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ADVANCING EMERGENCY CARE

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

Policy Resource and Education Paper (PREP)

This policy resource and education paper (PREP) is an explication of the policy statement "Use of Peak Expiratory Flow Rate Monitoring for the Management of Asthma in Adults in the Emergency Department"

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 topic[1] 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 ED[21] 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 study[23] 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.

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Evidentiary Table

Study	Year	Design	Intervention(s)/Test(s)/ Modality	Outcome Measure/ Criterion Standard	Results	Limitations/Comments	Class
Emerman et al[23]	1999	Multicenter prospective cohort	PEFR one of the factors assessed during initial ED visit	Relapse defined as unscheduled ED return or visit to any physician for worsening symptoms of asthma	PEFR at discharge did not predict relapse; 17% of study group did relapse	PEFR may have been one of the factors used in decision-making for discharge at first ED visit	II
Abisheganaden et al[24]	1998	Prospective paired cohorts	PEFR-driven protocol compared to routine clinical parameter-driven protocol	Discharge PEFR; admission rate	PEFR-guided protocol does not reduce admission rates or demonstrate improved PEFR response compared to clinically guided treatment	Patients not randomized to protocols; treatment periods separated by 1 y; relapse rates not compared	III
Choi et al[25]	2002	Prospective cohort	PEFR and FEV_1 compared at different times in clinical course from ED presentation to 7 days	Spirometric measurements PEFR and FEV_1	PEFR underestimates severity of airway obstruction in acute asthma compared to FEV_1 measurements	Small study size; only 2 time data points of 0 and 1 h relevant to ED patients	III
Diner et al[26]	2001	Prospective cohort	PEFR obtained by research assistant compared to patient's self-determined personal best	Researcher-obtained PEFR	PEFR – personal best - reported by patients not reliable	Not a study of PEFR in the ED Inner-city population	III

Evidentiary Table (continued)

Study	Year	Design	Intervention(s)/Test(s)/ Modality	Outcome Measure/ Criterion Standard	Results	Limitations/Comments	Class
Piovesan et al[27]	2006	Prospective cohort	PEFR measured at presentation, 15 min, and 4 h	Favorable outcome if PEFR >50% at 4 h of treatment	Improvement in 15 min PEFR to ≥40% was predictive of improvement of 4 h PEFR ≥50%	PEFR was the outcome measure, not clinical parameters; admissions not reported	III
Rodrigo and Rodrigo[28]	1997	Prospective cohort	Change in PEFR at 30 min (both as percent predicted and absolute flow rate)	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	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	Discharge decision based on clinical criteria at 6 h, not measurement of respiratory function; favorable outcome was discharge from ED	III

Evidentiary Table (continued)

Rodrigo and Rodrigo[29]	1998	Prospective cohort	Change in PEFR at 30 min (both as percent predicted and absolute flow rate)	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	PEFR measurement and change in PEFR from baseline at 30 min used to develop index validated to predict favorable outcome (FEV_1 >45%)	Discharge decision based on clinical criteria at 3 h, not measurement of respiratory function; favorable outcome was FEV_1, not PEFR	III
Weber et al[30]	2002	Prospective cohort	PEFR was one of several factors assessed during ED visit	Admissions; ED discharges; relapse as defined by unscheduled visit to physician or ED within 72 h	PEFR <50% of predicted not reliable for predicting relapses; final PEFR in ED was predictive of admission	Retrospective data analysis; PEFR not examined independently for admission decisions; clinicians not blinded to PEFR; admission or discharge decisions not based on PEFR	III

ED, emergency department; *FEV_1*, one-second forced expiratory volume; *h*, hour; *min*, minute; *PEFR*, peak expiratory flow rate; *y*, year.

Appendix A. Literature classification schema*

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

*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.

	Design/Class		
Downgrading	**1**	**2**	**3**
None	I	II	III
1 level	II	III	X
2 levels	III	X	X
Fatally flawed	X	X	X