

# Peak Expiratory Flow Rate

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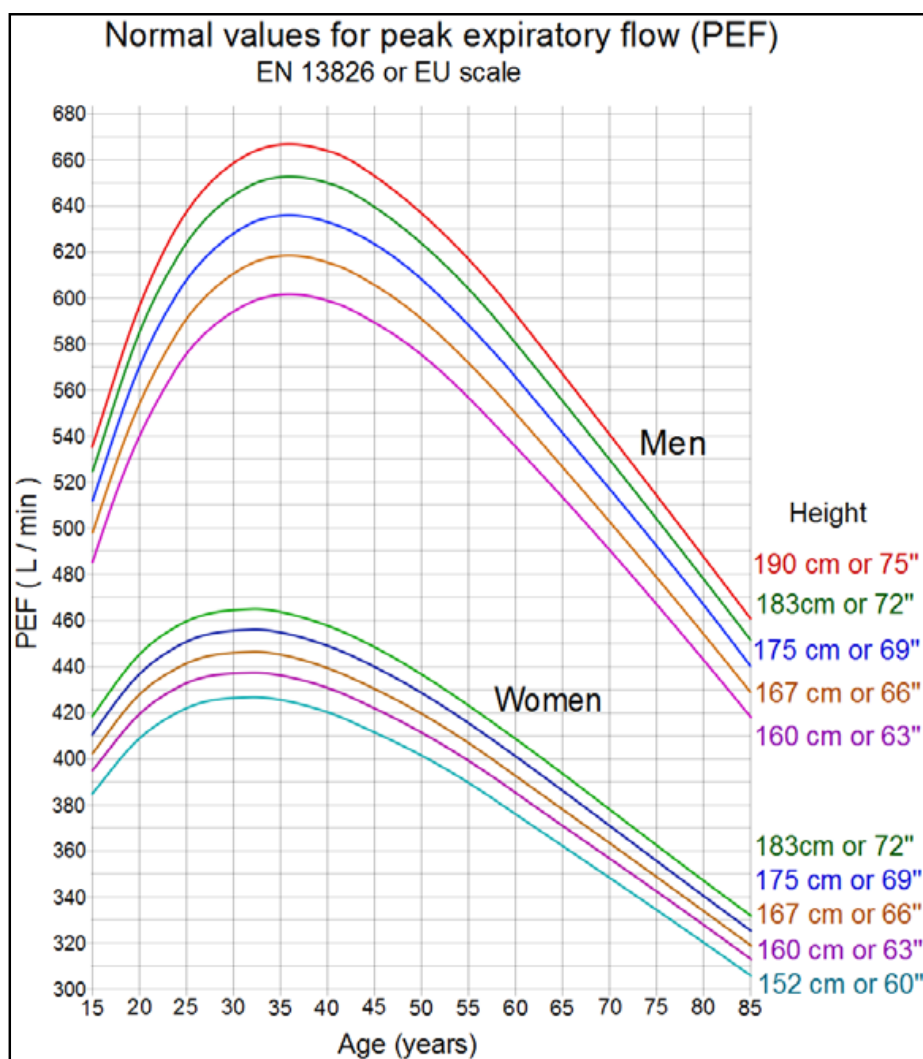


## Peak Expiratory Flow Rate

### **Background**

Peak expiratory flow rate (PEFR) is the volume of air forcefully expelled from the lungs in one quick exhalation, and is a reliable indicator of ventilation adequacy as well as airflow obstruction. The normal peak flow value can range from person to person and is dependent upon factors such as sex, age and height. PEFR is typically higher in males than females and higher in taller patients. After expected increases through childhood and adolescence, PEFR decreases with age from 30-40 years onwards (see Figure 1).



**Figure 1**



Asthma is the most common condition that affects peak flow. However, other conditions such as Chronic Obstructive Pulmonary Disease (COPD) that cause airway obstruction can also affect PEFR.

Asthma is a chronic condition characterised by exacerbations of airway hypersensitivity, bronchoconstriction, mucus secretion and inflammation of the lower airways. An exacerbation of asthma caused by a trigger (for example cold air) results in the narrowing of the lower airways, trapping air and resulting in the individual struggling to exhale. This can lead to a ventilation/perfusion mismatch, hypoxia, hypercapnia and acid-base imbalances, each of which can lead to further potentially life-threatening complications if not treated in a timely manner. Peak expiratory flow is a simple and easy, yet essential diagnostic tool used to assess asthma severity. Peak flow is also an important measure of the effectiveness of treatment with bronchodilator therapy. Peak flow meters (EU/EN ISO standard) are handheld devices used to measure PEF in the ambulatory setting. The differences between Peak Flow Meters and Spirometry are shown in Figure 2.

