

Best Evidence Statement (BEST)

Date: August 22, 2011

Title

Use of a clinical pathway in decreasing albuterol frequency in all patients up to 18 years of age admitted to the hospital with a diagnosis of asthma or reactive airway disease.

Clinical Question

P (population)	Among pediatric patients up to age 18 years of age admitted to the hospital with a diagnosis of asthma or reactive airway disease who are receiving either continuous or intermittent nebulized albuterol
I (intervention)	does the use of a clinical pathway to wean the albuterol treatment frequency
C (comparison)	compared to obtaining a physician order for every frequency adjustment
O (outcome)	effect length of hospital stay or amount of albuterol given?

Target Population: Pediatric patients up to age 18 years admitted with asthma or reactive airway disease (RAD) receiving either continuous or intermittent nebulized albuterol

Note 1: Exercise caution when treating patients who have congenital or acquired cardiovascular disease, cystic fibrosis, chronic lung disease, bronchopulmonary dysplasia, acute chest syndrome due to sickle cell anemia, or immunodeficiency syndromes as these conditions may not respond as expected to therapy.

Note 2: An accurate diagnosis of asthma in patients 0-12 months is difficult. Based on the existing CCHMC asthma guideline's appendix 1 and appendix 2, this age group is included as part of the target treatment population (Acute Asthma Guideline, Cincinnati Children's Hospital Medical Center [5a]).

Exclusion criteria:

- Patients who require intubation, non-invasive ventilation support, or are in impending respiratory arrest
- Patients with bronchiolitis or conditions characterized by non-bronchodilator-responsive wheezing.

Recommendations (See Table of Recommendation Strength following references)

- It is recommended that a clinical pathway be used for pediatric patients up to age 18 years of age admitted with the diagnosis of asthma or reactive airway disease who are receiving **intermittent** nebulized albuterol treatments for decreasing the:
 - length of hospital stay (Banasiak 2004 [1b], Papo 1993 [2a], McDowell 1998 [3a], Johnson 2000 [3b], Kelly 2000 [4b], Lierl 1999 [4b], and Wazeka 2001 [4b])
 - amount of albuterol given (McDowell 1998 [3a], Johnson 2000 [3b], and Wazeka 2001 [4b]).
- There is insufficient evidence and lack of consensus to support the use of a clinical pathway for pediatric patients up to 18 years of age admitted with the diagnosis of asthma or reactive airway

disease who are receiving **continuous** nebulized albuterol treatments for weaning from continuous to intermittent therapy.

Relevant CCHMC policies / procedures

Evidence-based Care Guideline for Management of Acute Exacerbation of Asthma in children 0-18 years. Last revised 9/16/10. <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/asthma.htm>

Discussion/summary of evidence

Evidence indicates that the use of a clinical pathway will significantly decrease the length of hospital stay when used in weaning intermittent nebulized albuterol (Banasiak 2004 [1b], Papo 1993 [2a], McDowell 1998 [3a], Johnson 2000 [3b], Kelly 2000 [4b], Lierl 1999[4b], and Wazeka 2001 [4b]). Evidence indicates that a clinical pathway can be used in treating patients in the intensive care unit (Papo 1993 [2a], Kelly 2000 [4b] and Wazeka 2001 [4b]). One study (Carroll 2006 [3a]) showed using a clinical pathway for weaning terbutaline, an intravenous bronchodilator instead of an inhaled bronchodilator, was effective in decreasing length of stay in the intensive care unit and overall length of hospital stay. Evidence indicates the use of a clinical pathway for weaning decreased the overall amount of albuterol delivered to the patient (McDowell 1998 [3a], Johnson 2000 [3b], and Wazeka 2001 [4b]). No studies were found regarding the use of a clinical pathway to wean continuous nebulized albuterol. The strength of body of evidence is moderate.

Health Benefits, Side Effects and Risks

Health benefits associated with using a clinical pathway are decreased overall exposure to albuterol, decreased length of stay in the intensive care unit, and decreased length of overall hospital stay. By decreasing the length of hospital stay and medication delivered, overall hospital costs will be decreased. Minimal side effects and risks associated with using a clinical pathway for weaning continuous and intermittent nebulized albuterol include readmission to the hospital (Banasiak 2004 [1b]) and respiratory therapists not following the clinical pathway (McDowell 1998 [3a] and Lierl 1999 [4b]). While not addressed in the evidence, a potential risk is the frequency of treatments being decreased before the patient meets pathway guidelines.

References/citations (evidence grade in []; see *Table of Evidence Levels following references*)

Acute Asthma Guideline, Cincinnati Children's Hospital Medical Center: Evidence-based care guideline for management of acute asthma exacerbation in children (2010), <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/asthma.htm>, Guideline 4, 1-35. [5a].

Banasiak, N. C., & Medows-Oliver M. (2004). Inpatient asthma clinical pathways for the pediatric patient: An integrative review of the literature. *Pediatric Nursing*, 30(6), 447-450. [1b].

Carroll, C.L., & Schramm, C.M. (2006). Protocol-based titration of intravenous terbutaline decreases length of stay in pediatric status asthmaticus. *Pediatric Pulmonology*, 41(4), 350-356. [3a].

