Specific Care Question
For the pediatric patient who presents to the emergency department or urgent care center (ED/UCC) with an acute asthma exacerbation, is there a score that is reliable and valid to assess the severity of the exacerbation, and the patient’s response to treatment?

Question Originator
The Asthma in the Emergency Department/ Urgent Care Center Clinical Practice Guideline Team

Literature Summary

Background. Challenges exist when assessing the severity of an acute asthma exacerbation of a young pediatric patient. In older children and adults peak expiratory flow rate (PEFR) spirometry is used to assess the severity of an exacerbation. The technique to perform PEFR spirometry is difficult for some pediatric patients, especially the very young patient or those with a severe exacerbation (Gorelick, Stevens, Schultz, & Scribano, 2004). Adult guidelines rely on these measures, however since they are not reliable in pediatrics, instruments otherwise known as asthma scores have been developed. Some of the scores available for use are the Asthma Severity Score (ASS), Clinical Asthma Score (CAS), Preschool Respiratory Assessment Measure (PRAM), and Pulmonary Score (PS). The scores have included various items, such as wheeze, inspiratory: expiratory ratio, or oxygen saturation. Since there are many scores, the Asthma in the ED CPG Team inquired, which of the available scores has been tested for validity and reliability to assess the severity of a pediatric patient’s asthma exacerbation, and their response to treatment.

Study characteristics. The search for suitable studies was completed on May 25, 2018. Nineteen titles and abstracts were found in the search and reviewed Nancy Allen, MS, MLS, RD, LD CPHQ. Five articles were believed to address the question. After an in-depth review two articles (Alnaji, Zemek, Barrowman, & Plint, 2014; Gouin et al., 2010) answered the question. Also included in this analysis are three articles (Birken, Parkin, & Macarthur, 2004; Chalut, Ducharme, & Davis, 2000; Ducharme et al., 2008) from the previous Critically Appraised Topic (CAT).

Key results. Based on low quality evidence, a strong recommendation is made to use the PRAM score to assess asthma severity in the ED/UCC for a pediatric patient with an acute asthma exacerbation. The expansion of the PRAM from a score to be used in pre-school patients to the overall pediatric population is clearly described (Ducharme et al., 2008). Subsequent studies have identified a high PRAM score as a strong predictor of hospital admission (Alnaji, Zemek, Barrowman, & Plint, 2014; Gouin et al., 2010) and extended ED stays (Alnaji et al., 2014; Gouin et al., 2010).

Summary by Outcome

Asthma Score testing. Three studies are included for this outcome. Birken et al. (2004) is a systematic review on 10 asthma scores develop for use in the inpatient and outpatient care areas. The asthma scores are Bronchiolitis Score (BS), Clinical Asthma Score (CAS), Clinical Asthma Evaluation Score (CAES), Clinical Score (CS), Clinical Symptom Grading System (CSGS), Clinical Scoring System – 1 (CSS - 1), Clinical Scoring System– 2 (CSS - 2), Pulmonary Index (PI), Preschool Respiratory Assessment Measure (PRAM), and Respiratory Distress Assessment Index (RDAI). However, the criteria for study selection, risk of bias across studies, number of articles selected, or number of subjects were not reported. The authors did not perform a meta-analysis. The two prospective cohort studies

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that tested the PRAM are Chalut et al. (2000) in the pre-school population and Ducharme et al. (2008) that expanded the use of the PRAM to the full range of pediatric ages. Cohort studies start as low quality and could not be upgraded for (a) large effect size, (b) plausible confounding that would reduce the effect, or (c) a dose response gradient (Schunemann, Brozek, Guyatt, & Oxman, 2013). The quality of the evidence reported in the three studies is graded as low.

Birken et al. (2004) recognized the CAS (inpatient) and PRAM (outpatient) as having the most robust psychometrics of the 10 scores. The PRAM score has the following features:

- The basis for scored items is based on research findings
- Items were checked for comprehension
- Validity- PRAM moderately correlated with provider assessment ($r = .5$)
- Criterion validity correlated with respiratory resistance pre- and post- bronchodilation ($r = .22$ and $r = .36$) respectively
- Responsiveness- assessed by change in score pre and post treatment with corticosteroids, and inhaled beta2-agonists ($p < .01$)

Birken et al (2004) concludes that asthma severity scores have been informally developed, and although the PRAM and the CAS have the most rigorous testing, score development and testing should continue to assure accurate classification of the severity of asthma exacerbation in pediatrics.

