The Impact of a Virtual Home Environmental Assessment and Modification Project on Pediatric Asthma Symptom Burden and Control

Anu Bompelli, PharmD, MS[1]; Angeline Carlson, PhD[1]; Jill Heins-Nesvold, MS[2]

[1]Department of Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota, College of Pharmacy, MN, USA. [2]American Lung Association, St. Paul, MN, USA.

Poster Code: HSD85

COLLEGE OF PHARMACY

UNIVERSITY OF MINNESOTA

Driven to Discover℠

Introduction

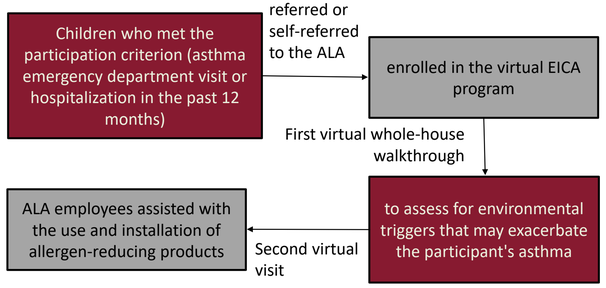
Background: Environmental Improvements for Children with Asthma (EICA) is an American Lung Association assessment and modification program designed to reducing asthma symptoms by lessening exposure to environmental asthma triggers in the home environment.[1]

The program focuses on identifying environmental asthma triggers and providing materials to help reduce exposure to triggers, such as bed and pillow covers, green cleaning supplies, vacuums, HEPA air cleaners.[2] Pre-pandemic EICA was an in-home visit program; COVID-19 required adoption of virtual visits. The effectiveness of in-home EICA program in improving health outcomes was established.[1] However, the effectiveness of virtual EICA program has not been studied yet.

Objective: To assess the impact of virtual EICA on asthma symptom burden and control from baseline to 12-month post-intervention.

Methods

Virtual EICA Process:



Data Collection:

Environmental asthma triggers | Asthma control test (ACT) scores | Child Asthma Short Form (CASF)

Data was collected at baseline, 3- and 12-months post-intervention from 20 households between February 2020 and March 2021

Outcomes:

Asthma control (using ACT scores) | Asthma-related symptom burden (using CASF scores)

Analysis: T-test compared differences at baseline and 12-month post-intervention for continuous scores; Chi-square was used to test for proportional differences in severity of CASF domains. P-value ≤0.05 indicates statistical significance. Analysis was completed using R-studio.

Results

Dust (90% of households), carpet (80%), air fresheners (70%), and cleaning chemicals (60%), candles/incense (50%), sleeping on carpet (45%), pets (40%), and mold (10%) were major sources of asthma triggers (Figure 1). Cockroaches, rodents, cooking smoke, wood heat, space heaters, kitchen stove as heater, water leaks, broken windows, and holes in the walls all are potential environmental triggers, but they were not present in the households included in the study.

There was statistically significant improvement in asthma control test (ACT) scores (mean difference = 4.95; $p < 0.05$), and Child Asthma Short Form daytime symptoms (mean difference = 18.12; $p < 0.05$), nighttime symptoms (mean difference = 23.12; $p < 0.05$) and functional limitations (mean difference = 17.19; $p < 0.05$) (Table 2) from baseline to 12 months.

Based on Child Asthma Short Form scores, 25% of children had severe daytime symptoms at baseline but at 12 months only 5% ($X^2 = 4.38$; $p = 0.11$); 35% of children had severe nighttime symptoms at baseline, but at 12 months only 5% ($X^2 = 6.5$; $p = 0.03$); 10% of the children had severe functional limitations at baseline but at 12 months, no children had severe functional limitations ($X^2 = 3.69$; $p = 0.16$) (Table 3).

Table 1. Child Asthma Short Form Questions.

