

PEDIATRIC ASTHMA AND THE USE OF METERED DOSE INHALERS WITH VALVE HOLDING CHAMBERS: BARRIERS TO THE IMPLEMENTATION OF EVIDENCE-BASED PRACTICE

Authors: Shawna S. Mudd, DNP, CPNP-AC, PNP-BC, Kearstyn Leu, CPNP, MPH, Elizabeth D. Sloand, PhD, CPNP, and Thuy L. Ngo, DO, MEd, Baltimore, MD

Asthma is a chronic disease that has major effects on many children in the United States and a significant impact on the health care system. It is estimated that more than 7 million children are affected by asthma, with an overall prevalence of 9.4%.¹ Asthma exacerbations account for approximately 13.5% of all pediatric hospitalizations,² and asthma was the primary diagnosis for 17 million outpatient and ED visits in 2007.³

The acute management of asthma involves administration of inhaled medications, particularly beta-agonists, via nebulization (aerosolization) or via metered dose inhalers (MDIs) with valve-holding chambers (VHCs) (Figure).⁴ Historically, nebulization has been the delivery method most commonly used in emergency departments in the United States, despite the wealth of studies done nationally and internationally that have demonstrated that MDIs with VHCs have equivalent or improved outcomes in the treatment of mild to moderate acute asthma exacerbations in children.⁵ Studies have reported decreased lengths of stay in the emergency department, decreased adverse effects, similar hospitalization rates, and decreased overall costs when MDIs with VHCs were used compared with nebulizers in children.⁵ Multiple studies have shown that MDIs with

VHCs require less staff time and administration time than nebulized bronchodilators.⁶ Additionally, nebulizer administration requires a compressed gas source, patient compliance (particularly in younger children to maintain a tight fit of a face mask), and higher dosing when compared with MDIs with VHCs.⁶

Multiple studies evaluating ED provider perceptions (including physicians, nurses, respiratory therapists, and pharmacists) show several barriers when switching from nebulized albuterol to MDIs with VHCs in acute asthma management. Despite the evidence showing that MDIs with VHCs are the best choice, reported primarily in ED settings, many providers continue to use nebulizers in the management of acute asthma exacerbations in children. A culture of nebulizer use in pediatric emergency departments remains, and the belief that nebulizers are more effective than MDIs with VHCs is “seemingly based more on faith and tradition than solid evidence”.⁶

The purpose of this review was to explore barriers reported in the literature that may affect the implementation of MDIs with VHCs for the management of children with acute asthma exacerbations in the emergency department.

Methods

A systematic review of the literature was conducted to identify barriers and attitudes toward implementation of evidence-based practice in the use of MDIs with VHCs for acute asthma exacerbations in children. A literature search of PubMed, CINAHL, Web of Science, Embase, and Cochrane was performed. Both MeSH subject and key word searches were performed using the following terms: metered dose inhaler, nebulizers and vaporizers, inhalation spacers, MDIs, nebulizer, asthma, guideline adherence, health knowledge, attitudes and practice, knowledge, attitude, barrier, resistant, patient satisfaction, child, children, adolescent and teen (Appendix). Limits included

Shawna S. Mudd is Assistant Professor, Johns Hopkins University School of Nursing, Baltimore, MD.

Kearstyn Leu is Pediatric Nurse Practitioner, Neighborcare Health, Seattle, WA. Elizabeth D. Sloand is Associate Professor, Johns Hopkins University School of Nursing, Baltimore, MD.

Thuy L. Ngo is Assistant Professor, Johns Hopkins University School of Medicine, Baltimore, MD.

For correspondence, write: Shawna S. Mudd, DNP, CPNP-AC, PNP-BC, Johns Hopkins University School of Nursing, 525 N Wolfe St, Rm 467, Baltimore, MD 21205; E-mail: Smudd1@jhu.edu.

