Northumbria Research Link

Reference: Hill, B. (2019). Measuring peak expiratory flow in adults with asthma. *British Journal of Nursing*, 28(14), pp.924–926. doi: 10.12968/bjon.2019.28.14.924

Measuring peak expiratory flow in adults with asthma.

Peak Flow

There is no single diagnostic test for asthma, but measurement of peak expiratory flow (PEF) plays an important role in the diagnosis and management of the condition (British Thoracic Society and Scottish Intercollegiate Guidelines Network (BTS and SIGN), 2016; National Institute for Health and Care Excellence (NICE), 2017).

PEF is an objective test to measure lung function and to support the assessment of airway obstruction or inflammation. It is recorded using a peak flow meter. Readings will vary from person to person, and will depend on factors such as height and age and on how constricted the patient's airways are. *Figure 1* illustrates the effect that asthma has on the airway.

The PEF rate is defined as the highest flow achieved on forced expiration from a position of maximum lung inflation and is expressed in litres per minute (Dougherty et al, 2015). It will indicate how narrow or open the airways are.

PEF should be recorded as the best of three forced expirations from full lung capacity, with a maximum pause of 2 seconds before blowing (BTS and SIGN, 2016) (*Box 1*). The patient can be seated or standing and any subsequent test should mirror the previous, ie the patient should be seated if this was the previous position, so it is important to record how PEF was taken.

In the UK, there is currently no consensus about what a normal adult PEF rate should be. As noted, above the readings will depend on a range of demographic factors, including the person's age, height, gender, ethnicity and severity of disease; it may also vary with time of day. Ongoing monitoring and regular

PEF measurement will enable each patient to establish their own baseline.

Anatomy and physiology

According to Dougherty et al (2015), in healthy individuals without any pathological conditions of the airways factors that determine PEF include:

- The quality of the large airways
- The volume of the lungs
- The elastic properties of the lungs (ability to stretch and recoil)
- The power and coordination of the expiratory muscles
- The resistance of the instrument used to measure PEF.

In patients with respiratory disease and other conditions, the ability of the respiratory system to work effectively will be impeded, which will affect PEF readings. Conditions that may affect the respiratory system may include neuromuscular disease, cardiac failure, vascular disease, musculoskeletal deformity, and infections such as sepsis.

Some people may develop occupational asthma from substances inhaled at work: those working in, for example, bakeries, zoos, carpentry workshops, hospitals and hairdressers and on farms may be exposed to workplace

allergens and irritants (Asthma UK, 2019).

Presentation

When a patient presents with suspected asthma, the nurse should:

- Take a history of their respiratory problems
- Record any seasonal changes in symptoms
- Find out if the patient has noticed any triggers (*Box 2*)
- Ask whether there is a personal or family history of atopic disease (ie eczema or allergic rhinitis) (BTS and SIGN, 2016; NICE, 2017).

If there are strong indications to suspect asthma, PEF should be undertaken. If an adult patient's symptoms are better at weekends, on days off work or on holiday, there is a possibility that they may have occupational asthma (NICE, 2017). These patients should be referred to an occupational asthma specialist.

Patient presenting with acute symptoms should be treated immediately. If possible, PEF tests should be undertaken on presentation or, if the patient is too unwell, once the symptoms have eased.

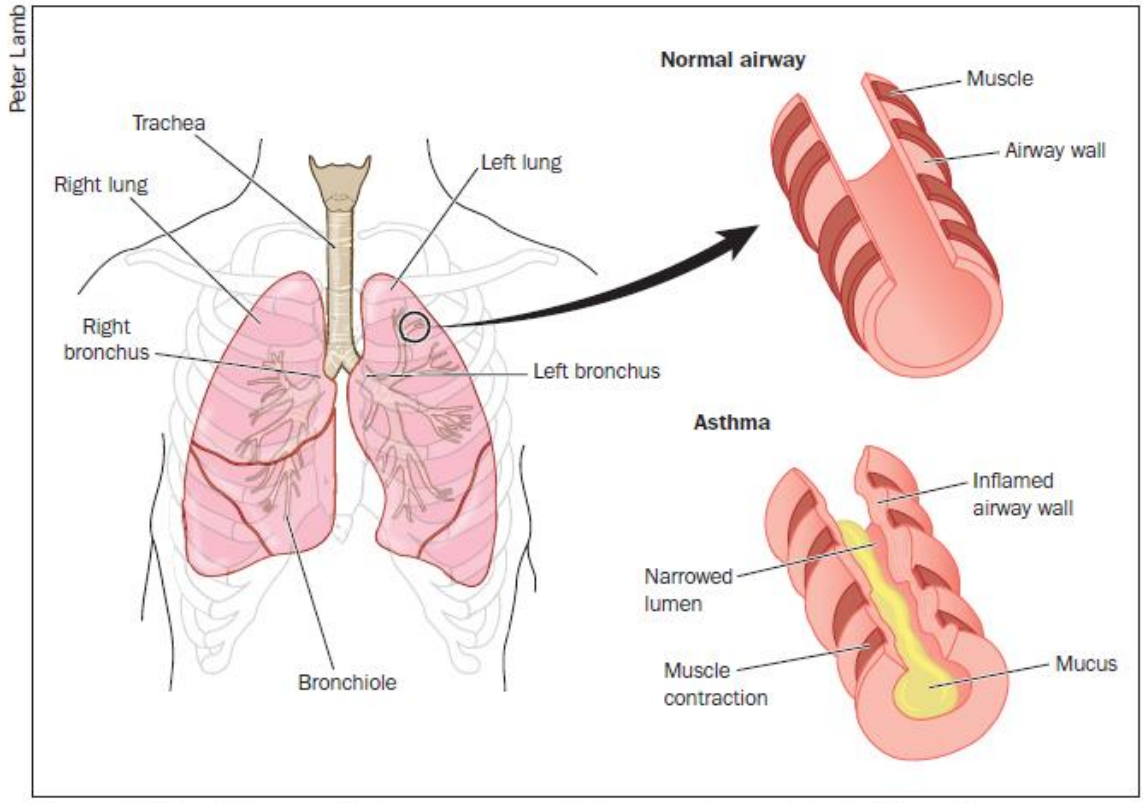

Figure 1. The difference between a normal airway and one affected by asthma

How often should PEF be recorded?

