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Providing Individualized Written Asthma Action Plans During the Pediatric Emergency Department Visit

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ABSTRACT

INTRODUCTION: Among children presenting to the pediatric emergency department (PED) with an asthma exacerbation, the objective was to determine if creating an individualized written asthma action plan (WAAP) during the PED visit, when compared with standard discharge instructions, led to fewer asthma-related unplanned return visits up to three months after the PED visit. Secondary outcomes included rates of routine follow up with a healthcare provider, asthma control scores and caregiver confidence measures.

METHODS: Children ages 2-17 who presented to the PED with an asthma exacerbation and did not already have a WAAP were randomized to receive discharge instructions including a WAAP versus standard discharge instructions. The WAAP was ordered by the physician and reviewed with families by a respiratory therapist as part of a brief educational session during the PED visit. Parents completed follow-up surveys at one and three months after the PED visit.

RESULTS: 91 families were enrolled and 83/91 (91%) completed at least one follow-up survey. Fewer families in the WAAP group reported an unplanned visit to a healthcare provider during the follow-up period [WAAP 7/39 (18%), Control 17/44 (39%), $p=0.038$]. Inhaled corticosteroids were prescribed more commonly in the WAAP group [WAAP 29/45 (64%), Control 15/46 (33%), $p=0.002$]. There was no difference in rates of routine follow-up visits, asthma control scores or caregiver confidence measures during the follow-up period.

CONCLUSIONS: Families who were provided a written asthma action plan during their pediatric emergency department visit for an asthma exacerbation reported fewer unplanned visits during the subsequent three months.

Key Words: Written Asthma Action Plan, Pediatric Emergency Department

INTRODUCTION

Asthma remains the most common chronic medical condition among US children, with significant morbidity and mortality, even though prevalence in the United States is plateauing after increasing for decades.¹ As a means of improving health outcomes for children with asthma through patient and parent education and self-management, there is extensive evidence for the effectiveness of written asthma action plans (WAAPs) in the inpatient and clinic settings.^{2,3,4,5} National asthma guidelines recommend individualized asthma education including a WAAP in these settings.⁶

Pediatric emergency department (PED) visits for asthma, which have increased in frequency and are disproportionately common among minority and urban populations⁷, may also provide an opportunity for self-management education, in spite of the challenge of time constraints and the lack of continuity of care. Children who visit the PED for asthma exacerbations are more likely to have poor asthma control⁸ and often have limited prior asthma education and few routine medical visits. Although various educational interventions have targeted children after their PED visit for an asthma exacerbation^{9,10,11,12,13}, fewer studies have described interventions that occurred exclusively during the PED visit.^{14,15}

The objective of this study was to determine if introducing a WAAP during the PED visit, for children who presented with an asthma exacerbation and did not already have a WAAP, led to reduced asthma-related unplanned return visits to a healthcare provider when compared with standard written and verbal emergency department discharge instructions. Our hypothesis was that children receiving a written asthma action plan would have fewer unplanned return visits during the three-month period after the PED visit. Secondary outcomes included asthma control scores, parent confidence measures and rates of routine follow-up with a primary care provider.

MATERIALS AND METHODS

Study Design

This was a prospective, randomized pilot study of a convenience sample of patients presenting to a single, academic, tertiary care pediatric emergency department (PED) between February, 2014 and December, 2015. The Institutional Review Board approved this study (#1290276) and funding was provided by an internal grant.

Study Setting and Population

Investigators recruited children between ages two and seventeen who presented to the PED with an asthma exacerbation. When available during the PED visit, a research assistant or one of the two co-investigators screened children for eligibility who presented with a respiratory chief complaint and required a breathing treatment. Children were defined as having asthma if they had a prior diagnosis of asthma documented in the electronic medical record (EMR) or two prior episodes of wheezing that were treated with an inhaled bronchodilator medication. Children were excluded if they required hospital admission, if the child had a major comorbid chronic cardiac or pulmonary illness, if the parent or guardian was not fluent in English, or if the child already possessed a WAAP. Possession of a WAAP was defined as one or more of the following: having a WAAP in the parent's possession during the PED encounter, parental report of using a WAAP during the previous week or EMR evidence of a WAAP being provided during the previous 6 months.

