

Asthma: is the peak flow meter reliable to measure asthma research paper samples

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HYPOTHESIS

Is the peak flow meter reliable enough to measure asthma? Are peak flow measurement variations sufficiently sensitive and specific in cases of occupational asthma, childhood asthma and under other asthmatic conditions?

INTRODUCTION

Asthma is a serious lung condition characterized by bronchial hyper-reactivity, inflammation and mucous plugging resulting in airway constriction. An acute asthmatic attack is usually reversible by rescue inhalers. Asthma affects over 5 % of the US population and is responsible for approximately half a million hospital admissions annually in the US. 1 The Peak Flow Meter is a simple device which is very useful in measuring changes in airway capacity in asthmatics by measuring Peak Expiratory Flow (PEF) and Forced Expiratory Volume (FEV) in one second. In general, PEF measures the large airways capacity while FEV measures both the large and small airways function of the asthmatic patient. 2 The PEF measurements in asthmatics are influenced by several factors such as allergen exposure, exercise, medications, infections and normal variations during the diurnal cycle. 3 The diurnal changes in lung function occur in asthmatics as well as non-asthmatics with a larger variation seen in asthmatics. 4 In addition, the Oasys score (obtained by a computer analysis of serial peak flow meter readings taken at various time points on working days and rest days) is commonly used in diagnosing occupational asthma. 3 However, several experts do not agree on the use of PEF measurements used to calculate the

Oasys score in the diagnosis of occupational asthma. 5, 6

International guidelines for the management of asthma recommend home monitoring of PEF by all asthmatic individuals i. e. both adults and children. In general, the severity of asthma is correlated with a larger variation in PEF measurements. A patient's personal best PEF reading is considered to be a better indicator of asthmatic symptoms instead of age and sex reference PEF values. Children under the age of 12 show large variations in PEF measurements in general and thus variations in PEF measurements are considered to be of limited use in the diagnosis of asthma in young children under 12 years of age. 7 As an alternative to the peak flow meter, home spirometry is preferred and young children show adherence to it. Spirometry measures lung function by a more complicated and accurate device than a simple peak flow meter and also analyzes PEF and FEV1. In elderly asthmatics, lung function declines as a function of age since elderly patients have reduced respiratory muscle strength and inspiratory ability as a result of the ageing process. 8

Another alternate to PEF measurements by the peak flow meter is capnography (used in the Emergency Department) which does not require great effort and co-ordination to obtain readings as in the case of the peak flow meter. It is also much easier to use capnography in asthmatic patients who have difficulty getting accurate, reproducible PEF measurements. 9

ASTHMA TREATMENT

There are several treatment options for asthmatics and most treatment options try to reduce inflammation in the lungs and dilate the smooth muscle

of the bronchi to relieve asthmatic symptoms. Among the various treatment options are bronchodilators, inhaled corticosteroids, leukotriene antagonists and a new treatment option for severe uncontrolled asthma known as bronchial thermoplasty. Bronchial thermoplasty is a method of reducing the smooth muscle in the central and peripheral airways by the application of heat in order to reduce symptomatic bronchoconstriction in severe asthmatics. 10

METHOD OF STUDY

Data Collection: PEF measurements obtained from peak flow meters, spirometry and capnography from a large number of adults (n= 1000) during a 1-month study.

Data Analysis: Compare the PEF variations in the results at the same time points and under the same conditions using different devices peak flow meter, spirometry and capnography.

Data Collection: PEF measurements obtained from Peak flow meters, spirometry and capnography from a large number of children (n= 1000) for a 1- month study.

Data Analysis: Compare the PEF and FEV measurements and variations at the same time points and under the same conditions using different devices peak flow meter, spirometry and capnography.

Data Collection: PEF measurements obtained from peak flow meters, spirometry and capnography from a large number of elderly adults (n= 1000) during a 1-month study.

Data Analysis: Compare the PEF and FEV measurements and variations at

the same time points and under the same conditions using different devices peak flow meter, spirometry and capnography

DISCUSSION

It is expected that several PEF measurements would be obtained by the peak flow meter and its alternate devices. The data then needs to be analyzed for variations in the readings obtained by the 3 devices. Spirometry is known to be quite reliable in measuring lung function changes accurately. However the availability and the costs associated with spirometry on a regular basis including trained medical personnel to obtain accurate results makes it impractical for daily use in many cases.

The readings obtained from the peak flow meter should be compared to the PEF measurements obtained from spirometry at the same time points and under similar conditions. Statistical analysis should be performed to analyze if the variation is significant in a large number of patients. If the variation is significant then the peak flow meter is not reliable in accurately measuring changes in lung function in asthmatics.

CONCLUSION

Thus overall the peak flow meter may not be very reliable in measuring PEF variations under various asthmatic conditions. Although peak flow meters are simple, low-cost devices which are convenient to use their accuracy under all conditions could be a concern. The alternates such as spirometry and capnography are preferable for accurate measurements in the variations of PEF and FEV.

ABSTRACT

Asthma is a serious lung condition that is responsible for over half a million hospital admissions annually in the US. Asthma is characterized by bronchial hyper-reactivity, inflammation and mucous plugging resulting in airway constriction. The Peak Flow Meter is a simple device which is very useful in measuring changes in airway capacity in asthmatics by measuring Peak Expiratory Flow (PEF) and Forced Expiratory Volume (FEV) in one second. Are Peak Flow Meter measurements (PEFs) reliable in Asthma under various asthmatic conditions? Many experts do not agree on the use of PEF measurements by the peak flow meter used to obtain Oasys scores in the diagnosis of occupational asthma. PEF measurement variations by peak flow meters are not reliable in young children under age 12 in asthma diagnosis. Spirometry is a more accurate method of obtaining PEF variations by using a spirometer as an alternate to the peak flow meter. Another alternate to PEF is capnography which does not require much co-operation and co-ordination from the asthmatic patient.

Asthma treatments are varied and all treatments aim to reduce bronchial constriction and improve lung function through various mechanisms. Corticosteroids, leukotriene antagonists and Bronchial thermoplasty are some examples of the various asthmatic treatments currently available.

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