Chalut et al. (2000) evaluated 19 clinical signs to discriminate the severity of the exacerbation in the pre-school population. From this work, the PRAM score was developed. Suprasternal retractions, scalene muscle contraction, air entry, wheezing, and oxygen saturation were the five signs selected to be included in the PRAM (Chalut et al, 2000). PRAM has a range from zero to 12 with 12 indicating a severe exacerbation and zero no exacerbation. PRAM was found to be a responsive tool, correlating ($r = .58$) with a change in respiratory resistance measured by Rfo2. PRAM was found to be able to discriminate exacerbation severity, “A PRAM score of 5 (95% CI [4.5, 5.2]), corresponded to 175% of predicted Rfo2 and thus would be suggestive of moderate airway obstruction; a change to 3 (95% CI [2.2, 3.0]) corresponded to a > 25% change from baseline Rfo2” (Chalut et al. 2000).

To assess the PRAM score in pediatric patients of all ages, Ducharme et al. (2008) examined the performance of the PRAM in children 2-17 years of age. Construct validity, both internal consistency and predictive validity; responsiveness, and interrater agreement were assessed. The internal validity of the PRAM was good both overall and across the age groups ($Cronbach a = .71$). PRAM score at triage and after initial bronchodilation was strongly associated with rate of admission ($r = .4, p < .0001$, and $r = .5, p < .0001$) respectively. The Guyatt responsiveness coefficient (Guyatt et al., 2002), which measures sensitivity to clinical change, identified that PRAM was 0.7, showing the PRAM score detected change after bronchodilation. Finally, inter-rater reliability was high ($\kappa = .78$) between physician and nurse groups and was consistent for all ages studied. The authors found the PRAM score is the most extensively reported score, and shows strong psychometrics.

Hospital admission. Two studies ($n = 580$) are included for this outcome (Alnaji et al., 2014; Gouin et al., 2010). The evidence is graded as very low quality as the severity of the exacerbation varied in the two studies. Gouin et al. (2010) enrolled patients of all severities, while (Alnaji et al., 2014) included those with moderate or severe exacerbation. Although the mean age for subject recruitment spanned zero to 17 years, the included studies report mean ages with a range of 1.6 to 5 years of age. Alanaji et al. (2014) reports a PRAM performed at two and three hours were the best predictors of hospital admission $OR = 1.84$ 95% CI [1.47, 2.29], $AUC = .85$, 95%
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CI [.77, .92], and OR = 2.05 95% CI [1.57-2.68], AUC = .85, 95% CI [.79, .93], respectively. While (Gouin et al., 2010) reports a PRAM performed at 90 minutes predicts admission PRAM - AUC = .91, 95% CI [.87, .95].

Extended ED stay. One study (n = 283) is included for this outcome. (Gouin et al., 2010) is graded as very low as it is a cohort study and the only study measuring this outcome. The outcome reported upon is “LOS > 6 hours and or hospital admission” AUC = .69 for PRAM conducted at the start of the ED visit and AUC = .82 when conducted at 90 minutes.

Search Strategy and Results (see PRISMA diagram)

CINAHL

S4 S1 AND S2 Limiters - Published Date: 20140101 - 20171231
S3 S1 and S2 Search modes _Boolean/Phrase
S2 (MH"Asthma+") OR "asthma" Search modes _Boolean/Phrase
S1 "PRAM' OR Pediatric Respiratory Assessment Measure" Search modes _Boolean/Phrase

PubMed

Search: ("PRAM" OR "Pediatric Respiratory Assessment Measure") AND asthma
Filters: From 2014/01/01 to 2018/12/31
Total number: 16 articles returned

Studies Included in this Review (in Alphabetical Order)