Study Protocol

After obtaining written informed consent from all participants and assent from children over age seven, participants were randomized 1:1 to the intervention or control group using a randomization generator with blocks of eight. Allocation assignments were kept in sealed, opaque envelopes. Study personnel were blinded with respect to the study intervention. The intervention group received a

WAAP that was ordered in the electronic medical record by the provider and reviewed with the child and parent by a respiratory therapist. The WAAP, which included the standard green, yellow and red zone care instruction sections, was in use in the Children's Mercy Hospital system prior to the study. The patient's provider specified all details of the WAAP, including medications. Participants in the control group received usual care at the discretion of the treating provider, including a combination of written and verbal instructions, education from the provider and/or education by a respiratory therapist, but no WAAP.

The parent completed a survey during the PED visit as well as telephone follow-up surveys after one and three-months. The initial survey included demographic information, relevant details about the child's outpatient asthma therapy, and an assessment of current asthma severity and control using the Pediatric Asthma Control Tool (PACT). The PACT is a validated survey designed to measure asthma control in children over the previous three months.¹⁶ A study team member also reviewed each participant's electronic medical record for relevant details of the child's treatment during their PED encounter, including triage acuity level, prescription of oral steroids, prescription of asthma controller medications, and whether inhaler technique was reviewed.

Outcome Measures

All outcomes were measured using parental survey responses at one and three months. The primary outcome was the rate of asthma-related unplanned return visits to a healthcare provider during the three-month follow-up period. Secondary outcomes included the rate of scheduled follow-up with a primary care provider, asthma control scores at three months and caregiver confidence scores after one month. Asthma control was measured using the Pediatric Asthma Control Tool (PACT).¹⁶ The PACT score is computed as the sum of the 10 survey items, five regarding the frequency and severity of asthma exacerbations and five regarding the presence of symptoms when the child was at their best during the previous three months. Caregiver confidence scores were assessed using a series of four survey questions [Table 2] that were developed for a similar prior study but not externally validated.¹⁵

Data Analysis

A sample size calculation for the primary outcome was completed based on an estimated survey completion rate of 70%. Assuming a mean of 1.5 unscheduled follow up visits (and standard deviation of 0.6) during the follow-up period, a sample size of 90 patients per group was calculated to detect a 20% reduction in the average number of unscheduled visits with a type one-error rate of 0.05 and a desired power of 80%. A goal enrollment of 50% of the calculated sample size was chosen a priori for a pilot phase of the study. Study data were collected and managed using REDCap electronic data capture tools hosted at Children's Mercy Hospital.¹⁷ SPSS 13.0 (SPSS Inc, Chicago, IL) was used for all statistical analyses, including the student's T-test for numerical outcomes and the Chi-squared test for categorical outcomes.

RESULTS

Subjects

From February 2014 to December 2015, 91 children were enrolled. Figure one contains a summary of participant screening, enrollment and follow-up. The most common reason for exclusion was current possession of a written asthma action plan (WAAP) at the time of the PED visit. The most common reason that an eligible child was not enrolled was due to healthcare provider refusal. In 95% of these cases, the provider's reason for refusal was so that the child could be guaranteed a WAAP.

As shown in Table 1, the study groups were similar in terms of age, race, baseline PACT scores and triage acuity levels. The study groups were also similar in terms of their prior asthma treatment, including the use of controller medications, current availability of albuterol and a spacer at home, and whether or not the child currently had a primary care physician. For the intervention group, a WAAP was ordered in the electronic medical record. The child's healthcare provider selected the details of the WAAP for each child as well as all other aspects of treatment for both groups. Children in the intervention group were more likely to have controller medications prescribed during their PED visit [29/45 (64%) intervention versus 15/46 (33%) control, $p=0.002$]. Other measured aspects of emergency department care, including whether or not oral steroids were prescribed, inhaler technique was reviewed and follow-up appointments were recommended, did not differ between the study groups.

Parents were contacted by telephone after one month and again after three months to complete the study surveys. Follow-up rates were 87% (79/91) for the one-month survey and 80% (73/91) for the three-month survey [Figure 1].

