Original Article

Behavioral Interventions to Improve Asthma Outcomes for Adolescents: A Systematic Review

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What is already known about this topic? Factors at multiple ecological levels, including child, family, home, medical system, and community, impact asthma outcomes in adolescents.

What does this article add to our knowledge? School-based group interactive learning and directly observed therapy have demonstrated efficacy at improving asthma self-management skills and inhaled corticosteroid adherence among adolescents, respectively. Allergists and/or immunologists may promote increased adherence by objective monitoring of inhaled corticosteroid use combined with feedback on medication-taking behavior.

How does this study impact current management guidelines? This study offers support of new approaches for the delivery of asthma guideline recommendations for asthma self-management and adherence to inhaled corticosteroid medications among adolescents.

BACKGROUND: Factors at multiple ecological levels, including the child, family, home, medical care, and community, impact adolescent asthma outcomes.
OBJECTIVE: This systematic review characterizes behavioral interventions at the child, family, home, medical system, and community level to improve asthma management among adolescents.
METHODS: A systematic search of PubMed, SCOPUS, OVID, PsycINFO, CINAHL, and reference review databases was conducted from January 1, 2000, through August 10, 2014. Articles were included if the title or abstract included asthma AND intervention AND (education OR self-management OR behavioral OR technology OR trigger reduction), and the mean and/or median age of participants was between 11 and 16 years. We compared populations, intervention characteristics, study designs, outcomes, settings, and intervention levels across studies to evaluate behavioral interventions to improve asthma management for adolescents.
RESULTS: Of 1230 articles identified and reviewed, 24 articles (21 unique studies) met inclusion criteria. Promising approaches to improving adherence to daily controller medications include objective monitoring of inhaled corticosteroid adherence with allergist and/or immunologist feedback on medication-taking behavior and school nurse directly observed therapy. Efficacy at increasing asthma self-management skills was demonstrated using group interactive learning in the school setting. This systematic review is not a meta-analysis, thus limiting its quantitative assessment of studies. Publication bias may also limit our findings.
CONCLUSIONS: Novel strategies to objectively increase controller medication adherence for adolescents include allergist and/or immunologist feedback and school nurse directly observed therapy. Schools, the most common setting across studies in this review, provide the opportunity for group interactive learning to improve asthma knowledge and self-management skills. © **2015 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2015;■:■-■)**

Key words: *Asthma; Childhood asthma; Outcome assessment (health care); Adolescents; Schools*

Asthma is among the most common chronic illnesses of childhood in the United States,[1,2] with a prevalence of 9.5%.[3] Asthma is the third leading cause of hospitalization among children.[4] Adolescents are at particularly high risk for poor asthma outcomes, with asthma death rates twice as high for 11-17 year olds than 0-10 year olds.[2,5]

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Adolescence offers a unique window of opportunity to deliver behavioral interventions to improve long-term asthma outcomes. Despite the challenges of complacency, uncertainty, and sense of invincibility,[6] opportunities exist. Lifelong patterns of health behaviors and key self-management skills are established during this important developmental period.[7-10] Success in changing habits during adolescence can carry through over the adult lifetime.

Research is clear that factors at multiple ecological levels impact asthma outcomes in adolescents.[11,12] National guidelines and task forces have identified recommendations at multiple levels for improving pediatric asthma management.[13,14] These 4 levels include the child and family (eg, asthma knowledge, self-management behaviors, family support, and psychosocial factors such as depression), home (eg, exposure to allergens and irritants), medical care (eg, practitioner's adherence to national asthma guidelines), and community (eg, school programs to support asthma self-management).[13] Because of the focus on adolescents (rather than young children), in this article, we separate child and family into 2 separate levels. The goal of this systematic review was to identify and evaluate behavioral interventions targeting adolescents. Those interventions demonstrating efficacy may be considered for use in clinical practice as well as potential inclusion in future multilevel effectiveness studies.