(Alnaji et al., 2014)
(Birken, Parkin, & Macarthur, 2004)
(Chalut, Ducharme, & Davis, 2000)
(Ducharme et al., 2008)
(Gouin et al., 2010)

Studies Not Included in this Review with Exclusion Rationale (in Alphabetical Order)

<table>
<thead>
<tr>
<th>Authors (YYYY)</th>
<th>Reason for exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Alansari et al., 2015)</td>
<td>Used an asthma score, did not test the asthma score</td>
</tr>
<tr>
<td>(Cronin et al., 2012)</td>
<td>Used an asthma score, did not test the asthma score</td>
</tr>
<tr>
<td>(Eggink et al., 2016)</td>
<td>Did not include all items on the PRAM score</td>
</tr>
<tr>
<td>(Schuh, Willan, Stephens, Dick, &amp; Coates, 2009)</td>
<td>Used an asthma score, did not test the asthma score</td>
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</tbody>
</table>

Method Used for Appraisal and Synthesis

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The Cochrane Collaborative computer program, Review Manager (Higgins & Green, 2011) was used to synthesize the five included studies. GRADEpro GDT (Guideline Development Tool) is the tool used to create the Summary of Findings Tables for this analysis.


Medical Librarian Responsible for the Search Strategy
Keri Swaggart, MLIS, AHIP

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Becky Frederick, PharmD

EBP Team Member Responsible for Reviewing, Synthesizing, and Developing this Document
Nancy H. Allen, MS, MLS, RD, LD CPHQ

Acronyms Used in this Document

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Explanation</th>
</tr>
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<tbody>
<tr>
<td>ASS</td>
<td>Asthma Severity Score</td>
</tr>
<tr>
<td>AUC</td>
<td>Area under the curve</td>
</tr>
<tr>
<td>BS</td>
<td>Bronchiolitis Score</td>
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<tr>
<td>CAES</td>
<td>Clinical Asthma Evaluation Score</td>
</tr>
<tr>
<td>CAS</td>
<td>Clinical Asthma Score</td>
</tr>
<tr>
<td>CAT</td>
<td>Critically Appraised Topic</td>
</tr>
<tr>
<td>CSGS</td>
<td>Clinical Symptom Grading System</td>
</tr>
<tr>
<td>CSS1</td>
<td>Clinical Scoring System 1</td>
</tr>
<tr>
<td>CSS2</td>
<td>Clinical Scoring System 2</td>
</tr>
<tr>
<td>EBP</td>
<td>Evidence Based Practice</td>
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<tr>
<td>ED</td>
<td>Emergency Department</td>
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<tr>
<td>PASS</td>
<td>Pediatric Asthma Severity Score</td>
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<tr>
<td>PEFR</td>
<td>Peak expiratory flow rate</td>
</tr>
<tr>
<td>PI</td>
<td>Pulmonary Index</td>
</tr>
<tr>
<td>PRAM</td>
<td>Pediatric Respiratory Assessment Measure</td>
</tr>
<tr>
<td>PS</td>
<td>Pulmonary Score</td>
</tr>
<tr>
<td>RDAI</td>
<td>Respiratory Distress Assessment Index</td>
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<tr>
<td>UCC</td>
<td>Urgent Care Center</td>
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</tbody>
</table>

Date Developed/Updated: October 2018

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Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)\textsuperscript{b}

- Records identified through Database searching \((n = 16)\)
- Additional records identified through other sources \((n = 3)\)
  Previous CAT

- Records after duplicates removed \((n = 19)\)

- Records screened \((n = 19)\)
- Records excluded \((n = 10)\)

- Full-text articles assessed for eligibility \((n = 9)\)
- Full-text articles excluded, with reasons \((n = 4)\)

- Studies included in qualitative synthesis (systematic review) \((n = 5)\)
- Studies included in quantitative synthesis (meta-analysis) \((n = 0)\)
  Unable to pool findings