Outcome Measures

Results for the primary and secondary outcomes are shown in Table 2. Since the mean number of unplanned follow-up visits was much lower than anticipated, unplanned follow-up visits were analyzed both as a mean number of visits and as a dichotomous variable: whether or not the child required an unscheduled follow-up visit during the follow-up period. Accordingly, fewer children in the WAAP group reported an unplanned visit to a healthcare provider during the follow-up period than in the control group [7/39 (18%) intervention versus 17/44 (39%) control, $p=0.038$]. During the one-month survey, parents were asked four questions in order to rate their confidence in managing their child's asthma at home on a scale of 1 = "*not confident at all*" to 5 = "*extremely confident*". While mean confidence levels were higher in the WAAP group for all four questions, the only question that reached statistical significance was, "*How confident are you that you can prevent your child from getting asthma symptoms?*" [WAAP Mean: 4.34, CI: 4.08 – 4.61, Control Mean: 3.91, CI: 3.60 – 4.23, $p=0.043$] Rates of routine follow-up with a primary care provider and mean PACT scores after three months did not differ between the two groups.

DISCUSSION

Compared with children who were provided usual emergency department discharge instructions, those who received a written asthma action plan (WAAP) during their pediatric emergency department (PED) visit for an asthma exacerbation were less likely to have an asthma-related unplanned visit to a healthcare provider during the subsequent three months. Parents of children who received a WAAP also expressed increased confidence in their ability to prevent their child's asthma symptoms when surveyed one month after the PED visit, but differences in other confidence measures were not significant between the two groups. Routine follow-up rates with a primary care provider and pediatric asthma control tool (PACT) scores were also not significantly different after three months between the two groups. In addition, providers were more likely to order inhaled corticosteroids for children in the WAAP group. This unexpected finding could be part of the reason for the reduction in unplanned return visits and increase in caregiver confidence.

This study was limited primarily by its small sample size and the large number of eligible children who were not enrolled. Notably, the most common reason for exclusion of eligible participants was so that their PED physician could ensure provision of an asthma action plan during the visit. It is also possible that the subset of children who were enrolled may have unidentified differences compared with the overall population or that the population in our single PED may be different than other emergency department settings. In addition, although study personnel attempted a neutral presentation of the intervention and control methods, intervention bias is possible. Parental

reporting of the outcome measures may have been subject to recall bias. Potentially relevant aspects of the child's ongoing care after the PED visit, such as whether they were provided a WAAP or other education by their primary provider during the follow-up period, were not controlled. Finally, the percentage of children presenting to the PED whom already had a WAAP was higher than anticipated during the study period and increased over time. Hence, we believe that future efforts in our setting could focus on ways to update and reinforce previous asthma education.

There are a limited number of published studies evaluating targeted education for asthma during the PED visit. One previous study compared WAAP with usual discharge instructions and provision of unformatted prescriptions and found improvement in patient adherence to inhaled corticosteroids and improved asthma control after 28 days in the WAAP group.¹⁴ In another study, creation of a WAAP was part of a larger education and process intervention (including asthma educator sessions, an educational summary, a computer resource and telephone follow-up) that resulted in fewer repeat PED visits and more well visits.¹⁵ Our study adds to the existing literature by concluding that there is an independent usefulness in the provision of written asthma action plans during the pediatric emergency department visit due to a potential to reduce the rate of asthma-related unplanned return visits.

CONCLUSIONS

Providing a written asthma action plan (WAAP) during the pediatric emergency department (PED) visit for children with asthma exacerbations who do not already have a WAAP was associated with fewer asthma-related unplanned return visits to a healthcare provider during the subsequent three months when compared with providing standard PED discharge instructions. Providers were much more likely to prescribe inhaled corticosteroids to children in the WAAP group, an unexpected finding which may have contributed to the reduction in unplanned return visits. We conclude that implementing a WAAP in the PED setting may be beneficial and should be considered for children who are being discharged home after treatment for an asthma exacerbation in the PED.

