Use of Peak Expiratory Flow Rate Monitoring for the Management of Asthma in Adults in the Emergency Department

Policy Resource and Education Paper (PREP)

Introduction

The purpose of this paper is to identify the medical literature that pertains to the use of PEFR monitoring for ED management of adult patients with asthma.

This PREP is an update of a previous PREP with the same title, Use of Peak Expiratory Flow Rate Monitoring for the Management of Asthma in Adults in the Emergency Department which served as the background information for the policy statement of the same title.1

The previous policy statement on this topic1 originally arose from a number of studies that suggested that peak expiratory flow rate (PEFR) assessment or other spirometric measures were useful in clinical decision-making for patients with acute exacerbations of asthma.2-14 However, other studies did not find measurement of PEFR in the ED useful in management or in predicting the need for hospital admission.15-20 Despite the inconsistency of evidence, practice guidelines at the time of the original policy statement recommended the use of PEFR monitoring for patient care in the ED21 as do more recent guidelines.22

There have been additional publications on this topic since the prior policy statement was approved by the ACEP Board of Directors in June 2000. For this revision, a literature search was performed and recent articles were reviewed. Those references not cited in the prior PREP were systematically graded and may be found in the Evidentiary Table that appears later in this document.

All articles were graded by 2 subcommittee members for strength of evidence and classified by the subcommittee members into 3 classes of evidence on the basis of the design of the study, with design 1 representing the strongest evidence and design 3 representing the weakest evidence for therapeutic, diagnostic, and prognostic clinical reports, respectively (Appendix A). Articles were then graded on 6 dimensions thought to be most relevant: blinded versus nonblinded outcome assessment, blinded or randomized allocation, direct or indirect outcome measures (reliability and validity), biases (eg, selection, detection, transfer), external validity (ie, generalizability), and sufficient sample size. Articles received a final grade (Class I, II, III) on the basis of a predetermined formula taking into account design and quality of study (Appendix B). Articles with fatal flaws were given an “X” grade.

The literature search identified 26 articles not cited in the previous PREP. One Class II study23 and 7 Class III studies were identified.24-30 The remainder of the studies were not applicable to the question of use of PEFR in the ED, either because PEFR was not a studied variable, or the study setting was not the ED.31-48

Discussion

Although additional articles were found in the literature update, it appears that the pace of research in this area has slowed. Revisions to the prior policy statement were minor and reflect current evidence-based practices. Many of the critiques noted in the prior PREP remain valid:
1. Investigators were not blinded to PEFR measurements used for disposition decisions.
2. Study asthma treatment studies were different from contemporary treatment protocols.
3. Disposition and outcome criteria were poorly defined.
4. Study sizes were small.
5. Studied patient groups potentially lack generalizability to ED patient populations.

Summary

The use of PEFR monitoring has not been shown to improve outcomes, reliably predict need for admissions, or limit morbidity or mortality when used during the ED management of adult patients with acute exacerbations of asthma. The decision to perform PEFR monitoring should be individualized for each patient. Although PEFR may aid emergency physicians during their evaluation and treatment of an adult patient with an acute exacerbation of asthma, the evidence does not support requiring PEFR monitoring for all adult patients.

Originally approved June 2000
Revised October 2007
Reaffirmed January 2019

REFERENCES


42. Ng TP. Validity of symptom and clinical measures of asthma severity for primary outpatient assessment of adult asthma. *Br J Gen Pract.* 2000;50:7-12.