For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

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<table>
<thead>
<tr>
<th>Methods</th>
<th>Retrospective cohort chart review</th>
</tr>
</thead>
</table>
| **Participants** | Setting: Patients presenting to pediatric Emergency Department of the Children's Hospital of Eastern Ontario (CHEO), Ontario, Canada between February and May 2010.  
**Number enrolled:** N = 297  
**Number completed:** N = 297  
**Gender, males:** n = 193 (65%)  
**Age, years, median [range]:** 4.7 [2.8 - 7.6] |
| **Inclusion Criteria:** |  
- Age 2 through 17 - Patients must have received a prior diagnosis of asthma by a physician or have three or more episodes of wheezing responsive to beta-2 agonists  
- Presented with moderate to severe acute asthma exacerbations, defined as triage PRAM score ≥ 4  
- Patients who received intensive asthma therapy based on their presenting triage PRAM scores.  
  - Intensive asthma therapy defined for moderate exacerbations, PRAM 4 through 7, as three initial salbutamol treatments via metered dose inhaler using a valved spacer along with oral corticosteroid administration by the triage nurse between first and second inhaled treatment  
  - Intensive asthma therapy defined for severe exacerbations, PRAM 8, or greater, as three inhaled salbutamol plus ipratropium bromide treatments via nebulization along with oral corticosteroid administration by the triage nurse between first and second inhaled treatment.  
  - In all cases, oral systemic corticosteroids plus all three initial inhaled treatments were administered within 1 hour of patient arrival at triage |
| **Exclusion Criteria:** |  
- Children with PRAM scores < 4 or > 11-  
- Hypersensitivity to dexamethasone or oral corticosteroids  
- Chronic respiratory conditions such as bronchopulmonary dysplasia or cystic fibrosis  
- Cardiac, metabolic, or immunologic disease  
- History of adrenal suppression  
- Coexisting acute illness such as pneumonia, pertussis, or croup  
- Any use of oral corticosteroids in the past 14 days  
- Exposure to varicella in the previous three weeks in a susceptible child  
- Patients who did not receive intensive asthma therapy based on their presenting triage PRAM score |
| **Interventions** | To determine the association between asthma severity as measured by the Pediatric Respiratory Assessment Measure (PRAM) score and the likelihood of admission for pediatric patients who present to the emergency department with moderate-to-severe asthma exacerbations and who receive intensive asthma therapy. This was a secondary analysis of data collected from a study examining the effectiveness of an asthma medical directive in the ED that permitted nurses to initiate corticosteroid administration at triage. |
### Outcomes

The PRAM performed at two and three hours were the best predictors of hospital admission $OR = 1.84$ 95% CI [1.47, 2.29], $AUC = .85$, 95% CI [.77, .92], and $OR = 2.05$ 95% CI [1.57-2.68], $AUC = .85$, 95% CI [.79, .93], respectively.

The PRAM at triage was the best predictor of long ED stay $OR = 1.26$ 95% CI [1.03, 1.55], $AUC = .62$, 95% CI [.52, .72].

### Notes

- Analysis of the information provided in Figure 1 reveals a discrepancy regarding the number of participants eligible for the study. The authors report 297 patients eligible, but subtraction of those listed as excluded result in 295 eligible patients.

- Note that PRAM assessments were not available for all patients every hour. For example, patients may have been discharged within the 4-hour period of data collection.

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**Birken 2004**

<table>
<thead>
<tr>
<th>Design</th>
<th>Qualitative Synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective of SR:</strong></td>
<td>Compare the measurement properties of available clinical asthma scores for children 0 – 6 years of age.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Methods</th>
<th>Protocol and registration</th>
<th>Not reported</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eligibility Criteria:</strong></td>
<td>Searched for studies that either evaluated the properties of the score (psychometrics) or used the score in the assessment of preschool children.</td>
<td></td>
</tr>
<tr>
<td><strong>Information sources:</strong></td>
<td>Medline (1966 – 2002)</td>
<td></td>
</tr>
<tr>
<td><strong>Search Strategy:</strong></td>
<td>A Medline search (1966-2002) was performed to identify all studies that described the development or use of and asthma score for children $&lt;$ 6 years of age.</td>
<td></td>
</tr>
<tr>
<td><strong>Study Selection</strong></td>
<td>Used a framework, but it is not reported. They do not report studies, but they report the scores they evaluated. The scores are:</td>
<td></td>
</tr>
<tr>
<td>BS – Bronchiolitis Score</td>
<td>CSS1 - Clinical Scoring System 1</td>
<td></td>
</tr>
<tr>
<td>CAS – Clinical Asthma Score</td>
<td>CSS2 - Clinical Scoring System 2</td>
<td></td>
</tr>
<tr>
<td>CAES – Clinical Asthma Evaluation Score</td>
<td>PRAM – Preschool Respiratory Assessment Measure</td>
<td></td>
</tr>
<tr>
<td>CSGS – Clinical symptom Grading System</td>
<td>RDAI – Respiratory Distress Assessment Index</td>
<td></td>
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<tr>
<td>PI – Pulmonary Index</td>
<td>CS – Clinical Score</td>
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</tbody>
</table>

