Objective: To determine whether an asthma coaching program can improve parent and child asthma-related quality of life (QOL) and reduce urgent care events.

Design: Randomized controlled trial of usual care vs usual care with coaching. Comparisons were made between groups using mixed models.

Setting: A Midwest city.

Participants: A community-based sample of 362 families with a child aged 5 to 12 years with persistent asthma.

Intervention: A 12-month structured telephone coaching program in which trained coaches provided education and support to parents for 4 key asthma management behaviors.

Main Outcome Measures: Parental and child QOL measured with a validated, interview-administered, 7-point instrument and urgent care events in a year (unscheduled office visits, after-hours calls, emergency department visits, or hospitalizations) determined by record audit.

Results: Parental asthma-related QOL scores improved by an average of 0.67 units (95% confidence interval [CI], 0.49 to 0.84) in the intervention group and 0.28 units (95% CI, 0.10 to 0.46) in the control group. The difference between study groups was statistically significant (difference, 0.38; 95% CI, 0.14 to 0.63). No between-group difference was found in the change in the child’s QOL (difference, −0.17; 95% CI, −0.47 to 0.12) or in the mean number of urgent care events per year (difference, 1.15; 95% CI, 0.82 to 1.61). The proportion of children with very poorly controlled asthma in the intervention group decreased compared with the control group (difference, 0.34; 95% CI, 0.21 to 0.48).

Conclusions: A telephone coaching program can improve parental QOL and can be implemented without additional physician training or practice redesign.

Trial Registration: clinicaltrials.gov Identifier: NCT00660322

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was participating in another asthma study. If a sibling was already a study subject, or if the child was participating in the study.

classes for parents provided by our hospital-based asthma nurses. Of an asthma action plan, and a schedule of asthma education evaluated in a randomized controlled trial.

coaching intervention designed to reduce rehospitalization among low-income children with asthma. It was evaluated in a randomized controlled trial.

METHODS

PARTICIPANTS, RECRUITMENT, AND DESIGN

Subjects were recruited from families who had contacted the call center for after-hours care for asthma between January 1, 2004, and December 31, 2003. At the time of the study, the call center provided after-hours and weekend coverage for 182 pediatricians. Families were eligible to participate if their child was aged 5 to 12 years, had a physician diagnosis of asthma for at least a year, and had at least 1 acute exacerbation within the prior year that required an unscheduled office visit, a course of oral steroids, an emergency department (ED) visit, or hospitalization. Eligibility also required the parent to report that the child was using daily controller medications or had asthma symptoms consistent with persistent asthma for the past 2 weeks. Families were excluded if they did not have a telephone or could not speak English, if a sibling was already a study subject, or if the child was participating in another asthma study.

Details of the recruitment process have previously been described. A research assistant (RA) telephoned potentially eligible parents to invite study participation, answer questions, and complete the eligibility questionnaire. Consent forms were mailed to all eligible parents (children aged >7 years provided written assent) with up to 2 repeated mailings. Each family was paid $60 for completion of all measurement interviews but was not paid for coaching calls. The study was approved by the Washington University Human Research Protection Office.

RANDOMIZATION

Once the signed parental consent was received, the RA called again to complete the baseline interview. Subsequently, the RA forwarded the subject’s name to the off-site statistician for randomization. Randomization used computer-generated random numbers and was stratified by the child’s primary care provider (PCP). When appropriate, the statistician forwarded subject contact information to the coach manager for allocation to a coach. Subject recruitment was limited to no more than 10 subjects from each PCP to minimize contamination.

INTERVENTION AND CONTROL GROUP ACTIVITIES

Participating physicians were mailed a summary of the asthma guideline recommendations current at the time, an example of an asthma action plan, and a schedule of asthma education classes for parents provided by our hospital-based asthma nurses. The intervention was provided in addition to usual care, and physicians were not informed which of their patients were participating in the study.

