# STUDY OF OSTEOPOROTIC FRACTURES (V4)

# Peak Expiratory Flow Protocol

## 1. Introduction

Peak expiratory flow, the maximum rate of flow of air expelled during a forced expiration, measures large airway function. It can be measured simply by using an inexpensive portable instrument, the mini-Wright peak flow meter. The measure also provides useful information on the health of the elderly, beyond lung function (see Am J Epidemiol 1989; 130:66-78).

Normal flow rate in a 70 year old SOF participant who has never smoked would be about 300 L/min (liters per minute), and in a smoker, about 250 L/min. There is an age-related decline of about 30 L/min per 5 years of age. Rates vary by body size as well.

These peak flow devices are commonly used in medical practice to monitor patients with asthma.

The measurement is quite simple: you simply ask a woman to take a deep breath, then blow out through the device in one big huff.

## 2. Equipment

Mini-Wright peak flow meter. Disposable cardboard tubes.

## 3. Measurement Procedures

It is simplest to demonstrate the use of the flow meter first.

Reset flow meter to zero. Place your mouthpiece (you can color code them for each examiner) on the flow meter. Hold the flow meter at the bottom, level with the ground.

> "This instrument tests lung function. See how I hold it at the bottom? I am going to take a deep breath, close my lips tightly around the tube, and blow out quickly as hard as I can. Think of it as a BIG HUFF. I will blow out air in one big huff, sharply and quickly, and I will stop before I've completely run out of air. (Demonstrate). Now it's your turn."

**Reset flow meter to zero. Put on a new mouthpiece in front of the participant,** and hand her the device. Have her hold it at the bottom.

> "I would like you to take a deep breath and hold it. Then close your lips tightly around the tube, and HUFF as hard as you can. Just blow out in ONE BIG HUFF and stop blowing before you've completely run out of air. The first two tries will be for practice."

Have her take a deep breath, and watch her close her lips. Make sure she holds her breath.

> "Ready? Huff."

**DO NOT LET A PARTICIPANT EMPTY HER LUNGS** (this may provoke coughing). **A big huff is sufficient**. If the participant is having problems or is blowing out too much air, correct her right then, before her second practice. Practice is very important for this test and feedback should be given immediately. Reset and repeat practice.

> "Good. Now we will measure it for real, three more times."

Repeat above three times, **resetting to zero,** and checking for secure closure of mouth around the mouthpiece each time. Correct the participant if she needs it. Before each trial, repeat the following two sentences "HUFF as hard as you can. Just one big huff and stop blowing before you've completely run out of air." Record all three measurements (to the nearest 10 L).

If you the participant is getting scores in the low one hundreds or lower, then she is probably not doing the test correctly (unless she is extremely frail and sickly). Check to make sure that she understands to HUFF as hard as she can and make sure she is making a tight seal around the mouthpiece. On the otherhand, if the participant is getting very high values, say in the high 400s, she may also be doing the test incorrectly, by blowing out too much air instead of just ONE BIG HUFF. These participants may also just have great pulmonary function but if you're consistently getting values in the high 400s then double check your instructions and demonstrations. Please watch for these common errors.

Be sure to use the exact same script and level of enthusiasm with all participants as this exam is easily influenced by the directions given as well as by how much the participant is encouraged to blow hard. The script should be read exactly as written above. Most important are the lines describing how hard to blow out: " HUFF as hard as you can. Just one big huff and stop blowing before you've completely run out of air." These 2 sentences should be read exactly as written. Please try to give instructions with "moderate" enthusiasm - i.e. encourage the participant to perform well but don't overdo it.

Remove and dispose of the mouthpiece after each participant in front of the participant.

You may tell the participant her flow rate (the highest one), and the average for women her age and size.

## 4. Potential Problems

If the participant can not stand, have her perform the test sitting, or if necessary, lying down. Record this information.

If the participant coughs or becomes breathless, let her rest between blows.

Make sure she holds it at the bottom; otherwise, the dial may be blocked.

Watch for air leaks. These may be a particular problem in a woman with ill-fitting dentures; it may be necessary to ask her to remove them.

Record your subjective judgment about whether the participant had difficulty with this procedure on the examination form.

## 5. Instrument calibration.

The flow meter is calibrated at the factory, and is intended for several hundred uses. You will each have 6 instruments; use them for no more than 400 patients.

You may self-calibrate them by having a staff member (a non-smoker without asthma) check his or her peak flow rates on a biweekly basis. Record the maximum of three tries and the date. Flow rates should be within 10% of another, with no pattern of drift.

The devices are inexpensive and sturdy enough so that they can be taken on home visits.

**AVERAGE PEAK FLOW RATES (L/MIN) IN WOMEN**

| | Body size | | |
|---|---|---|---|
| *Age (years)* | *Large* | *Medium* | *Small* |
| 70 | 330 | 311 | 294 |
| 75 | 300 | 281 | 264 |
| 80 | 269 | 251 | 234 |
| 85 | 239 | 221 | 204 |
| 90 | 209 | 191 | 174 |

Large = 5' 6", 184 pounds (90th percentile for both)
Medium = 5' 3", 147 pounds (mean)
Small = 5" 0", 116 pounds (10th percentile for both)

Based on prediction equations in Am J Epidemiol 1989; 130:66-78, and SOF baseline data for height and weight.

Values within 80 ml of the means are within 2 SD.

Note that these are lower than those on the chart that comes with the flow meter.