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*If you have questions regarding this Specific Care Question – please contact [Erin Scott, DO](mailto:erin.scott@childrensmini.org), [Amanda Nedved, MD](mailto:amanda.nedved@childrensmini.org), or [Jeff Michael, DO](mailto:jeff.michael@childrensmini.org)*
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| Data collection process: | For each score, they gathered data from studies Development studies-  
| --- | ---  
| **Basis of item generation** |  
| **Endorsement frequency** |  
| **Restrictions in range** |  
| **Item heterogeneity,** |  
| **Item comprehension** |  
| **Risk of Bias across studies** | Not reported  
| **Summary measures** | Reliability, Validity, Responsiveness, Usability  
| **Results** | Study Selection: Neither the number of studies identified in the literature search, nor the method for study selection were reported. They state, “  
| **Synthesis of results** | Of the scores developed for inpatient use (CAS, CSGS, and CSS1) only the CAS reported on metrics. The CAS showed good internal consistency, inter-rater reliability, construct validity, and responsiveness. Of the scores developed for the ED setting, (BS, CAES, CS, CSS2, PI, PRAM, and RDAI), RDAI and PRAM had the best measurement properties. Although RDAI had good inter-rater reliability, the PRAM showed that and construct validity, responsiveness, criterion validity.  
| **Additional analyses.** | The PRAM appears to be the score that has been extensively tested, and shows strong psychometrics, however, results of testing are not reported.  
| **Risk of bias across studies** | Not reported  
| **Discussion** | Summary of evidence  
| **Limitations** | Asthma scores in general are not well tested. The major limitation is the individual studies reported various results; could not perform a meta-analysis.  
| **Conclusions:** | CAS (inpatient) and the PRAM (ED) have supporting metrics.  
| **Funding** | Funding: None  

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Chalut 2000

| Methods | Prospective cohort- convenience sample  
All data was collected, then the results were separated into 2 groups |
|---------|----------------------------------------------------------------------------------|
| Participants | **Participants:** Children, 3-6 years  
**Setting:** ED, presenting with acute asthma exacerbation, Montreal, Canada  
**Number enrolled:** \( N = 217 \)  
• **Test group - to elaborate the PRAM:** \( n = 145 \)  
• **Validation group - to test the PRAM characteristics:** \( n = 72 \)  
**Number completed:** \( N = 217 \)  
**Gender, males: Percent**  
• **Test group** - 61%  
• **Validation group** - 58%  
**Age, years/month Mean, [range]:**  
• **Test:** Mean = 5, [4,6]  
• **Validation:** Mean = 5, [4,6]  
**Inclusion Criteria:**  
• &lt; 6 years of age  
• Required treatment with nebulized SABAs  
• Were able to perform a predicted respiratory resistance (forced oscillation at 8 Hz) \((Rfo_8)\) X 3 times  
**Exclusion Criteria:**  
• Severe asthma, requiring continuous SABA  
• Could not tolerate the delay to perform the \((Rfo_8)\)  
• Acute illness - Pneumonia, croup, varicella, pertussis,  
• Chronic illness - cystic fibrosis, bronchopulmonary dysplasia, cardiac or renal disease  
• Birth weight &lt; 1500 grams  
• Previous enrollment  
**Covariates identified:**  
• Age, younger patients were more likely to be unable to perform the \(Rfo_8\) |
| Interventions | All subjects received the same treatment, collection of 19 clinical signs pre and post bronchodilation, including:  
• Cough  
• Grunting  
• Nasal flaring  
• Muscle contractions  
• Scalene muscles  
• Sternomastoid |
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<table>
<thead>
<tr>
<th>Retractions</th>
<th>Supraventricular</th>
<th>Suprasternal</th>
<th>Intercostal</th>
<th>Thoracoabdominal asynchrony</th>
<th>Wheezing</th>
<th>Air entry</th>
<th>Inspiratory/expiratory time ratio</th>
<th>Mental status</th>
<th>Heart rate</th>
<th>Respiratory rate</th>
<th>Pulsus paradoxus</th>
<th>Speech impairment</th>
<th>Oxygen saturation</th>
</tr>
</thead>
</table>

