Office of Evidence Based Practice (EBP) – Critically Appraised Topic (CAT): Albuterol via Metered Dose Inhaler Dosing

Specific Care Question
In children aged 0 – 18 years with asthma and admitted to the hospital for an exacerbation, should the dosage of quick relief albuterol medicine via metered dose inhaler (MDI) **be based on weight** versus **based on age** better for improved outcomes (decreased length of stay and respiratory scores) and fewer side effects (increased HR, hyperactive, nausea/vomiting, arrhythmia, irritably).

Recommendations Based on Current Literature (Best Evidence) Only
No recommendation can be made for weight or age-based MDI albuterol administration, based on expert review of current literature by the Department of EBP. No studies were found that answered the specific care question of weight versus age dosing for albuterol. When there is a lack of scientific evidence, standard work should be developed, implemented, and monitored.

Literature Summary
Background Asthma is a chronic disease characterized by airway inflammation (Global Initiative for Asthma (GINA), 2021). Respiratory symptoms such as chest tightness, cough, shortness of breath, wheezing, and variable expiratory airflow are common citation. Symptoms can be chronic or occur suddenly, with acute amplification of symptoms (GINA, 2021). An accepted treatment for mild-to-moderate exacerbation is administering short-acting beta agonists (SABA), such as albuterol, administered through an MDI (GINA, 2021). The previous dosing recommendations have been based on number of puffs given through MDI (Children's Mercy Kansas City, 2016). The purpose of this review is to determine if weight-based versus age-based dosing results in improved outcomes.

Two guidelines were identified for this review (Cloutier et al., 2020; GINA, 2021). Both guidelines were assessed using AGREE II (see Table 1).

The Global Initiative for Asthma (2020) and The National Asthma Education and Prevention Program Coordinating Committee Working Group Expert Panel Report (EPR)-4 (Cloutier et al., 2020) do not make any recommendations for short-acting beta-agonists (SABA) based on age or weight.

Medication	Dose	Comments
Albuterol MDI (90 mcg/puff)	4-8 puffs every 20 minutes for 3 doses, then every 1-4 hours inhalation maneuver as needed. Add mask in children <4 years	In mild-to-moderate exacerbation, MDI plus valved-holding chamber is as effective as nebulized therapy with appropriate administration technique and coaching by trained personnel

(Cloutier et al., 2020)

Medication	Dose	Comments
Albuterol MDI (90 mcg/puff)	4-10 puffs every 20 minutes for the first hour, After the first hour, doses vary from 4-10 puffs every 3-4 hours up to 6-10 puffs every 1-2 hours, or more often	Mild-to-moderate exacerbation, delivery of SABA via MDI and spacer leads to similar improvement in lung functions as delivery via nebulizer

(GINA, 2021)

Study Characteristics The search for suitable studies was completed on April 1, 2021. H. Murphy, BHS RRT AE-C and M. Buchanan BHS, RRT-NPS reviewed the 76 titles and/or abstracts found in the search and identified[a] two guidelines and nine single studies believed to answer the question. After an in-depth review of the identified guidelines and single studies, none answered the specific care question, but one guideline addressed provided general recommendations related to the question.

Identification of Studies
Search Strategy and Results (see Figure 1)

(("Asthma"[Majr]) AND "Metered Dose Inhalers"[Mesh]) AND "Albuterol/administration and dosage"[Majr] AND (child OR children OR pediatr* OR paediatr*)
76 selected items
Records identified through database searching *n* = 76

Studies Included in this Review

Citation	Study Type
No studies answered the question	

Studies Not Included in this Review with Exclusion Rationale

Citation	Reason for exclusion
Abaya et al. (2019)	Continuous albuterol dosing
Battistini (2000)	Non-English
D'Vaz et al., (2019)	Dose not based on weight or age
Muchão et al. (2016)	High versus low dose
Parlar-Chun and Arnold (2021)	Continuous albuterol dosing
Polat, Saz, and Nursoy (2011)	Study on high dose Salbutamol
Ratnayake et al. (2016)	Dose not based on weight or age
Schuh et al. (1999)	Continuous albuterol dosing
Schuh et al. (2012)	Continuous albuterol dosing

Methods Used for Appraisal and Synthesis

[a]Rayyan is a web-based software used for the initial screening of titles and/or abstracts for this analysis (Ouzzani, Hammady, Fedorowicz & Elmagarmid, 2017).

[b]The Appraisal of Guidelines Research and Evaluation II (AGREE II) is an international instrument used to assess the quality and reporting of clinical practice guidelines for this analysis (Brouwers et al. 2010).

[c]The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram depicts the process in which literature is searched, screened, and eligibility criteria is applied (Moher, Liberati, Tetzlaff, & Altman, 2009).