Previous Presentations

The results of this study were presented in part at the 2015 meeting of the Pediatric Academic Societies in San Diego, CA

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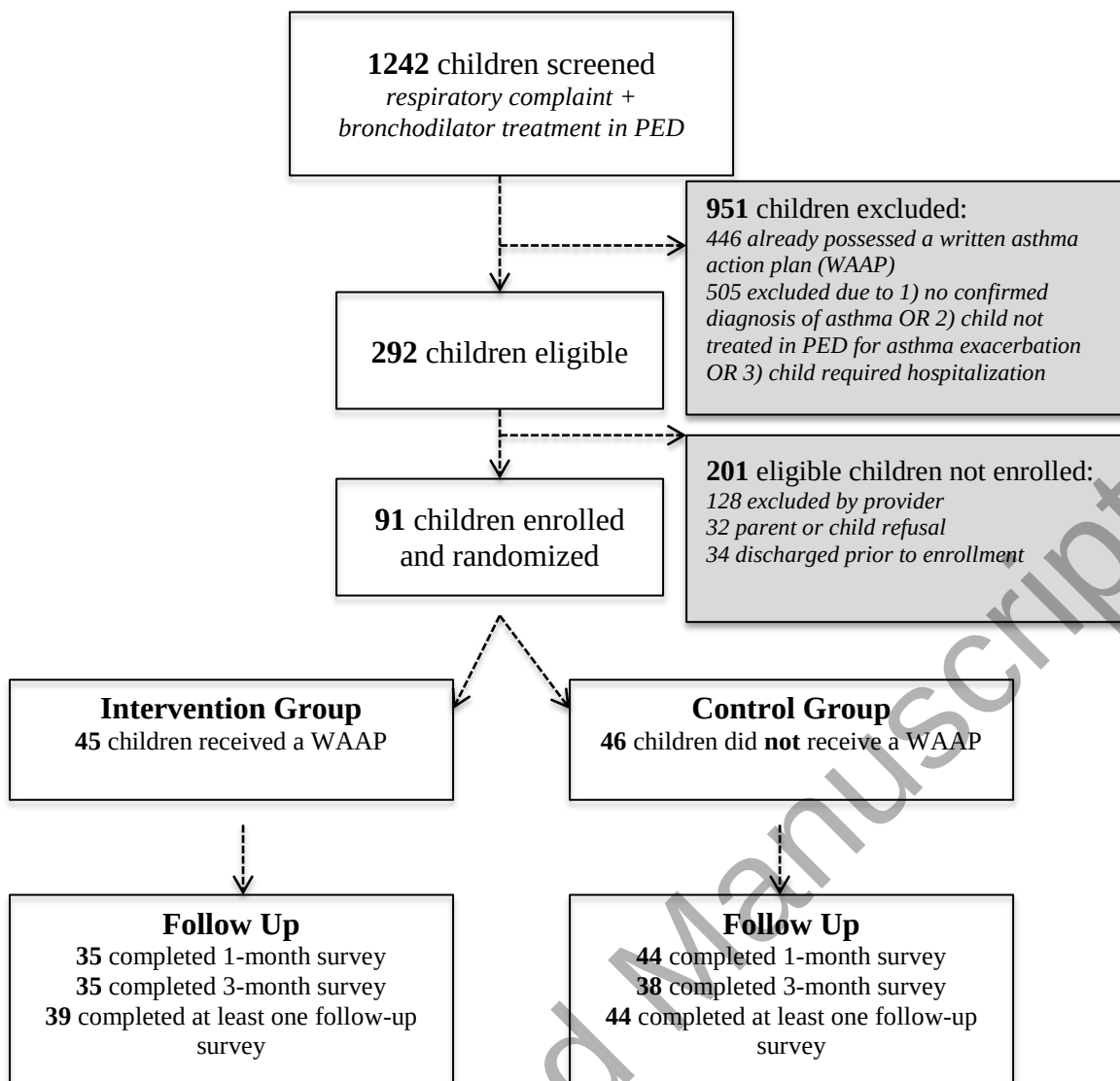


Figure 1. Participant screening, enrollment, randomization and follow up

Table 1 Study Group Comparison and Details of Asthma Treatment During the PED Visit

