ARTICLE

Adapting an Evidence-Based Pediatric Acute Asthma Exacerbation Severity Assessment Tool for Pediatric Primary Care

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ABSTRACT

Introduction: The purposes of this project were (a) to examine criteria derived from evidence-based pediatric acute asthma exacerbation assessment tools, asthma scores, and the acute asthma prediction rule validated and used in the emergency department and (b) to adapt these criteria for pediatric primary care.

Method: The three stages of the project included (a) identification of criteria in a literature review, (b) validation of the criteria by an expert panel, and (c) adaptation of the criteria in the design of an assessment tool.

Results: The criteria were validated and adapted in the design of The Pediatric Acute Asthma Exacerbation Severity Assessment and Disposition Decision-Making Tool for Pediatric Primary Care.

Discussion: The adaptation of criteria derived from the evidence and validated by an expert panel will inform and guide clinicians in assessing severity and support decision making in determining disposition of pediatric patients presenting with an acute asthma exacerbation in primary care. J Pediatr Health Care. (2017) ■, ■-■.

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KEY WORDS

Acute asthma exacerbation, assessment tool, asthma score, primary care, severity assessment

In the past two decades, children ages 5 to 17 years old have had the highest asthma prevalence rates and the highest exacerbation prevalence rates across all ages. In 2011, 4 million children younger than 18 years old had an exacerbation, 77% of whom were ages 5 to 17 years old (American Lung Association, 2012). Rapid management and treatment must be initiated in children with severe or life-threatening exacerbations (U.S. Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute, & National Asthma Education

and Prevention Program, 2007). Clinical signs and symptoms are critical to determining the severity level of an exacerbation in a child. The emergency department (ED) management of moderate to severe acute asthma exacerbations requires an assessment tool to measure the severity of asthma to provide effective treatment (Van der Windt, Nagelkereke, Bouter, Danker-Roelse, & Veerman, 1994). "Given that pulmonary function testing in the preschool children is often neither feasible nor reliable, many clinical scores of asthma severity have been developed" (Birken, Parkin, & MacArthur, 2004, p. 1177).

Because many pediatric patients also present with acute asthma exacerbations in primary care settings, there is a need to implement such tools to guide primary care providers. Such evidence-based asthma assessment tools provide essential guidance for providers assessing severity level, initiating treatment, and determining disposition of pediatric patients with acute asthma exacerbation in primary care. "The ability to quickly and accurately evaluate acute asthma exacerbation severity is essential for providing appropriate, quality care in an efficient manner" (O'Connor, Berg, Stack, & Arnold, 2015, p. 1). Furthermore, use of an evidence-based asthma assessment tool has the potential to increase patient safety, improve quality of care, and expedite patient flow in the primary care setting. Our purpose was to describe the validation and adaptation of criteria used in the design of the Pediatric Acute Asthma Exacerbation Severity Assessment and Disposition Decision-Making Tool for Pediatric Primary Care.

BACKGROUND

There has been great variability in assessing and treating children with an asthma exacerbation because children at different age levels vary in their clinical presentation. As Van der Windt et al. (1994) stated, "A single clinical sign will not be very indicative of asthma severity, but a combination of signs may provide more valid information, considering the complex relationship between the pathophysiological and the clinical features of asthma" (p. 636). One method for assessing severity of airway obstruction is by pulmonary function tests, such as forced expiratory volume at 1 second (i.e., FEV_1) and peak expiratory flow. However, young children do not have the capability to perform pulmonary function testing, especially during an exacerbation, making this method neither feasible nor reliable. Birken et al. (2004) noted that clinical scores for determining asthma severity have been developed as a result of this fact. Most of these scores were designed in an ad hoc manner and, because children younger than 6 years of age were unable to perform pulmonary function tests, clinical signs were the deciding factor in the assessment of acute asthma (Van der Windt et al., 1994).

There was very little information on the clinimetric properties of the scores in terms of reliability, validity, and responsiveness whether used in clinical practice or clinical trials (Van der Windt, 2000).

The first systematic review of asthma scores was completed by Danielle Van der Windt and her colleagues in 1994. Van der Windt et al. (1994) conducted a review of the literature for clinical asthma scores to assess acute asthma exacerbations in preschool children. Their search identified 16 different clinical asthma scores between 1966 and 1992. These asthma scores were reviewed for (a) purpose of the score, (b) description of the score, (c) suitability for use in children, (d) interobserver agreement, (e) validity, and (f) responsiveness. The results were then placed in three different tables, based on the application of the asthma score: (a) discriminative purposes, (b) predictive purposes, and (c) evaluative purposes. Based on their results, the authors concluded that the clinical asthma scores were useful instruments with discriminative and evaluative properties; however, there was insufficient information to justify the use of one asthma score over another.

Another study by Birken et al. (2004) was conducted to evaluate the measurement properties of asthma severity scores for use in preschool children. These properties included item development, reliability, validity, responsiveness, and usability. Through a MEDLINE search (1966–2002), 10 asthma severity scores (with 19 different clinical variables) were identified for children younger than 6 years in the inpatient and ED settings. The results showed that the Clinical Assessment Score, for use in the inpatient setting, and the Preschool Respiratory Assessment Measure (PRAM), for use in the ED setting, were the two scores with the "most comprehensive assessment of measurement properties" (Birken et al., 2004, p. 1180).

Ducharme et al. (2008) also conducted a study on the Preschool Respiratory Assessment Measure (PRAM). This included a prospective cohort study to examine the validity, responsiveness, and reliability of the PRAM. Their study included 782 children, ages 2 to 17 years, with acute asthma who had the PRAM score recorded at triage. To determine the performance capabilities of the PRAM, the authors also incorporated the expert skills of over 100 nurses and physicians who were trained and then performed the PRAM at three different points during the patients' visits: triage, after initial bronchodilation, and disposition. Using

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