessment by the AOW resulted in improved asthma for their child, 82% of caregivers responded affirmatively.

Perceived ability to control asthma triggers
Another indicator of AOW effectiveness was the caregiver’s perceived ability to control various triggers. Responses were rated on a five-choice Likert-type scale that was recoded into two categories: well or not well, with the neutral response recoded as not well. At follow-up, most caregivers felt they could control tobacco smoke (96%), ventilation (93%), mold and mildew (91%), and wood smoke (89%) well. Slightly fewer caregivers felt they could control animal dander (85%) and dust and dust mites (72%) well.

Behavioral changes made
Behavioral changes to minimize exacerbating factors for asthma were examined. Almost all caregivers (98.3%) reported that they made changes recommended by the AOW. Caregivers were asked about specific changes and the responses were categorized (see Table 2). Household cleaning and improving ventilation were the most common changes. Caregivers also described reasons for not making changes. For the 11 who reported they did not intend to make some of the recommended changes, reasons included difficulty in getting rid of pets, renting their residence so that they could not make the changes, unfeasibility of changes (washing everything in hot water), and ineffectiveness of changes (covering supply air vents with filters did not allow heat in).

In response to an open-ended question about AOW services, “Is there anything else you would like us to know?” respondents referred to the AOW’s character traits (friendly, encouraging). Some caregivers

<table>
<thead>
<tr>
<th>Type of change</th>
<th>n</th>
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<tbody>
<tr>
<td>Household cleaning (vacuuming, dusting, cleaning</td>
<td>28</td>
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<tr>
<td>Furnace</td>
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<tr>
<td>Ventilating the residence (using fans, opening</td>
<td>26</td>
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<tr>
<td>windows)</td>
<td></td>
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<tr>
<td>Mattress and pillow cover use</td>
<td>18</td>
</tr>
<tr>
<td>Door mat use</td>
<td>12</td>
</tr>
<tr>
<td>Change in smoking behavior (smoking outside,</td>
<td>8</td>
</tr>
<tr>
<td>wearing smoking jacket)</td>
<td></td>
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<tr>
<td>Furnace and vent filters use</td>
<td>8</td>
</tr>
<tr>
<td>Washing bedding in hot water</td>
<td>6</td>
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<tr>
<td>Making household repairs (fixing leaks,</td>
<td>5</td>
</tr>
<tr>
<td>removing carpets, new windows, removing</td>
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<td>curtains)</td>
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<td>Improving air quality (decreasing use of candles</td>
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<td>and scents, plant care)</td>
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<td>Removing air quality (decreasing use of candles</td>
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<td>and scents, plant care)</td>
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<tr>
<td>Keeping shoes upon entering home</td>
<td>4</td>
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<tr>
<td>Moving to another location</td>
<td>2</td>
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n = number of respondents reporting each type of change (some respondents reported more than one).
reported that the AOW enabled them to communicate with their doctors about asthma, mitigate triggers such as mold, and obtain resources such as mattress covers. One stated, “She reinforced what I learned in the hospital. She suggested that we post the asthma management plan on the fridge.” Specific assistance to mitigate triggers was noted. “She knows enough about homes to know where to make changes. Our landlord got the fans and windows that we needed.” Another reported health outcomes: “My son hasn’t had any symptoms in six months.”

Results from a long-term follow-up using a mailed survey with 10 families in January 2004 showed that caregivers continued to be positive about AOW benefits, even up to 2 years later. Caregivers sustained behavior changes and perceived that their child’s asthma health outcomes improved following the AOW visits.

**Program cost**
The average cost for AOW services was $200.00 per family including staffing ($110), supplies ($50), travel ($30), and overhead ($10). AOW time per family averaged 5.5 hr including 40 min on travel, 2.5 hr on home visits, 1.5 hr on documentation and provider communication, 20 min on phone calls, and 30 min on organizing tools and resources. Cost effectiveness was not calculated because measures of health care utilization were self-reported. Nonetheless, based on an estimated $840 per hospitalization day (Sullivan et al., 2002), the reduction in hospitalizations suggests that the AOW program may help reduce overall health care costs.

**Discussion**
Although recent clinical trials have demonstrated the effectiveness of AOW models (Krieger et al., 2005; Morgan et al., 2004), their success once translated into community settings has not been documented. This theory-based AOW program, developed by a local partnership to enhance community capacity around asthma, provided in-home support, education, and home environmental assessments and interventions to control asthma triggers. Aspects of the health belief model and social cognitive theory were supported by the study findings. Home visits by the AOW to assess and identify ways of minimizing asthma triggers in the home increased caregivers’ self-efficacy to make behavioral changes to better manage asthma. Furthermore, caregivers’ confidence in their ability to manage asthma and minimize asthma’s exacerbating factors was enhanced by providing information about asthma management, supplies, and support to make the needed changes. Asthma outreach services, though relatively short term, improved QOL, increased use of asthma management plans, and enhanced perceived control of asthma triggers. Self-reported hospitalizations and quick-relief medications were reduced.