Variable	Question
Daytime	Your child complained of being short of breath
	Exertion (such as running) made your child breathless
Nighttime	Your child coughed at night
	Your child been woken up by wheezing or coughing
Functional Limitations	Your child stayed indoors because of wheezing or coughing
	Your child's education suffered due to his/her asthma
	Your child's asthma interfered with his/her life
	Asthma limited your child's activities

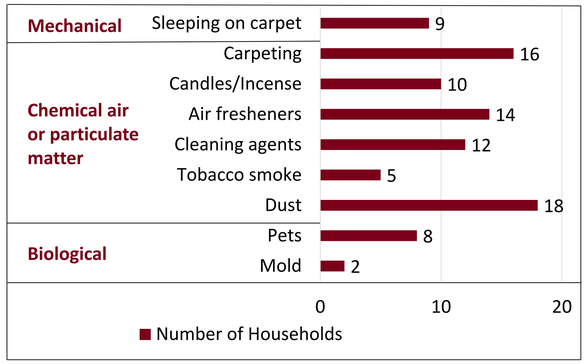


Figure 1. Distribution of environmental asthma triggers among the households.

Table 2. Impact of virtual EICA on asthma symptom burden and control from baseline to 12-month post-intervention.

Variable	Timeline	N	Mean	SD	SEM	Mean difference	Std. Error Difference	95% CI Lower	95% CI Upper	t-value	df	p-value
Asthma control test	12 Months	20	20.45	2.52	0.56	4.95	1.28	2.32	7.57	3.863	27.638	<0.001
	Baseline	20	15.5	5.15	1.15							
CASF Daytime Symptoms	12 Months	20	69.375	23.11	5.17	18.12	7.82	2.28	33.96	2.318	37.399	0.026
	Baseline	20	51.25	26.25	5.9							
CASF Nighttime Symptoms	12 Months	20	76.25	21.8	4.9	23.12	8.69	5.46	40.79	2.662	33.42	0.012
	Baseline	20	53.125	32.15	7.19							
CASF Functional Limits	12 Months	20	81.25	16.96	3.79	17.19	6.65	3.68	30.69	2.586	33.886	0.014
	Baseline	20	64.06	24.41	5.46							

Table 3. Proportional differences in severity of CASF domains

Variable	Category	Baseline (N)	12-month (N)	X^2 value	p-value
Child Asthma Short Form - Daytime symptoms	≤ 25	5	1	4.39	0.111
	26 to 74	10	9		
	≥ 75	5	10		
Child Asthma Short Form - Nighttime symptoms	≤ 25	7	1	6.5	0.038
	26 to 74	7	7		
	≥ 75	6	12		
Child Asthma Short Form - Functional Limits	≤ 25	2	0	3.69	0.157
	26 to 74	8	5		
	≥ 75	10	15		

Conclusions

The study findings demonstrate that the Environmental Improvements for Children with Asthma program can be successfully delivered virtually.

Dust, carpet, air fresheners, cleaning chemicals and candles, sleeping on carpet and pets were major sources of environmental asthma triggers.

The virtual EICA program led to significant improvement in ACT scores and CASF daytime symptoms, nighttime symptoms and functional limitations from baseline to 12 months.

The virtual EICA program led to significant improvements in asthma-related symptom burden and asthma control.

Future Work

It will be important that future research compare the impact of virtual and in-home environmental assessment and modification programs on pediatric asthma symptom burden and control.

Acknowledgements

Patrick Hattaway, MPH, Director of Health Promotion and Shonnel Blair, Specialist from the American Lung Association.

References

1. American Lung Association. The impact on symptom burden and return on investment of a home-based environmental assessment and modification project. Available at https://www.lung.org/getmedia/72aa62b2-f1d4-473c-abfa-e67285933aab/eica-findings.pdf.pdf
2. American Lung Association. Environmental improvements for copd and asthma. Retrieved April 3, 2023, from https://www.lung.org/lung-health-diseases/lung-disease-lookup/asthma/health-professionals-educators/environmental-improvements-for-copd-asthma

Contact Information

If you have any questions or need additional information, please contact Anu Bompelli at bompe001@umn.edu or Jill Heins-Nesvold at Jill.Heins@lung.org