For patients diagnosed with asthma, Asthma UK (2016) recommends recording PEF twice a day. However, this is unrealistic and patients should be advised to do this periodically, both when they are well and unwell, to identify patterns. The nurse can explain the importance of recording PEF to the patient, demonstrate how to use a peak flow meter and check that the patient has a good technique (*Box 1*).

Recording PEF is helpful to obtain a baseline, and can be subsequently used to monitor the patient when they feel their condition has deteriorated, as well as at their annual asthma review.

It is important for patients to get to know their asthma. Self-management should include a personalised asthma action plan, taking peak flow readings and monitoring

how their breathing changes when they undertake different activities will help them accept and understand their own normal baseline values.

When to record PEF

Outpatients should be advised to record their PEF in a diary and, in the case of inpatients, their readings will be recorded on a PEF chart in their notes.

As noted above, patients with a diagnosis of asthma should be advised to record their peak flow regularly to monitor their condition. The score will indicate whether their asthma is getting worse, help determine if their medication is working and indicate if they are having an asthma attack (NHS website, 2018).

Indications for PEF

- Detect possible lung obstruction or restriction due to inflamed airways
- Help diagnose asthma
- Identify asthma control strategies
- Support capture of the severity of exacerbation of asthma
- Identify triggers and exacerbating factors
- Monitor the progression of respiratory disease
- Evaluate the effectiveness of inhalers or other treatment.

Contraindications for PEF

- Patients with severe breathlessness
- Patients who are unable to inspire effectively (this will lead to an inaccurate PEF reading)

- Patients who are unable to understand or lack capacity to perform the procedure independently
- Patients who have recently undergone thoracic, abdominal or cranial surgery.

Advantages of PEF

Repeated measurement and charting of PEF have long been used to diagnose asthma. The advantages of using peak flow measurement as part of diagnosing asthma are low cost and the availability of equipment, as well as the ease with which peak flow measurement and periods of peak flow monitoring can be repeated. If a patient presents with acute symptoms, measurements

can start at once (Keeley, 2017).

Patients can keep track of their peak flow scores by recording their PEF in between their annual asthma reviews, to identify and record any triggers (*Box 2*) or allergies that could be making their asthma worse, and to monitor the difference that medication adherence and concordance makes to the condition of the airways.

In addition, PEF may provide early warning signs that a patient's airways are compromised, so that prompt action can be taken, such as the use of inhalers, to avoid progression to an asthma attack.

Advice to patients

- Individuals should be advised to develop the following good habits to record their PEF, which nurses should reinforce as part of patient education: Nurses should recommend that patients:

- Use a good technique and procedure, which the nurse can demonstrate (*Box 2*)

- Stick to a regular routine, writing down exactly when they are going to take their peak flow measurement, and make sure they stick to it. Advise that patients keep their peak flow meter on their bedside table as this can help them remember to record their peak flow as soon as they wake up in the morning and at night before going to bed

- Record their readings in a peak flow diary, at periodic intervals, so they can monitor patterns. It will help them get a clearer picture of when their asthma medicines are working, to spot if the condition is getting worse and when they need to act

- Use their peak flow diary alongside a written asthma action plan so they can be confident they know what to do if their peak flow readings drop below a certain level. Patients can write this in their action plan

- Record their peak flow score before they use their preventer inhaler

- Record symptoms alongside their peak flow reading to keep an eye on their asthma. If their symptoms change, but their peak flow score is the same, they still need to book an appointment with their GP or asthma nurse

- At their asthma review, ask their GP or asthma nurse to check that they are taking their readings correctly to make sure that they are getting accurate measurements

- Always use the same peak flow meter (different meters may give different readings).

- Clean their meter regularly by soaking the mouthpiece and tube in warm water mixed with mild detergent; finish by rinsing in clean water and shaking gently to remove excess water. They should not scrub inside the tube because this could damage it. Clean it at least once a month to keep it in good condition

- Store the meter somewhere safe so it does not become damaged, such as a bedside table drawer, bathroom medicine cabinet, or in a special pouch or case.

Conclusion

Peak flow meters are inexpensive, handheld devices that measure how well air is expired from the lungs. It is one of a number of tests used to assess lung function and help diagnose conditions such as asthma. Nurses should ensure that they understand and are able to perform good PEF technique to coach patients in how to take their own readings to ensure that these are reliable and accurate. It is vital that patients regularly record PEF to establish their baseline which should enable recognition of when their PEF is low.

- It is important that nurses are aware of NICE (2019) guidance and evidence-based practice when treating adult patients with asthma. In contemporary nursing practice, especially when caring for patients with chronic lung conditions, it is vital to ensure they ‘live well’ with their condition and that they are encouraged to live life and enjoy it.

- It is part of the nurse’s role to support patients by providing health promotion and educating patients about how to monitor and treat their asthma.

- Nurses should also raise awareness about the importance of good mental and psychological wellbeing to enable patients to maintain a healthy and positive outlook and prevent them being defined by their condition.