Johnson, K. B., Blaisdell, C. J., Walker, A., & Eggleston, P. (2000). Effectiveness of a clinical pathway for inpatient asthma management. *Pediatrics*, 106(5), 1006-1012. [3b].

Kelly, S. C., Littelman Anderson, C., Pestian, J. P., Wenger, A. D., Finch, A. B., Strobe, G. L., & Luckstead, E. F. (2000). Improved outcomes for hospitalized asthmatic children using a clinical pathway. *Annals of Allergy, Asthma, & Immunology*, 84, 509-516. [4b].

Lierl, M. B., Pettinichi, S., Sebastian, K. D., Kotagal, U. (1999). Trial of a Therapist-Directed Protocol for Weaning Bronchodilator Therapy in Children with Status Asthmaticus. *Respiratory Care* 44(5), 497-505. [4b].

McDowell, K. M., Chatburn, R. L., Myers, T. R., O'Riordan, M. A., Kercesmar, C. M. (1998). A Cost-Saving Algorithm for Children Hospitalized for Status Asthmaticus. *Archives of Pediatric and Adolescent Medicine*, 152, 977-984. [3a].

Papo, M. C., Frank, J., & Thompson, A. E. (1993). A prospective, randomized study of continuous versus intermittent nebulized albuterol for severe status asthmaticus in children. *Critical Care Medicine*, 21(10), 1479-1486. [2a].

Wazeka, A., Valacer, D. J., Cooper, M., Caplan, D. W., DiMaio, M. (2001). Impact of a pediatric asthma clinical pathway on hospital cost and length of stay. *Pediatric Pulmonology*, 32, 211-216. [4b].

Note: Full tables of evidence grading system available in separate document:

- [Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality](#) (abbreviated table below)
- [Grading a Body of Evidence to Answer a Clinical Question](#)
- [Judging the Strength of a Recommendation](#) (abbreviated table below)

Table of Evidence Levels (see note above)

<i>Quality level</i>	<i>Definition</i>
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Other: General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

Table of Recommendation Strength (see note above)

<i>Strength</i>	<i>Definition</i>
“Strongly recommended”	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
“Recommended”	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.

Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.

1. Grade of the Body of Evidence (see note above)
2. Safety / Harm
3. Health benefit to patient (*direct benefit*)
4. Burden to patient of adherence to recommendation (*cost, hassle, discomfort, pain, motivation, ability to adhere, time*)
5. Cost-effectiveness to healthcare system (*balance of cost / savings of resources, staff time, and supplies based on published studies or onsite analysis*)
6. Directness (*the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]*)
7. Impact on morbidity/mortality or quality of life

Supporting information

Introductory/background information

A clinical pathway for weaning the frequency of **intermittent** nebulized albuterol treatments has been used in this facility for many years. The pathway has never applied to patients in the **intensive care unit** or to patients receiving **continuous** nebulized albuterol treatment. There have been inconsistent parameters used for patients in the intensive care unit when weaning the frequency of treatments. A consistent, evidence based clinical pathway may lead to safer and more efficient care for this patient population.

Group/team members

Team leader: Tanya Scholl, RRT-NPS, BHS, RT III, Pediatric Intensive Care Unit
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 Derek Wheeler, MD, Clinical Director, The Division of Critical Care Medicine;

Search strategy

Databases searched: OVID MEDLINE, EBSCO CINAHL, Google Scholar, National Guideline Clearinghouse (www.guidelines.gov) and National Heart Lung and Blood Institute (www.nhlbi.nih.gov/guidelines/asthma).

Search terms: asthma/clinical guideline, asthma/weaning protocol, asthma/clinical pathway, continuous albuterol/weaning protocol, albuterol/clinical pathway, albuterol/clinical guideline

Filters: English language and pediatrics

Date range: All dates up to and including May 31, 2011.

Applicability issues

A pathway for use in the Intensive Care Unit must be developed. Proper education and training of staff involved in the care of asthma and reactive airway disease patients being cared for following the clinical pathway is necessary. Appropriate documentation tools need to be in place to properly monitor adherence to the pathway. A valid and reliable scoring tool is needed to establish implementation of the clinical pathway.

Copies of this Best Evidence Statement (BEST) are available online and may be distributed by any organization for the global purpose of improving child health outcomes. Website address: <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm>
 Examples of approved uses of the BEST include the following:

- copies may be provided to anyone involved in the organization's process for developing and implementing evidence based care;
- hyperlinks to the CCHMC website may be placed on the organization's website;
- the BEST may be adopted or adapted for use within the organization, provided that CCHMC receives appropriate attribution on all written or electronic documents; and
- copies may be provided to patients and the clinicians who manage their care.

Notification of CCHMC at EBDMiNFO@CCHMC.ORG for any BEST adopted, adapted, implemented or hyperlinked by the organization is appreciated.

For more information about CCHMC Best Evidence Statements and the development process, contact Center for Professional Excellence/Research and Evidence-based Practice office at CPE-EBP-Group@cchmc.org

Note:

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Reviewed against quality criteria by two independent reviewers