[a]Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan-a web and mobile app for systematic reviews. *Systematic Reviews, 5*(1), 210. Doi:10.1186/s13643-016-0384-4

[b]Brouwers, M.C. et al. for the AGREE Next Steps Consortium. (2010) AGREE II: Advancing guideline development, reporting and evaluation in healthcare. *Canadian Medical Association Journal, 182*, E839-842. Retrieved from https://www.agreetrust.org/wp-content/uploads/2017/12/AGREE-II-Users-Manual-and-23-item-Instrument-2009-Update-2017.pdf

[c]Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PloS Med 6(7): e1000097. Doi:10.1371/journal.pmed1000097 **For more information, visit www.prisma-statement.org.**

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Acronyms Used in this Document

Acronym	Explanation
AGREE II	Appraisal of Guidelines Research and Evaluation II
CAT	Critically Appraised Topic
EBP	Evidence Based Practice
EPR	Expert Panel Report
GINA	Global Initiative for Asthma
MDI	Metered dose inhaler
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Figure 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIMSA)[c]

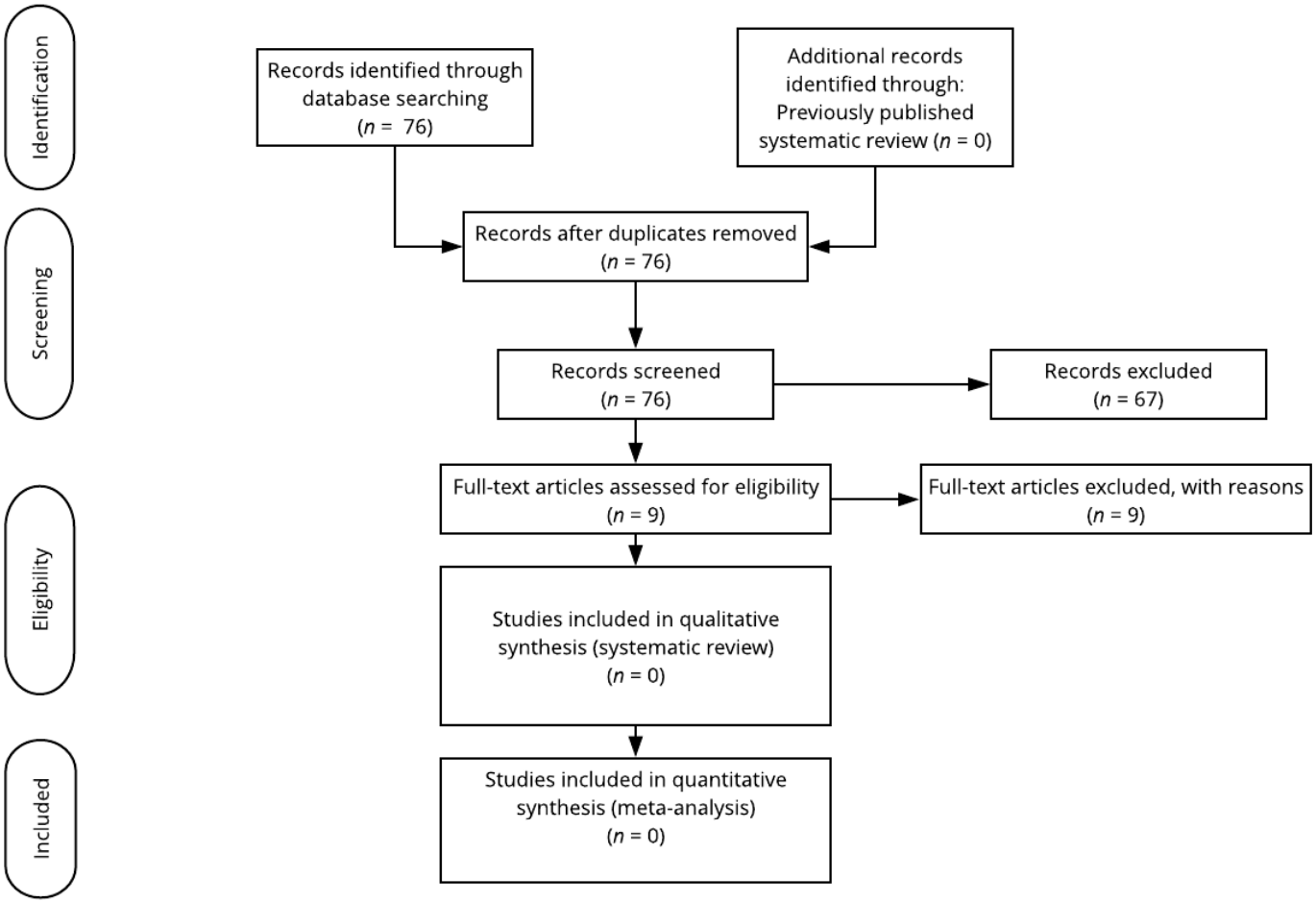

Table 1

AGREE II[XX] Summary for the EPR-4 Guideline (Cloutier et al., 2020)

Domain	Percent Agreement
Scope and purpose	83%
Stakeholder involvement	64%
Rigor of development	73%
Clarity and presentation	97%
Applicability	90%
Editorial independence	63%
Team's recommendation for guideline use	Yes

Note: 4 EBP Team members and Scholars completed the AGREE II on this guideline.

AGREE II[XX] Summary for the GINA Guideline (GINA, 2021)

Domain	Percent Agreement
Scope and purpose	96%
Stakeholder involvement	93%
Rigor of development	90%
Clarity and presentation	64%
Applicability	77%
Editorial independence	81%
Team's recommendation for guideline use	Yes

Note: 4 EBP Team members and Scholars completed the AGREE II on this guideline.

References

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