	Action Plan	No Action Plan	P-Value
Population Characteristics			
Gender	16/45 (36%) female	17/46 (37%) female	0.89
Age (mean)	6.1 years	5.6 years	0.144
Race	35 (78%) African American 6 (13%) Caucasian 4 (9%) Hispanic	34 (74%) African American 6 (13%) Caucasian 4 (9%) Hispanic 2 (4%) Other	0.572
Initial Triage Level	8 Emergent 21 Urgent 16 Semi-urgent 0 Non-urgent	11 Emergent 20 Urgent 14 Semi-urgent 1 Non-urgent	0.655
Immediate family member with asthma	30/45 yes (67%)	33/46 yes(72%)	0.600
Child currently has a primary care provider	37/45 (82%)	30/33 (87%)	0.531
Quick relief medication (such as albuterol) available at home	28/45 (62%)	30/46 (65%)	0.766
Spacer available at home	13/31 (42%)	18/33 (54%)	0.313
Currently using a controller medication	20/45 (44%)	17/46 (37%)	0.467
Child has seen their primary provider in the last three months.	20/45 (44%)	17/46 (37%)	0.467
Mean PACT Score at Enrollment	1.64 (2.39)	1.27 (1.19)	0.352
Details of Treatment During the PED Visit			
Follow-up appointment recommended or scheduled	43/45 (96%)	32/33 (98%)	0.544
Controller medication was prescribed	29/45 (64%)	15/46 (33%)	0.002
Oral steroids were prescribed	34/45 (76%)	24/33 (65%)	0.280
Inhaler technique was reviewed	17/45(38%)	10/46 (22%)	0.094

The Chi-squared test was used for binary outcomes, and the student's T test was used for continuous outcomes. Continuous variables are presented as mean +/- standard deviation.

Table 2 Comparison of Follow-up Visits, Asthma Control and Caregiver Confidence

	Action Plan	No Action Plan	P-Value
Follow-up Visits			
Child required an unplanned follow-up visit to a healthcare provider during the follow-up period. [Primary Outcome]	7/39 (18%)	17/44 (39%)	$P=0.038$ $OR\ 0.35$ [CI 0.13-0.96]
Caregiver reported mean number of unplanned return visits during the follow-up period.	0.17 [CI 0.02 to 0.32]	0.21 [CI 0.03 to 0.39]	$P=0.747$ $d = 0.077$
Child attended a scheduled routine follow-up with their provider during the follow-up period.	23/39 (59%)	18/44 (40%)	$P=0.083$ $OR\ 0.86$ [CI 0.86 to 4.99]
Asthma Control			
Mean Pediatric Asthma Control Test score at three month follow-up	6.6 [CI 4.0 to 9.1]	5.7 [CI 3.9 to 7.4]	$P=0.565$ $d = 0.136$
Caregiver Confidence			
<i>How confident are you that you can prevent your child from getting asthma symptoms?</i>	4.34 [CI 4.08 – 4.61]	3.91 [CI 3.60 – 4.23]	$P=0.043$ $d = 0.455$
<i>How confident are you that you can prevent your child's asthma symptoms from getting worse after they start?</i>	4.17 [CI 3.88 – 4.47]	3.91 [CI 3.57 – 4.25]	$P=0.259$ $d = 0.251$
<i>How confident are you that you can stop your child's symptoms without having to visit the doctor?</i>	3.97 [CI 3.66 – 4.29]	3.59 [CI 3.25 – 3.93]	$P=0.111$ $d = 0.360$
<i>In general, how confident are you in your ability to care for your child's asthma?</i>	4.54 [CI 4.38 – 4.71]	4.34 [CI 4.10 – 4.58]	$P=0.203$ $d = 0.282$

The Chi-squared test was used for categorical variables and odds ratios (OR) are reported with 95% confidence intervals. The student's T test was used for continuous variables and effect sizes were calculated as *Cohen's d* (0.2 = small effect, 0.8 = large effect). Continuous variables are presented as mean [95% confidence interval (CI)]. For confidence measures, 1 = not confident at all and 5 = extremely confident.