METHODS

Initial search

We completed a systematic review of the literature in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reference standards.[15,16] The search was completed using the following electronic databases: PubMed Medline, Ovid Medline, Scopus, PsycINFO, and CINAHL (Figure 1). The electronic search included titles and abstracts limited to articles focusing on humans, published in the English language and the following date range: January 1, 2000, through August 10, 2014. We combined the terms "asthma" and "intervention" with either education, self-management, behavioral, trigger reduction, or technology to identify behavioral interventional studies in adolescents with asthma. We did not originally limit to age to make sure that studies were not missed that may cross age ranges or included multiple age groups; however, we only reviewed articles whose population included a mean or median age between 11 and 16.

To ensure that we did not miss any intervention studies from this time period, we pulled several review articles of asthma interventions in this age group and reviewed their references. We additionally reviewed references of the included studies. We did not include unpublished data and abstracts.

The inclusion criteria were a teenage population with asthma (mean or median age between 11 and 16) and behavioral intervention studies. We included all types of intervention studies completed in all health care settings, community, and at home as well as interventions focusing on health care providers who have a direct impact on asthma management in our target population. Both national and international studies were included.

Article selection

Title and abstract review was completed by a minimum of 2 of the following authors: AAP, SER, RNM, VV, and GSM. We excluded articles if they were not asthma focused, performed on a population other than our target age group, or not a behavioral intervention study (Figure 2). If this information was not obvious from the title or abstract review, we reviewed the full article. At least 2 authors (SB, CDC, RNM, and VV) independently reviewed each of the remaining articles. The final inclusions were then further reviewed and finalized by the first and last 2 authors (GSM, EBL, and LHP) to ensure that all criteria were adequately met.

PubMed Search Strategy:

(Asthma[Title/Abstract]) AND (Intervention[Title/Abstract]) AND (Education[Title/Abstract]) OR (Self-management[Title/Abstract]) OR (Behavioral[Title/Abstract]) OR (Trigger Reduction[Title/Abstract]) OR (Technology[Title/Abstract])

Limited to literature published from January 1, 2000 through August 10, 2014, English Language and Humans.

FIGURE 1. Search strategy text box. The figure describes the search strategy implemented to execute this systematic review.

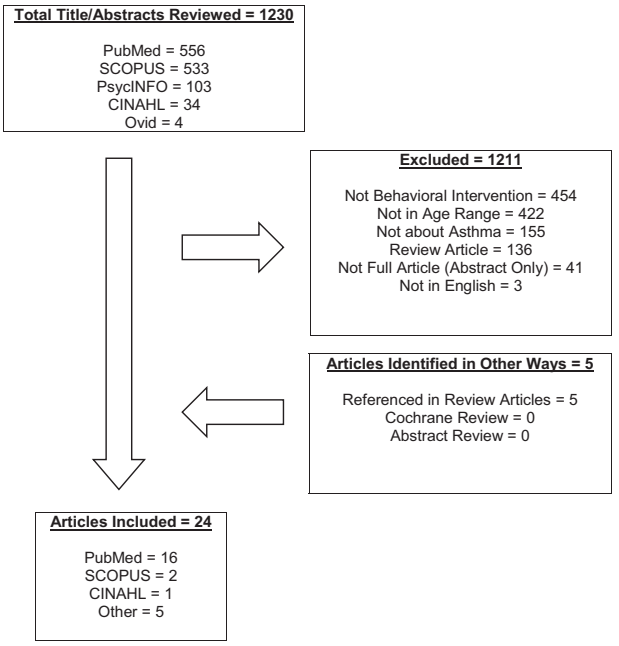

FIGURE 2. Consort diagram. The diagram illustrates article inclusion and exclusion criteria for this systematic review.

Grouping of intervention studies

Several studies yielded multiple publications (Figure 3). All articles (n = 24) were included, but each intervention (n = 21) was only counted once (Figure 4).[12,17-39] For each article, the sample size, patient population, intervention, control, outcomes and/or results, timeframe, setting, and intervention level were summarized. Intervention level was determined to be either single or multilevel;

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