TELEPHONE ASTHMA PROGRAM INTERVENTION

The Telephone Asthma Program (TAP) was a 12-month asthma coaching program designed to provide education and support to parents to help them with day-to-day management of their child’s asthma and was delivered by telephone. Four key behaviors were targeted: (1) using controller medications as prescribed; (2) administering albuterol at the child’s first signs of an asthma exacerbation; (3) having an up-to-date asthma action plan readily available for all who may need it; and (4) having a collaborative relationship with the child’s PCP that included asthma planning visits at least every 6 months. These behaviors were based on the NAEPP guidelines and adapted from a previous coaching intervention. We conceptualized that mastery of these behaviors would result in fewer urgent care events and improved QOL for the child and the parent.

We recruited 13 call center nurses to be part-time coaches. All had at least 2 years’ pediatric nursing experience and were experienced in providing telephone care for acute asthma episodes. Initial coach training occurred over 2 weeks and consisted of group meetings to introduce coaching, behavior change strategies, and documentation requirements. Individual meetings were used to practice coaching skills and using the protocol to provide non-directive, tailored advice and review early calls. Training continued with group meetings about every 6 weeks. Coaches did not provide urgent asthma care. With the exception of 3 coaches who left and were replaced, the same coach was available to the parent throughout the 12-month program period.

The coaching intervention was based on the transtheoretical model of behavior change. Core constructs are the stages of change, a series of 5 ordered categories along a continuum of readiness to change a problem behavior including the following: precontemplation, not thinking about change; contemplation, thinking about change in the next 6 months; preparation, planning to change in the next 30 days; action, doing the target behavior for less than 6 months; and maintenance, doing the target behavior for at least 6 months. Movement along the change continuum is influenced by cognitive and behavioral processes of change and can occur in both directions.

First, the coach assessed the parent’s readiness to adopt the targeted behavior according to his or her stage. Then, guided by a protocol, the coach used change strategies appropriate for that stage to develop tailored messages that were delivered in a non-directive, supportive manner. For example, a parent in precontemplation might be helped to identify the potential benefits to adopting the behavior, and someone in preparation might be helped to develop and execute a plan to take the next step in the change process.

An implementation schedule provided structure, but implementation was flexible and arranged at the parent’s convenience. The first call was scheduled within 2 weeks of randomization. During this call, the coach introduced the program, staged the parent for each of the 4 targeted behaviors, and helped the parent select which behavior to address first. Subsequent calls usually addressed 1 behavior only, but the goal was that all 4 targeted behaviors would be addressed during the 12-month intervention. Calls were to occur monthly on average but were to be more frequent when the parent was changing a behavior (weekly to monthly) and less often when the key behaviors were already routine (monthly to every 3 months). Parents were provided a telephone number to reschedule or request a call from their coach and were mailed a letter asking them to contact their coach if the parent could not be reached after 6 attempts. The coach did not communicate with the PCP.

MEASUREMENTS

Study data were collected using parent interviews and record review, both conducted by trained RAs blinded to study group assignment. Two measurement periods were used: the 12 months before and the 12 months after the date of randomization. The parent interview was conducted by telephone and took 20 to 30 minutes to complete. Interviews were conducted at baseline and 12 months after randomization. Interview questions asked about the frequency of asthma symptoms and use.
of albuterol in the past week, the number of school days missed in the past 2 weeks, the number of courses of oral steroids used in the past 3 months, and the number of ED visits or hospitalizations in the past year. Varying measurement periods were used to improve the accuracy of recalled data. We used these data to develop a metric to assess asthma control18 that is consistent with the 2007 guidelines (well controlled, not well controlled, or very poorly controlled).18 Disease-specific QOL was measured for children and parents using the Pediatric Asthma Quality of Life Questionnaire30 and Pediatric Asthma Caregiver's Quality of Life Questionnaire,30 respectively (with permission). For both instruments, answers are expressed on a 7-point scale, with a higher score indicating a better QOL and a change of 0.5 unit considered clinically significant.31 Additional questions asked about the targeted asthma behaviors.