#### Outcomes

**Primary:**
- Validate the PRAM in detecting the severity of an asthma exacerbation in preschool children

**Secondary**
- Establish the responsiveness to change in airway obstruction, as measure by the Rof₈

#### Notes

**Results:**
In the test group, seven of the above signs explained a significant (but modest) proportion of the % predicted Rfo₈. The best multivariate model included:
- Wheezing
- Air entry
- Contraction of scalene muscles
- Suprasternal retractions
- Oxygen saturation

This model was modestly discriminative, \( r^2 = .13, p = .5 \)

The PRAM was able to detect a change as a result of treatment \( r = .58, p < .0004 \)

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### Ducharme 2008

<table>
<thead>
<tr>
<th>Methods</th>
<th>Prospective cohort study</th>
</tr>
</thead>
</table>
| **Participants**         | **Participants:** Children 2 to 17 years of age  
**Setting:** Children’s Hospital, Montreal, Canada  
**Number enrolled:** \( N = 728 \) initial PRAM scores recorded, in triage  
**Number completed:** \( N = 554 \) with a second PRAM recorded, within 60 minutes of first dose of \( B_2 \)-agonist |

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<table>
<thead>
<tr>
<th><strong>Gender, males: Percent</strong></th>
<th><strong>Number enrolled:</strong> 63%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, years/month median (IQR):</strong></td>
<td><strong>Number enrolled:</strong> 5.8 [3.5, 9.6]</td>
</tr>
<tr>
<td><strong>Inclusion Criteria:</strong></td>
<td></td>
</tr>
<tr>
<td>- Age -- 2-17 years</td>
<td></td>
</tr>
<tr>
<td>- Two or more wheezing episodes, responsive to $B_2$-agonist</td>
<td></td>
</tr>
<tr>
<td>- Required at least one treatment with nebulized $B_2$-agonist</td>
<td></td>
</tr>
<tr>
<td><strong>Exclusion Criteria:</strong></td>
<td></td>
</tr>
<tr>
<td>- Chronic lung disease, example bronchopulmonary dysplasia</td>
<td></td>
</tr>
<tr>
<td>- Repeat patient visits were not counted</td>
<td></td>
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</tbody>
</table>

### Intervention Factors
- Determined internal consistency of PRAM at triage, or which of the tested items contributed to the overall PRAM score (Cronbach α)

To assess predictive validity an outcome (disposition, either hospital admission or ED discharge) was selected and the association between admission rate and either PRAM (atriage or after first treatment with bronchodilator) was calculated using the Spearman’s rank correlation with value between age groups compared with the Mann-Whitney $U$-test, and by multivariate regression.

### Outcomes
- **Primary outcome:** Internal consistency,
- **Secondary outcome(s):**
  - Predictive validity
  - Responsiveness using disposition as the outcome
  - Interrater reliability

### Notes
- **Results:**
  - Internal consistency -- for each of the age ranges (2 to 6 years and 7-17 years) the PRAM showed good construct validity (Cronbach α = .71). Each of the 5 items included in PRAM contributed equally to the overall score, with Cronbach α range [.59 .74] for both age groups
  - Predictive validity -- both the PRAM had strong association with hospital admission.
    
    \[
    r = 0.4, \ p = .0001 \ \text{atriage} \\
    r = 0.5, \ p = .0001 \ \text{after bronchodilation}
    \]
  - Responsiveness -- The PRAM was able to differentiate change in condition from triage to disposition. Patients who were discharged had greater improvement in PRAM score than those admitted to the hospital
  - Interrater reliability -- For a sub-group of 254 patients who had data to assess interrater reliability, for all age groups $κ \text{ coefficient} = 0.92$, 95% CI [0.84, 1].

