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## Can measurement of peak expiratory flow enhance compliance in chronic asthma?

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The terms compliance and non-compliance are used to denote not only the taking of therapy in accordance with the prescribing doctor's directions with respect to its dosage, frequency and duration and, in the case of certain forms of treatment, observance of the correct technique for taking them, but also the carrying out of measures of a non-pharmacological kind that are an essential element of management.

Compliance in asthma, to a greater degree than in almost any other chronic disease, depends upon the quality of education that patients have received about its nature and the effects of therapy upon it. All too often, non-compliance in patients regarded as irresponsible or even stupid is a consequence of their having been given no explanation about the purpose or actions of the treatment that has been prescribed. For instance, many patients who take both an inhaled bronchodilator and an inhaled corticosteroid have no understanding about the differences between them. Similarly, it often emerges that those who use pressurised aerosols incorrectly have never been instructed in the correct technique for using these devices.

Compliance is generally considered to be a desirable feature of management, but this is not necessarily the case, at any rate in patients with asthma. In certain circumstances, for instance during acute exacerbations, rigid adherence to the directions given when treatment was prescribed may be inappropriate and even dangerous, and patients should, therefore, be encouraged to alter their maintenance regimen of drugs on their own initiative (provided, of course, that they have been instructed how they should do

so). Strict compliance is also undesirable during remissions of asthma, whether natural or achieved by therapy, since this entails the taking of unnecessarily high doses of drugs and possible exposure to adverse effects.

The first part of this paper examines the contribution that measurement of peak expiratory flow (PEF) by doctors or patients themselves can make towards the promotion of compliance in chronic asthma. The second part considers various problems that arise when patients monitor their PEF for the purpose of self-management of their asthma.

### Measurement of PEF as an aid to education and compliance

The Wright peak-flow meter was introduced in 1958, but many years were to pass before clinicians, especially general practitioners, recognised its value in the management of asthma. While there is now universal agreement that the measurement of PEF is mandatory in the management of asthma [1, 2], there is still insufficient appreciation of its value for educating patients about the nature of the disease and the purposes of their treatment and, hence, indirectly promoting compliance.

It is a simple matter in the course of a consultation to measure PEF before and after the inhalation of a bronchodilator aerosol in order to demonstrate its efficacy in relieving muscle constriction. However, much greater value is to be gained from consecutive measurements of PEF made over several days. Since the cost of the original Wright meter virtually restricted its use to the consulting-room, it was only with the introduction of

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the Mini-Wright meter in 1976 that it became feasible to provide patients with meters so that they could measure and record their PEF themselves.

Apart from those patients who have only very mild and occasional asthma, almost all others will derive great benefit from self-measurement of PEF. Having first been taught how to perform the test correctly and plot the recordings graphically, the patient should measure PEF twice or three times daily for about ten days. Subsequent perusal and discussion of the record with the doctor will give the patient considerable insight into the behaviour and constituents of airflow obstruction, including its diurnal pattern and its tendency to be maximal in the early morning. Furthermore, by seeing the effects of treatment upon PEF, the patient will acquire a much clearer understanding of the actions of different classes of drugs upon airflow obstruction than if this information were imparted by the spoken or written word.

Among the most important items of knowledge that every patient with asthma must have is that muscle constriction is merely one of the causes of airflow obstruction and that the others (mucosal inflammation and mucous plugging) respond poorly if at all to bronchodilator agents. Self-measurement of PEF during a course of corticosteroid will help patients to understand the inflammatory element of asthma and to appreciate the differences of action between bronchodilators and corticosteroids.

In addition to its value for educating patients about asthma and thus enhancing their compliance, self-measurement of PEF provides information that is essential for the assessment of progress in both the short and long term. By disclosing the highest PEF that a patient can attain after optimal control of asthma has been established, this highest personal value (HPV) is invaluable as a reference against which all subsequent measurements of PEF can be compared. Since a patient's HPV takes account of any irreversible airflow obstruction that may be present, in addition to asthma, due to structural damage of the bronchi or alveoli, it is a far more meaningful index than his or her predicted value.

#### **Flexibility of treatment in chronic asthma**

One of the principal characteristics of asthma is its tendency to undergo large and often unpredictable changes in severity. To insist upon strict compliance, such that it led to rigid adherence to a maintenance regimen of drugs, would introduce the potential danger in acute exacerbations of delay either in increasing in dose or in substituting an alternative and more appropriate form of treatment.

There is now general agreement that patients should be encouraged to manage their asthma as far as possible by themselves, having been taught how to make changes in treatment on their own initiative in order to prevent the occurrence of serious or even life-threatening situations [2]. Clearly, however, if such a policy is to be effective and safe, they must be able to detect deterioration in the control of their asthma and impending exacerbations.