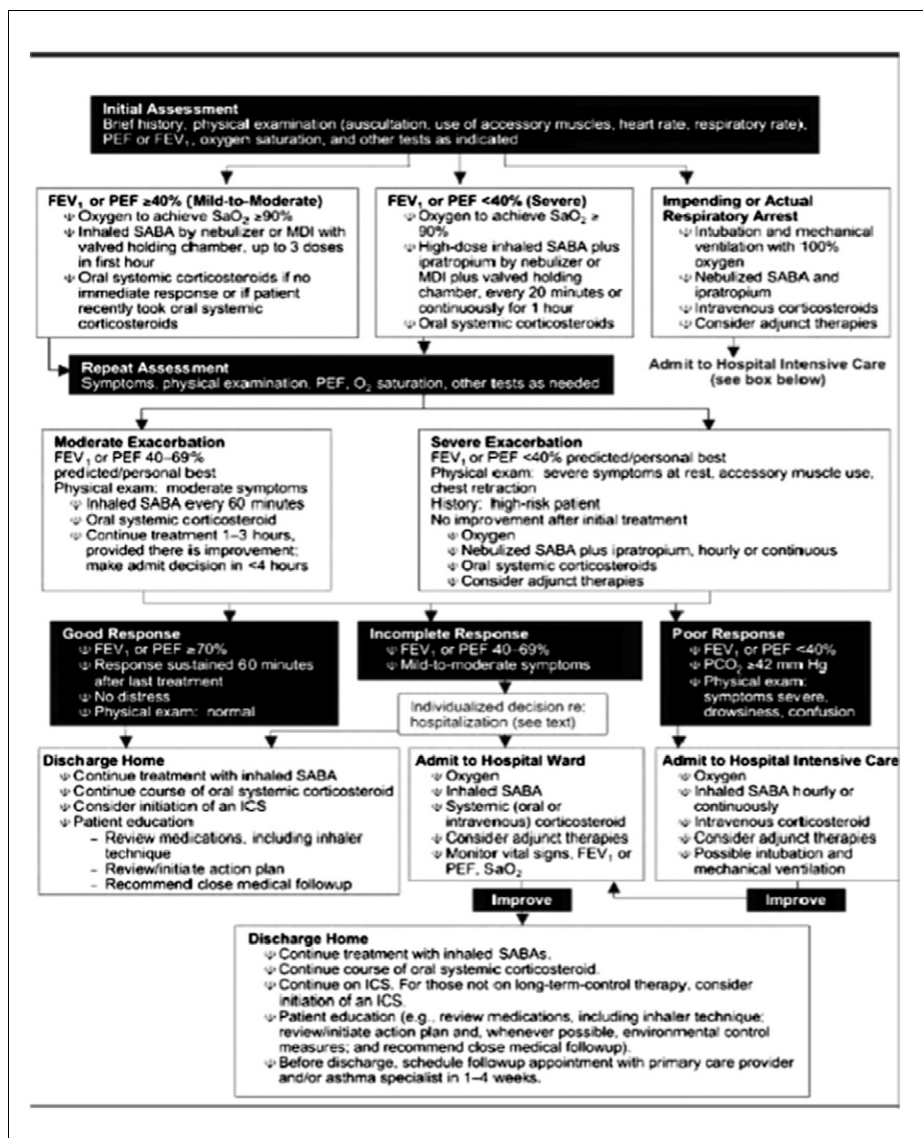
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FIGURE

FEV¹, forced expiratory volume in 1 second; ICS, inhaled corticosteroid; MDI, metered-dose inhaler; PCO₂, partial pressure carbon dioxide; PEF, peak expiratory flow; SABA, short-acting beta₂-agonist; SaO₂, oxygen saturation.
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English language, human subjects, and published after January 2000. The last search was conducted in March 2014 (Appendix). Reference lists of articles used were hand searched to obtain additional articles. Studies were included if they addressed barriers and attitudes regarding the use of MDIs with VHCs, with a barrier defined as a factor found to limit or restrict adherence to recommended evidence based practice. Studies were excluded if they did not address barriers to the use of MDIs with VHCs.

Results

Three hundred forty three articles were returned using our search strategies, and six met the inclusion criteria for the review. All studies were published in English, and publication dates ranged from 2000 to 2013. Study designs included 2 surveys, a questionnaire, a qualitative study, a comparative case study, and a prospective observational study (Table).

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