



Review article

A systematic review of school-based interventions that include inhaler technique education



Lorie L. Geryk ^{a,*}, Courtney A. Roberts ^b, Delesha M. Carpenter ^b

^a Center for Health Systems Effectiveness, Oregon Health & Sciences University, 3181 S.W. Sam Jackson Park Road, Mail Code: MDYCHSE, Portland, OR 97239, USA

^b Division of Pharmaceutical Outcomes and Policy, University of North Carolina, 301 Pharmacy Lane, CB#7355, Chapel Hill, NC 27599, USA

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ABSTRACT

Background: Proper use of inhaled medication is essential for the successful treatment of childhood asthma; yet, improper inhaler technique among school-aged children is common. There are many schoolbased asthma education programs, but the extent to which these programs teach inhaler technique is unknown.

Methods: We systematically reviewed the literature to identify schoolbased asthma interventions that included inhaler technique instruction. We searched several databases, including PubMed, for relevant articles. Studies were included if they were asthma interventions of any type (programs, curriculums, education) conducted at kindergarten through twelfth grade schools that taught inhaler technique and included inhaler technique as an outcome measure. Of the 285 citations identified, the final nine studies (selected from 71 full-text articles) met the inclusion criteria.

Results: Findings from this systematic review identified a very small number of school-based interventions that evaluated improvements in students' inhaler technique. Two of the nine studies (22%) used a validated measure of inhaler technique. Inhaler technique instruction varied in length, from 15 min to 1 h and nurses implemented inhaler technique instruction in six of the nine (67%) interventions. Existing studies offer mixed evidence for sustained technique improvements up to a 12-month follow-up period.

Conclusions: Evidence suggests that students benefit from school-based inhaler technique education; however, inconsistencies in how technique was measured limit our ability to draw firm conclusions regarding the effectiveness of inhaler technique education on student outcomes. Future studies are needed to identify the most appropriate and feasible inhaler technique education components for use in comprehensive asthma self management interventions.

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* Corresponding author.

E-mail address: gerykl@ohsu.edu (L.L. Geryk).

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1. Introduction

Inhaled corticosteroids are used to prevent and control asthma symptoms and are generally used as first-line therapy for children with mild or moderate persistent asthma [1–3] 2007]. Effective medication adherence depends not only on regular use, but also on correct inhaler technique [4–6]. This is important because most children with asthma demonstrate significant deficiencies in inhaler technique, a form of unintentional medication non-adherence [6–10]. In fact, a systematic review of adults and children found that the prevalence of correct technique was only 31%, with coordination, speed and/or depth of inspiration, and no post-inhalation breath-hold being the three most common technique errors [11]. Errors in technique can compromise delivery of medications to the lungs which contributes to poor asthma control and other costly problems such as emergency department visits [12,13].

Key components for effectively training children to use an inhaler are explaining and demonstrating inhaler technique and repeating this instruction over time [6,14]. Schools are ideal settings to access and engage children for asthma interventions as schools often provide asthma screenings and asthma management services (e.g., supervising medication and inhaler use training to students, parents, and school staff) [15]. Additionally, the school setting may be the only place socio-economically disadvantaged students can gain access to asthma care [15]. Finally, research shows that health care providers rarely monitor inhaler technique and school-based asthma programs can help fill this gap and reinforce care management that children receive in a clinical setting [7].

Several reviews of school-based asthma education programs have been published previously. These reviews have determined that school-based programs typically target the child with asthma (as opposed to including parents or other social network members) and are educational in nature (e.g., lessons, booklets, online games, story writing), with the most common delivery format being group workshops [15,16]. School-based asthma education programs have been shown to help students achieve asthma control and reduce associated morbidity, regardless of intervention type, format, or who delivers the program (e.g., health educators, nurses, physicians, clinical pharmacists, and teachers) [16–20].

To date, few studies have scrutinized inhaler use skill improvement and maintenance and reviews commenting on this cite a limited number of studies and generally report that inhaler technique improved with education and training [6,16,20,21]. Despite the potential for improved inhaler technique to lead to better asthma control and improved clinical outcomes, no review has specifically focused on evaluating the effects of school-based inhaler technique instruction on child outcomes. Therefore, the purpose of this systematic review is to examine school-based asthma interventions to describe how inhaler technique instruction is being delivered and to evaluate the relationship between inhaler technique instruction and asthma outcomes in children with asthma.

2. Methods

2.1. Identification of studies

For this review, we define the term “school-based” as interventions or programs that occur in publicly-supported school grades prior to college (i.e., kindergarten for 5- to 6-year-olds through twelfth grade for 17- to 18-year-olds; grades K-12). This age group was selected as it represents the age of children in primary to secondary school in the United States [22]. We used a systematic search strategy followed by article retrieval, abstract and full text screening, and qualitative assessment of selected articles. We included articles on inhaler technique regardless of the inhaled drug type and considered only articles that assessed inhaler technique.

2.2. Literature search

The systematic search strategy involved searching the following eight databases: Medline, PubMed, Education Resources Information Center (ERIC), International Pharmaceutical Abstracts (IPA), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase, Informit, PsychInfo. Additionally, Google Scholar was searched for further studies. We completed our search in April 2016. The following terms/combination of terms were used in searching the databases: (“school-based” OR school OR schools) AND (intervention OR lesson OR lessons OR “lesson plan” OR curriculum OR program OR programs OR education) AND (controller OR inhaler OR inhalers OR “inhaler steps” OR “inhaler technique” OR “inhaler use” OR medication OR medications) and asthma AND (self-management OR manage or management) AND (child OR children OR student OR students OR adolescent OR adolescents OR teens OR teenage OR teen OR teenagers OR boy OR boys OR girl OR girls) These search terms were collectively identified as relevant descriptors by two authors familiar with the literature, and with the assistance of a health sciences research librarian skilled in conducting systematic reviews and identifying search terms. The search starting year was limited to the year 1995 since the first Global Initiative for Asthma (GINA) guidelines were published in this year [23]. References of all the retrieved articles were compiled in one Endnote database. Duplicates were identified and removed.

2.3. Methods of the review

Title and abstract review: The abstracts of potentially relevant studies retrieved from the electronic searches were imported into Covidence Systematic Review Software [24] and independently screened for eligibility by two authors (LG and CR). Articles were included if they were: (1) school based, (2) about asthma, (3) strictly an intervention, program, curriculum, or any form of education, and (3) targeted children and adolescents aged 5–18. In cases of disagreements in coding, reviewers met and discussed the articles until consensus was met. Thus, reviewers decided jointly on articles to be moved to the next stage/full text review.

Full text review: The two reviewers independently reviewed the full text of articles carried forward from abstract screening to

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