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Gouin 2010

<table>
<thead>
<tr>
<th>Methods</th>
<th>Prospective Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Participants:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Setting:</strong></td>
<td>Pediatric ED, Canada, October 2006 - October 2007</td>
</tr>
<tr>
<td><strong>Number enrolled:</strong></td>
<td>N = 283</td>
</tr>
</tbody>
</table>
| 1. Length of stay > 6 hours discharged home, n = 43  
2. Length of stay > 6 hours with hospital admission, n = 12  
3. Length of stay < 6 hours with hospital admission, n = 24  
4. Length of stay < 6 hours discharged home, n = 204 |
| **Number completed:** | N = 283 |
| **Gender, males:** |                    |
| • 63% |
| **Age, years/month (mean):** |                    |
| • Mean = 3.4, 95% CI [2.2, 4.6] |
| **Inclusion Criteria:** |                    |
| • 18 months to 7 years of age  
• Presented with an acute asthma exacerbation, while the recruiting respiratory therapists (RT) were present |
| **Exclusion Criteria:** |                    |
| • Chronic respiratory disease such as cystic fibrosis, bronchopulmonary fibrosis etc.  
• Chronic cardiac condition  
• Bronchiolitis  
• Pneumonia, laryngitis, whooping cough  
• Patients transferred to the ED, and had been treated with SABAs |
| **Power Analysis was performed:** | The AUC of PASS was used to estimate the number of subjects. PRAM was assumed to have the same AUC. Therefore, 50 subjects in each group was necessary. |
| **Interventions** |                    |
| • All patients had an assessment of clinical findings and completion of the following asthma scores by a RT at initial assessment, and after being in the ED 90 minutes  
  o Preschool Respiratory Assessment Measure (PRAM)  
  o Pediatric Asthma Severity Score (PASS)  
• Scores were completed by the RT, ED provider cared for the patient without knowing the scores |
| **Outcomes** | Evaluated as four groups: |
| 1. Length of stay > 6 hours without hospital admission  
2. Length of stay > 6 hours with hospital admission  
3. Length of stay < 6 hours with hospital admission  
4. Length of stay < 6 hours without hospital admission |
| **Primary outcome(s):** |                    |
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**Secondary outcome(s)**
- PRAM and PASS scores of a combination of Group 2 and Group 3

**Safety outcome(s):** Providers estimate of severity (mild, moderate, severe, or extreme)

### Notes

**Results:**
Primary: PRAM and PASS scores of a combination of Group 1, Group 2 and Group 3- those with extended ED stays or hospital admission \( n = 79 \)
- At study entry (0 min)
  - PRAM - \( AUC = .69, 95\% CI [.59, .79] \)
  - PASS - \( AUC = .70, 95\% CI [06, 08] \)
- Reassessment (90 min)
  - PRAM - \( AUC = .82, 95\% CI [.73, .90] \)
  - PASS - \( AUC = .72, 95\% CI [.62, .82] \)

PRAM and PASS scores of a combination of Group 2 and Group 3 - those who were admitted \( n = 36 \)
- At study entry (0 min)
  - PRAM - \( AUC = .86, 95\% CI [.8, .91] \)
  - PASS - \( AUC = .86, 95\% CI [.83, .89] \)
- Reassessment (90 min)
  - PRAM - \( AUC = .91, 95\% CI [.87, .95] \)
  - PASS - \( AUC = .88, 95\% CI [085, .91] \)

### References


If you have questions regarding this Specific Care Question – please contact Erin Scott, DO, Amanda Nedved, MD, or Jeff Michael, DO
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