## Evidentiary Table

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Design</th>
<th>Intervention(s)/Test(s)/Modality</th>
<th>Outcome Measure/Criterion Standard</th>
<th>Results</th>
<th>Limitations/Comments</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerman et al^{23}</td>
<td>1999</td>
<td>Multicenter prospective cohort</td>
<td>PEFR one of the factors assessed during initial ED visit</td>
<td>Relapse defined as unscheduled ED return or visit to any physician for worsening symptoms of asthma</td>
<td>PEFR at discharge did not predict relapse; 17% of study group did relapse</td>
<td>PEFR may have been one of the factors used in decision-making for discharge at first ED visit</td>
<td>II</td>
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<tr>
<td>Abisheganaden et al^{24}</td>
<td>1998</td>
<td>Prospective paired cohorts</td>
<td>PEFR-driven protocol compared to routine clinical parameter-driven protocol</td>
<td>Discharge PEFR; admission rate</td>
<td>PEFR-guided protocol does not reduce admission rates or demonstrate improved PEFR response compared to clinically guided treatment</td>
<td>Patients not randomized to protocols; treatment periods separated by 1 y; relapse rates not compared</td>
<td>III</td>
</tr>
<tr>
<td>Choi et al^{25}</td>
<td>2002</td>
<td>Prospective cohort</td>
<td>PEFR and FEV&lt;sub&gt;1&lt;/sub&gt; compared at different times in clinical course from ED presentation to 7 days</td>
<td>Spirometric measurements PEFR and FEV&lt;sub&gt;1&lt;/sub&gt;</td>
<td>PEFR underestimates severity of airway obstruction in acute asthma compared to FEV&lt;sub&gt;1&lt;/sub&gt; measurements</td>
<td>Small study size; only 2 time data points of 0 and 1 h relevant to ED patients</td>
<td>III</td>
</tr>
<tr>
<td>Diner et al^{26}</td>
<td>2001</td>
<td>Prospective cohort</td>
<td>PEFR obtained by research assistant compared to patient’s self-determined personal best</td>
<td>Researcher-obtained PEFR</td>
<td>PEFR – personal best - reported by patients not reliable</td>
<td>Not a study of PEFR in the ED</td>
<td>III</td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Design</td>
<td>Intervention(s)/Test(s)/Modality</td>
<td>Outcome Measure/Criterion Standard</td>
<td>Results</td>
<td>Limitations/Comments</td>
<td>Class</td>
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<tr>
<td>Piovesan et al(^{27})</td>
<td>2006</td>
<td>Prospective cohort</td>
<td>PEFR measured at presentation, 15 min, and 4 h</td>
<td>Favorable outcome if PEFR $&gt;50%$ at 4 h of treatment</td>
<td>Improvement in 15 min PEFR to $\geq40%$ was predictive of improvement of 4 h PEFR $&gt;50%$</td>
<td>PEFR was the outcome measure, not clinical parameters; admissions not reported</td>
<td>III</td>
</tr>
<tr>
<td>Rodrigo and Rodrigo(^{28})</td>
<td>1997</td>
<td>Prospective cohort</td>
<td>Change in PEFR at 30 min (both as percent predicted and absolute flow rate)</td>
<td>Discharge at 3 h if free of dyspnea, use of accessory muscles diminished, wheezing minimal or absent, and able to walk 20 meters without increase in signs or symptoms</td>
<td>3 item index developed for application at 30 min after arrival that included accessory muscle use, PEFR measurement, and change in PEFR from baseline to predict need for admission</td>
<td>Discharge decision based on clinical criteria at 6 h, not measurement of respiratory function; favorable outcome was discharge from ED</td>
<td>III</td>
</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Study Design</td>
<td>Outcome Measure</td>
<td>Discharge Criteria</td>
<td>PEFR Measurement</td>
<td>Discharge Decision Criteria</td>
<td>Risk Assessment</td>
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<tr>
<td>Rodrigo and Rodrigo&lt;sup&gt;29&lt;/sup&gt;</td>
<td>1998</td>
<td>Prospective cohort</td>
<td>Change in PEFR at 30 min (both as percent predicted and absolute flow rate)</td>
<td>Discharge at 3 h if free of dyspnea, use of accessory muscles diminished, wheezing minimal or absent, and able to walk 20 meters without increase in signs or symptoms</td>
<td>PEFR measurement and change in PEFR from baseline at 30 min used to develop index validated to predict favorable outcome (FEV&lt;sub&gt;1&lt;/sub&gt; &gt;45%)</td>
<td>Discharge decision based on clinical criteria at 3 h, not measurement of respiratory function; favorable outcome was FEV&lt;sub&gt;1&lt;/sub&gt;, not PEFR</td>
<td>III</td>
</tr>
<tr>
<td>Weber et al&lt;sup&gt;30&lt;/sup&gt;</td>
<td>2002</td>
<td>Prospective cohort</td>
<td>PEFR was one of several factors assessed during ED visit</td>
<td>Admissions; ED discharges; relapse as defined by unscheduled visit to physician or ED within 72 h</td>
<td>PEFR &lt;50% of predicted not reliable for predicting relapses; final PEFR in ED was predictive of admission</td>
<td>Retrospective data analysis; PEFR not examined independently for admission decisions; clinicians not blinded to PEFR; admission or discharge decisions not based on PEFR</td>
<td>III</td>
</tr>
</tbody>
</table>

*ED*, emergency department; *FEV<sub>1</sub>*<sup>1</sup>, one-second forced expiratory volume; *h*, hour; *min*, minute; *PEFR*, peak expiratory flow rate; *y*, year.
Appendix A. Literature classification schema*

<table>
<thead>
<tr>
<th>Design/Class</th>
<th>Therapy†</th>
<th>Diagnosis‡</th>
<th>Prognosis§</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Randomized, controlled trial or meta-analyses of randomized trials</td>
<td>Prospective cohort using a criterion standard</td>
<td>Population prospective cohort</td>
</tr>
<tr>
<td>2</td>
<td>Nonrandomized trial</td>
<td>Retrospective observational</td>
<td>Retrospective cohort Case control</td>
</tr>
<tr>
<td>3</td>
<td>Case series Case report Other (eg, consensus, review)</td>
<td>Case series Case report Other (eg, consensus, review)</td>
<td>Case series Case report Other (eg, consensus, review)</td>
</tr>
</tbody>
</table>

*Some designs (eg, surveys) will not fit this schema and should be assessed individually.
†Objective is to measure therapeutic efficacy comparing ≥2 interventions.
‡Objective is to determine the sensitivity and specificity of diagnostic tests.
§Objective is to predict outcome including mortality and morbidity.

Appendix B. Approach to downgrading strength of evidence.

<table>
<thead>
<tr>
<th>Design/Class</th>
<th>Downgrading</th>
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<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>None</td>
<td>I</td>
</tr>
<tr>
<td>1 level</td>
<td>II</td>
</tr>
<tr>
<td>2 levels</td>
<td>III</td>
</tr>
<tr>
<td>Fatally flawed</td>
<td>X</td>
</tr>
</tbody>
</table>