**Figure 2**

<b>PEAK FLOW METER</b>	<b>SPIROMETRY</b>
<ul style="list-style-type: none"> <li>✓ Measures ability to exhale</li> <li>✓ Will vary with lung capacity</li> <li>✓ Use with charts to detect <b>OBSTRUCTIVE</b> disease</li> <li>✓ Can be used by patients to monitor lung 'function'</li> </ul>	<ul style="list-style-type: none"> <li>✓ Simultaneous measurement of flow and capacity</li> <li>✓ Can be used to diagnose both <b>OBSTRUCTIVE</b> and <b>RESTRICTIVE</b> disease (gold standard)</li> <li>✓ Costs more than peak flow meters</li> </ul>
	

## **Clinical Indications**

### **Indications for Peak Flow**

In the pre-hospital setting, peak flow can be used to assess the severity of an asthma exacerbation). It is also indicated to assess the effects of therapy post nebulisation

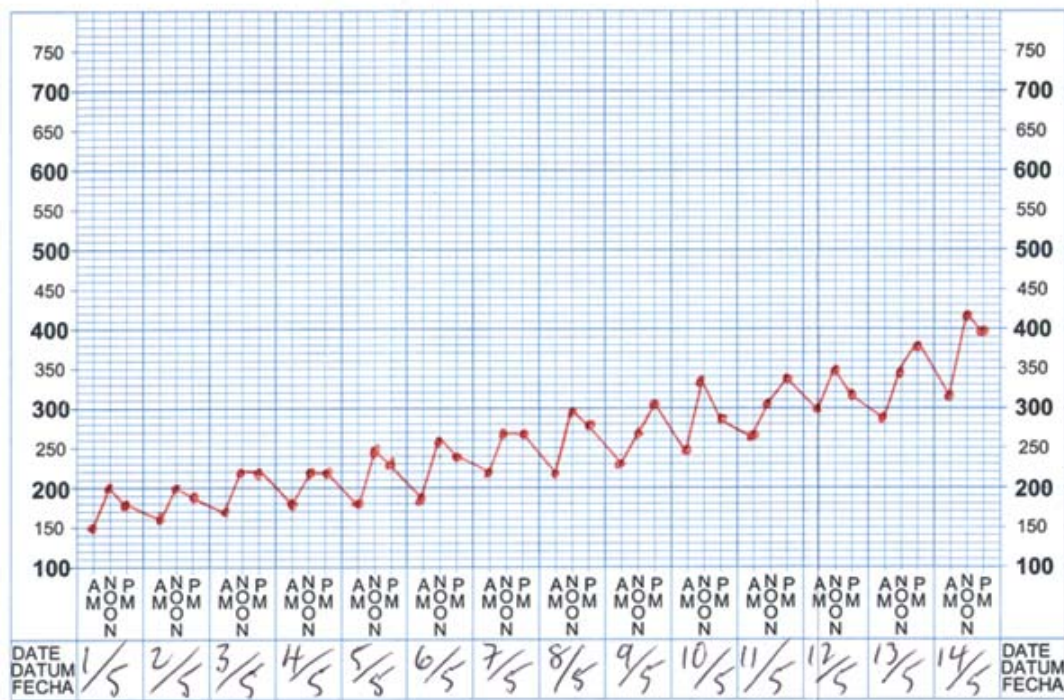
### **Contra-indications:**

Patients who are severely short of breath and unable to achieve full inspiration may not tolerate a peak flow, and in situations where the patient is in severe respiratory distress, attempting a peak flow may quicken deterioration of their breathing

Patients diagnosed with asthma may already have a peak flow meter and undertake daily readings, logging these on their own personalised charts. Peak flow readings can change throughout the day therefore patients are advised to record their readings both morning and evening. It is important to ascertain what an individual's normal and best PEFR values are and compare current readings along with the normal values chart

**Monitoring Peak Flow provides an indication of how well the disease is being managed**

> Peak flow chart showing recovery from acute asthma with pronounced morning dips



## Performing the Procedure

### Procedure

Introduce, **EXPLAIN**, consent

### Ask the patient to:

- ✓ Slide the marker down as far as it will go. This sets the meter at zero
- ✓ Stand up
- ✓ Breathe out fully
- ✓ Take a deep breath in with their mouth open
- ✓ Place the meter in their mouth with their lips forming a tight seal around the mouthpiece
- ✓ Keep their fingers away from the markings
- ✓ Blow out once as hard and fast as they can
- ✓ Repeat two more times (resetting the marker to zero each time)
- ✓ Their peak flow is the **HIGHEST** of these 3 readings



## Clinical implications and patient management

During an exacerbation of asthma, air becomes trapped due to bronchoconstriction and inflammation and therefore limits the volume of air exhaled during each breath. This can present with differing levels of severity which can affect peak flow values (see Table 1).

Table 1, Asthma Severity

Mild/moderate	Acute severe	Life threatening
<ul style="list-style-type: none"><li>• PEFR &gt;50-75% best or predicted</li></ul>	Adults: <ul style="list-style-type: none"><li>• PEFR 33-50% best or predicted</li></ul> Paediatrics 1 year and over: <ul style="list-style-type: none"><li>• PEFR 33-50% best or predicted</li></ul>	Adults: <ul style="list-style-type: none"><li>• PEFR &lt;33% best or predicted</li></ul> Paediatrics 1 year and over: <ul style="list-style-type: none"><li>• PEFR &lt;33% best or predicted</li></ul>

### Example:

*'A 25 year old female asthmatic patient presents severely short of breath and after initial assessment has a PEFR of 200L/min. She does not know her normal values. After comparing with the normal values chart, this presents as an acute severe exacerbation of asthma. After appropriate treatment with nebulised bronchodilators and other medications in accordance with local/national guidelines, the patient's breathing improves. A second PEFR is taken with a recording of 340L/min. This shows an increase in PEFR translating to an improvement of the patient's airflow and therefore effective clinical management.'*

### Key Learning Points:

- Peak flow is a simple and easy yet essential clinic skill in the assessment and management of asthma
- Peak flow measurement is an essential tool in the assessment and outcome predictor of asthma severity
- It is important to ascertain previous and best predicted values and compare these to the normal values chart
- Follow best practice technique to ensure valid and reliable peak flow values