#### **Monitoring PEF as a basis for self-management of asthma**

Symptoms are notoriously unreliable as a guide to severity. Therefore, it is now being widely advocated that patients should monitor their PEF and regulate their therapy themselves by reference to guidelines which indicate graduated changes in the type and dose of treatment that should be taken according to the level of their PEF [3]. While the logic behind this proposition is unassailable, insufficient consideration has been given to many problems involved in the realisation of that ideal. Among these are the willingness of patients to take responsibility for their own care and their ability to do so effectively and safely, regardless of the severity of their asthma and the complexity of the treatment required to control it. Other problems of a more fundamental nature include our present ignorance about the factors that determine the long term prognosis of chronic asthma and uncertainty over the interpretation of tests of ventilatory function such as PEF and the manner in which observed values should be expressed.

Some of these problems, to which answers are urgently required, are briefly discussed below.

#### **Outstanding problems in the use of PEF measurements in self-management**

##### *What level of PEF should patients aim to maintain?*

Patients must be given guidance concerning the level of PEF that they should endeavour to maintain by manipulation of their treatment. It might seem rational that this should be as close as possible to their HPV, so as to prevent the occurrence of insidious deterioration resulting from inadequate suppression of mucosal inflammation. However, this may only be achievable by patients being exposed to an unwarrantable risk of adverse effects from a very high dose of corticosteroid or, possibly, of other types of anti-asthma therapy.

##### *Guidelines for self-management*

In two studies of self-management [3, 4], guidelines were supplied to patients in which changes in the level of PEF were related to changes that had to be made in their treatment. There are formidable difficulties in devising guidelines which can be applied by any patient, irrespective of age, body-size and severity of asthma. Since it is essential that the amount and type of treatment taken should be adequate in all circumstances, such universal guide-lines must err on the side of safety. Inevitably this will entail the taking by some patients of unnecessarily high doses of bronchodilators and/or corticosteroids, exposing them to the attendant risks of adverse effects.

### Interpretation and expression of PEF

The potential dangers of asthma are not due simply to the degree of airflow obstruction but are also attributable to other factors, particularly the underlying mechanisms responsible. Furthermore, absolute values of PEF, except when they are so low as to be only just recordable, are an unreliable guide to the severity of airflow obstruction. One reason for this is that the range of PEF (or forced expiratory volume in 1 second and other indices of ventilatory capacity), is not "linear". For example, a difference of 100  $l \cdot \text{min}^{-1}$  at the higher end of the range is of much less significance than it is at the lower end. While clearly a patient's observed values of PEF must be assessed by reference to his or her HPV, expressing them as percentages of HPV introduces its own problems of interpretation.

If doctors with wide experience of treating asthma sometimes find it difficult to interpret PEF, should it be expected of patients that they will be capable of making correct inferences about the state of their asthma and avoid the dangers that could occur as a result of their misinterpreting the significance of their measurement?

### Feasibility

There should be no illusion about the amount of time that is necessary for instructing patients in the principles of self-management. Nevertheless, this may not be much greater than that required to give them adequate education about asthma and their treatment, and there is now general agreement that all patients (or parents of children) must understand the nature of their disease and the actions of the drugs that they are prescribed [2].

### Types of peak-flow meters

In Britain and New Zealand, several types of instruments for measuring PEF have recently become

prescribable. Whereas extensive experience over 15 years in the use of the Mini-Wright meter has established its reliability and accuracy, far less is known about the performance of other types of meter which have been introduced much more recently. Predicted values of PEF have been derived from studies which used the Wright meter; there is close agreement between the values obtained with it and those obtained with the Mini-Wright meter.

### Summary and conclusions

Almost all patients with chronic asthma will derive benefit from self-measurement of PEF. Unquestionably, this is of value for educating patients about their disease and treatment, leading in turn to improved compliance.

It will be several years before it becomes clear what proportion of patients are willing to manage their asthma themselves and are sufficiently competent in the interpretation of their measurement of PEF to do so safely.

It remains to be seen what effect greater use of PEF measurement by patients will have upon present levels of morbidity and mortality from asthma.

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## Educational programmes in asthmatics

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Despite the advances in the understanding of the pathogenic mechanisms, clinical assessment, and medical treatment of asthma, an increase of mortality and morbidity has been observed. This increase may reflect better recognition and reporting, a change in prevalence

and severity, or both. It is clear from many reports, however, that good treatment is still being denied to many patients, especially those with limited access to medical care.

A retrospective analysis of 90 deaths from asthma [1] revealed insufficient medication in 61% of the patients and insufficient compliance with treatment in 54% of the cases. An underestimation of the severity of the

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