Findings from the evaluation of this AOW program support its effectiveness in improving QOL and meeting several key clinical activities for quality care: use of asthma management plans, control of triggers, and medication use (Williams et al., 2003). The use of written asthma management plans increased significantly following AOW services. Families felt that the education provided by the AOW regarding asthma management plans helped them to communicate with their providers and work in partnership to self-manage asthma. This finding supports the effectiveness of outreach workers in enhancing the “therapeutic alliance” with health care providers (Nemcek & Sabatier, 2003). In addition, the AOW was effective in helping families control factors that exacerbate asthma. Caregivers made behavioral changes such as encasing mattresses in allergen-proof covers, improving ventilation, or eliminating mold to reduce triggers. These findings are consistent with other outreach models involving home environmental interventions that demonstrated reduced indoor allergens and asthma morbidity (Krieger et al., 2005; Morgan et al., 2004).

Following the AOW intervention, the use of quick-acting asthma decreased significantly. Asthma symptoms are better managed when longer-acting medications are used, thereby decreasing breakthrough symptoms that often accompany the use of quick-acting medications (NAEPP, 1997, 2002). Finally, self-reported hospitalizations were reduced following the AOW intervention. Comprehensive AOW programs have reported similar findings and demonstrate that individualized educational interventions aimed at self-management can reduce health care utilization (Krieger et al., 2005).

Caregivers reported significantly higher QOL for themselves and for their children after receiving AOW services. Krieger et al. (2005) reported improved caregiver QOL in a clinical trial that included a low-intensity community health worker intervention group similar to the AOW program. In contrast, QOL was not significantly different in a clinical trial of an
aggressive home environmental intervention (Shapiro et al., 1999) or in a study that used a 2-hr, standar-
dized home asthma health education session (Dolinar, Kumar, Coutu-Wakulczyk, & Rowe, 2000).

Caregivers reported that they felt their child’s asthma improved after outreach worker services. Dolinar et al. (2000) reported similar findings after an educational home visit. It is possible that through educational home visits, caregivers gain confidence in their ability to manage asthma and reduce triggers, and therefore perceive their child’s asthma has improved.

The convenience sample of volunteers limits the generalizability of the findings. The AOW’s personality and competence, as reported by the caregivers, may have influenced their perception of effectiveness. Results may differ if multiple outreach workers were employed. Furthermore, although the follow-up surveys were originally planned to occur 1 month after services were completed, the time frame for follow-up data collection was delayed and inconsistent. Finally, because the methodology was retrospective and involved self-reporting of health care utilization, recall bias might have occurred. Caregivers may not have remembered accurately the number of health care visits and may have included visits that were not asthma related.

**Implications**

Public health interventions that incorporate national asthma guidelines and include individualized self-
management education about asthma, home environmental trigger avoidance, medications, and ways to enhance collaboration with health care providers are needed to improve asthma care for children (Wang et al., 2005). Policy changes to cover outreach services and home interventions as part of a comprehensive, cost-effective strategy to manage asthma are indicated (Krieger et al., 2005; Lara et al., 2002). Furthermore, since interventions aimed at only clinical aspects of asthma care are inadequate, multifaceted strategies that increase community partnerships around asthma care are vital (Williams et al., 2003).

Home visiting programs to assist families with asthma management have been conducted by profes-
sionals (Brown et al., 2005; Navaie-Waliser, Misener, Mersman, & Lincoln, 2004) as well as outreach workers (Butz et al., 1994; Krieger et al., 2005; Stout et al., 1998) and can increase caregiver knowledge as well as enhance collaboration with health care providers. As home visitors, nurses may address a broad range of complex family stresses (Brown et al., 2005) while outreach workers can serve those who are often underserved and most difficult to reach (Swider, 2002). Role clarity between nurses and community workers is needed to maximize the benefits of outreach workers (Doherty & Coetzee, 2005).

Future research might compare various home visitation models. Barriers to home visits, appropriate length of service, and characteristics of outreach workers that may influence effectiveness should be examined. Translators should be used to gather data from non-English-speaking populations. Furthermore, clinical records to gather information about health care utilization, medication use, and asthma severity should be utilized in future studies.

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