Urgent care for asthma was measured by record audit in the PCP's office and review of the call center records. Urgent care was defined as the sum of asthma-related office visits for urgent care (treated with albuterol or oral steroids), ED visits and hospitalizations, and calls to the call center (treated with oral steroids per PCP-approved protocol) in each 12-month measurement period. We used data from an entire calendar year to avoid bias due to seasonal variation in asthma exacerbations.

DATA ANALYSIS
Continuous variables are reported as the mean (SD) or median (interquartile range or range), and categorical data are reported as proportions. We examined baseline differences between treatment groups on factors potentially associated with intervention success using x2 tests for categorical variables and Mann-Whitney U tests for continuous and ordinal variables.

We conducted an intention-to-treat analysis to compare temporal changes in asthma-related QOL and urgent care events for asthma between study groups. To test whether changes were significant within and between study groups, we used generalized linear mixed models with a dichotomous, between-group effect and a random effect to adjust for covariance among patients sharing the same PCP. Based on these models, planned contrasts derived from the interaction of treatment and study period were estimated. For all inferential analyses, we used a 2-tailed a of .05 to determine statistical significance. All statistical analyses were performed using Stata version 9.0 statistical software (StataCorp LP, College Station, Texas) and SAS version 9.12 statistical software (SAS Institute, Inc, Cary, North Carolina).

RESULTS

STUDY POPULATION
Between January 1, 2005, and January 31, 2006, 362 children were randomized (190 to the TAP group, 172 to the control group) (Figure). Study subjects were cared for by 83 community pediatricians in urban and rural practices in Missouri and Illinois (median, 2 subjects/PCP; interquartile range, 1-6 subjects/PCP).

Record review for both measurement periods was completed for 184 (97%) in the intervention group and 167 (97%) in the control group. Ninety-eight percent of respondents were the child’s mother (4% were the child’s father, 2% other). Follow-up interviews were completed for 164 parents (86%) in the intervention group and 150 (87%) in the control group. Ninety-seven percent of follow-up interviews were completed by the same parent who completed the baseline interview.

Parents who did not complete the final interview did not differ between groups but were more likely to be less educated and have lower scores for asthma-related QOL at baseline, and their children were more likely to be African American, use albuterol more often, and have attended the ED or hospital for asthma care in the prior 12 months than those who completed the follow-up interview (all P < .05).

BASELINE DATA
At baseline, patient and family characteristics were similar in both groups (Table 1). Thirty-two percent of children were African American and 22% had Medicaid insurance. More parents in the intervention group compared with the control group had received at least some college education (88% vs 75%, respectively; P = .001). As adjustment for this baseline difference did not alter our findings in the inferential analyses, we report the unadjusted results.

In the past 3 months, 52% of children had received at least 1 course of oral steroids. In the past 12 months, 59% had at least 1 ED visit and 10% had been hospitalized for asthma.

IMPLEMENTATION OF TAP
Each of 13 coaches was assigned 12 to 17 families. Of the 190 participants, 92% had at least 1 substantive telephone contact with their coach during the 12-month intervention period (23% had 1-3 calls, 54% had 4-8 calls, and 15% had ≥9 calls), but 8% could not be reached despite repeated calls. Ninety-three percent of families who talked with a coach discussed each of the 4 key behaviors at least once. The median duration of the first call was 21 minutes (range, 5-60 minutes) and the median duration for subsequent calls was 10 minutes (range, 2-57 minutes).


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repeated this analysis first excluding those from the in-
controlled for prior ED visits and hospitalizations. We
tween groups (Table 2). Results were similar when we

Table 1. Characteristics of 362 Families in the Study
Population by Self-report at Baseline

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>190 (52)</td>
<td>172 (48)</td>
</tr>
<tr>
<td>Patient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>120 (63)</td>
<td>104 (60)</td>
</tr>
<tr>
<td>Female</td>
<td>70 (37)</td>
<td>68 (40)</td>
</tr>
<tr>
<td>Age, y</td>
<td>8 [5-13]</td>
<td>7.5 [5-13]</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>120 (64)</td>
<td>100 (59)</td>
</tr>
<tr>
<td>African American</td>
<td>57 (30)</td>
<td>59 (35)</td>
</tr>
<tr>
<td>Other</td>
<td>12 (6)</td>
<td>10 (6)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>6 (3)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Medicaid insurance</td>
<td>37 (20)</td>
<td>42 (25)</td>
</tr>
<tr>
<td>Attends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>171 (91)</td>
<td>155 (92)</td>
</tr>
<tr>
<td>Day care</td>
<td>11 (6)</td>
<td>10 (6)</td>
</tr>
<tr>
<td>Home school</td>
<td>5 (3)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Family</td>
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<td></td>
</tr>
<tr>
<td>Mother’s education</td>
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<td></td>
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<tr>
<td>High school</td>
<td>22 (12)</td>
<td>42 (25)</td>
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<tr>
<td>Some college</td>
<td>64 (34)</td>
<td>50 (30)</td>
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<td>College graduate</td>
<td>76 (40)</td>
<td>53 (31)</td>
</tr>
<tr>
<td>Postgraduate/professional</td>
<td>27 (14)</td>
<td>24 (14)</td>
</tr>
<tr>
<td>Single-parent family</td>
<td>48 (25)</td>
<td>49 (29)</td>
</tr>
<tr>
<td>≥1 Other child at home</td>
<td>155 (82)</td>
<td>148 (87)</td>
</tr>
<tr>
<td>Mother works outside home</td>
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<td></td>
</tr>
<tr>
<td>Full time</td>
<td>96 (51)</td>
<td>88 (52)</td>
</tr>
<tr>
<td>Part time</td>
<td>44 (23)</td>
<td>33 (20)</td>
</tr>
<tr>
<td>None</td>
<td>50 (26)</td>
<td>48 (28)</td>
</tr>
<tr>
<td>Other family member with asthma</td>
<td>101 (53)</td>
<td>90 (52)</td>
</tr>
<tr>
<td>Cigarette exposure at home</td>
<td>14 (7)</td>
<td>15 (9)</td>
</tr>
<tr>
<td>Child’s asthma</td>
<td></td>
<td></td>
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<tr>
<td>Time since diagnosed as having asthma, y</td>
<td>4.5 [1-12]</td>
<td>5 [1-12]</td>
</tr>
<tr>
<td>Ever seen an asthma specialist</td>
<td>76 (40)</td>
<td>61 (35)</td>
</tr>
<tr>
<td>Using daily controller medication</td>
<td>144 (76)</td>
<td>127 (74)</td>
</tr>
<tr>
<td>Symptoms consistent with persistent asthma in past 2 wk</td>
<td>46 (24)</td>
<td>48 (28)</td>
</tr>
</tbody>
</table>

IMPACT OF TAP

Data regarding the impact of TAP are presented in Table 2. The key findings are highlighted here.

Outcome Measures

QOL. For parents, participation in the intervention was associated with an increase in QOL scores that was clini-
cally significant (Table 2). The increase was larger among parents who received 9 or more calls compared with those who had 4 to 8 calls (1.04 vs 0.68 units, respectively; *P* = .04) or with those who had fewer than 4 calls (1.04 vs 0.65 units, respectively; *P* = .03). For children, there was no dif-
cference in QOL scores between groups.

Urgent Care Events. There was a decrease in urgent care events in both groups, with no significant difference be-
tween groups (Table 2). Results were similar when we
controlled for prior ED visits and hospitalizations. We
repeated this analysis first excluding those from the in-
tervention group who could not be reached by the coach
and then excluding those with fewer than 4 calls, and our
finding of no difference between groups persisted.

Asthma Control. We had not planned to assess asthma
control, but with the focus of the 2007 NAEPP guide-
lines on impairment (measured by QOL and control), we
developed a control measure based on the child’s recent
and long-term asthma morbidity. Using this tool, the
intervention was associated with a significant reduction in
the proportion of children with poorly controlled asthma (Table 2).

Self-management Behaviors

The intervention was associated with a significant im-
provement in the proportion of parents who reported hav-
ing an asthma action plan and going to asthma check-
ups in the past 6 months. No difference was found in the
reported use of controller medications (Table 2). Al-
though not a targeted behavior, more children from the
intervention group than the control group were inocu-
lated with an influenza vaccine during the 12-month in-
tervention period (72% vs 64%, respectively; *P* = .02).

COMMENT

Compared with usual care, participation in the 12-
month telephone asthma coaching program resulted in an
improvement in the parent’s QOL and improved the child’s
asthma control. In addition, more asthma planning visits
occurred in the intervention group, an effect seen in other
coaching studies. These improvements occurred with-
out additional physician training or practice redesign. An
asthma coaching program delivered by telephone could
be an efficient, effective vehicle to augment asthma care
and offer a convenient alternative to more costly face-
to-face services. This alternative care delivery model may
be sustainable if reimbursement for telephone services (cur-
rently supported by the American Academy of Pediatrics
for physicians and nurses) is extended to include other
care providers such as lay asthma coaches.

Urgent care events decreased by half, but the inter-
vention failed to provide additional benefit. In both
groups, the decrease in urgent care events may rep-
resent regression to the mean, as urgent events were in-
frequent and required for study enrollment, or may be
due to attention from study personnel (the telephone in-

terviews), a phenomenon observed in other asthma stud-
es. Impairment and risk are thought to represent dif-
ferent components of asthma requiring different
management strategies, and the intervention may have
been too limited in scope and intensity to impact risk out-
comes beyond effects due to study participation. Family-

based interventions that have demonstrated reduced hos-

pitalizations or ED visits have been more extensive or have
focused on high-risk families.

There were several potential limitations to our study.
Despite our large and diverse study sample, our findings
may not be generalizable to other populations without a
prior connection to a call center for asthma care. It is pos-
sible that social desirability bias caused us to overestimate
self-management behaviors as these data were self-
reported. However, our change estimates are probably valid as we used the same measurement approach for the baseline and follow-up assessments and data were collected by an RA blinded to study group assignment. Hospital-based urgent care events may have been incompletely recorded in the PCP’s record,\(^4\) causing us to underestimate these variables. However, it is unlikely that any systematic differences occurred between intervention and control subjects in the same practice. Finally, it is possible that contamination occurred as most PCPs had patients both in the TAP group and in the control group. We think this is unlikely as more than 75% of participating PCPs had fewer than 6 patients in the study (approximately 3 per group).

We learned many lessons during program implementation, and the telephone coaching program will likely be more effective when it is strengthened based on this experience. For example, using full-time coaches and centralizing them to 1 location may facilitate training, supervision, and support and ensure consistency of the intervention. More structured work hours with defined off time may make it easier for coaches to persist in their outreach efforts to those patients who miss a scheduled call or have temporarily disconnected telephone numbers. The intervention may be less expensive if non–medically trained personnel rather than nurses are used as coaches. Lay coaches or outreach workers have been used successfully in high-risk populations to provide education and identify problems in asthma care,\(^35,42,43\) and these workers can reach most families.\(^22\) The observed dose-response effect suggests that increasing the intensity of the intervention with more coach calls may increase effectiveness. The coaching intervention may be more effective if it is integrated into primary care so that the PCP is aware of this effort to increase self-management skills and can actively partner with the parent and the coach. A centrally operated, practice-integrated telephone coaching program for parents of children with asthma may be an efficient, cost-effective way to reduce asthma morbidity.\(^21\)

The patient-centered intervention evaluated here shows promise as an efficient strategy to reduce asthma morbidity. It should be refined based on what we learned and evaluated. If the refined intervention proves to be cost-effective, widespread implementation may be possible as it would require minimal practice redesign and would not require additional physician training.
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REFERENCES