

THE NEED FOR A COMPREHENSIVE QUALITY ASSURANCE PROGRAM

BENEFITS

The purpose of instituting a respiratory health surveillance program is to provide a mechanism to identify and track small changes in function which may be indicative of developing pathology. In so doing, it provides an opportunity for medical management to intervene and change the course of the developing health effect and to relate changes to specific times and rates of exposures. From these findings, personal protection or production procedures can be modified to reduce company risk and improve health and safety.

To maintain the sensitivity and specificity of the surveillance program, data collection must be impeccable, and remain so for the course of the surveillance. Otherwise discrete changes in function are lost in the testing noise that ensues from poor data collection. The over reading physician may be faced with reading an invalid record or miss the borderline or abnormal finding.

Another variable that can affect test accuracy is testing noise which can come from one of two sources: Technical & Biologic.

1. Technical

- Equipment Performance Specifications**
- Equipment Calibration**
- Test Procedures (# of trials, quality of coaching)**
- Posture During the Test**
- Quality of Subject Effort**
- Technician - Subject Interactions**
- Ambient Temperature, Barometric Pressure**
- Software Quality**

2. Biologic

- Diurnal-Seasonal Variation**
- Race (12%)**
- Sex**
- Age, Height**
- Weight (Obesity)**
- Smoking Hx, Respiratory Hx, Occupation, Air Pollution**

LANGUAGE (SCRIPT) TO ADMINISTER A SPIROMETRY TEST

"Hi, my name is _____. So, you are here for your lung function test. Have patient sanitize their hands. (Before we get started, I need to ask you a few questions to see if we can continue.)" (ask pre-screen questions and write proper notes to positive responses) Postpone testing if necessary.

Explanation for the FVC:

"Let me briefly explain what I will be asking you to do. You will need to take the deepest, deepest, breath that you can possibly take, put the mouthpiece in your mouth, and then BLAST the air out hard and fast, and keep going until I tell you to stop."

Explanation for the FVL – Flow Volume Loop:

"Let me briefly explain what I will be asking you to do. With a nose clip on, you will insert the mouthpiece on top of your tongue and seal your lips tightly around it. You will take 3 normal breaths, then take the deepest, deepest breath that you possibly can, and BLAST out the air hard and fast. When I tell you to, you will then take in a full inspiration".

"But first, let me explain to you how to use the mouthpiece. Lay the tube on your tongue, like a tongue depressor, and wrap your lips tightly around it."

- Demonstrate Mouthpiece Placement: "It looks like this". Demonstrate using your hand as a tongue.

"Now, can you show me"? Have subject demonstrate mouthpiece placement. (Have patient put their mask back on)

- Now here is what the entire maneuver will look like: "I'm going to ask you to hold your mouthpiece steady by your cheek, then take your mask down and put a nose clip on. Then you are going to take the DEEPEST, DEEPEST breath you can possibly take, put the mouthpiece in your mouth, and then BLAST the air out hard and fast and keep going and going until I tell you to stop."

Enter demographics into the spirometer at this point. (during this time, have patient assemble their mouthpiece)

Now get the subject ready for the test. (either in the sitting or standing position depending on your written SOP)

"We will be in the sitting position. Sit up straight, shoulders back, and chin slightly elevated. Please hold the spirometer off to the side of your cheek and hold it steady". (have patients block the end of the filter for the zeroing of the spirometer)

If you will be standing:

"We will be in the standing position. Stand up straight, shoulders back, and chin slightly elevated. There will be a chair behind you if you feel the need to sit down".

"Are you ready? Mask down, Nose clip on, Let's go! DEEP, DEEP, tube in, BLAST!! Keep going, keep going, keep going.... squeeze.... and stop". (Have patient take their nose clip off and put their mask back on)

For the FVL: - with the nose clip on and tube on top of their tongue:

"Take in a deep deep breath, and BLAST it out! Keep going...keep going... (operator looks for the 1 second plateau to be met), now BIG INHALATION.

Other tips:

Due to the "learning curve" it usually requires several attempts to achieve the optimal spirogram. First obtain three maneuvers. If satisfactory data has not been obtained after three attempts, rest the employee and then do up to five more maneuvers, for a total of eight.

- Before commencing the first maneuver the employee should have the mouthpiece firmly seated in the spirometer hose or sensor and both hands around the hose just below the mouthpiece holder or sensor. Instruct to hold the sensor still to the side of mouth to prevent any airflow through the sensor thereby either preventing the spirometer establishing a true "zero" or reads the air movement as a "false blow".
- If standing, stand erect with chin slightly elevated and place a sturdy chair behind the subject. If sitting, sit erect at the front edge of the chair with chin slightly elevated. If using a nose clip, apply it at this point.
- Ask if it is okay to touch their shoulder as a reminder to remain upright if they start to bend over
- A maximal inhalation is rapidly taken from room air before placing the mouthpiece in the mouth. Prompt the inhalation with statement such as "Deep, deep".
(Watch to make sure that their mouth is tightly closed around the mouthpiece.)
- Then prompt the exhalation with: "Now **BLAST!!!**"
- Be a cheerleader. Don't be shy. Show energy in your voice. Your enthusiastic coaching makes a significant difference in the effort the employee will make. (You are the primary stimulus, which controls the subjects' response). You need not shout but have intensity in your voice.
- Continue coaching until a one second plateau is observed.

Review spirogram for Acceptability or Repeatability errors. If present, reinstruct the subject and continue testing.

Flow-Volume Loop Procedure:

Though the FVL is commonly used in clinical testing, the ATS/ERS confirms that expiration only and expiration-inspiration techniques both meet the recommendations of the 2019 ATS/ERS Spirometry statement.

Based on the information above, it is perfectly acceptable to perform spirometry in occupational settings using either the FVC (expiration only) or FVL (expiration-inspiration).

For spirometers that measure inspiration and expiration, there are four distinct phases of the FVC maneuver: **1)** maximal inspiration, **2)** a "blast" of expiration, **3)** continued complete expiration for a maximum of 15 seconds, and **4)** inspiration at maximal flow back to maximum lung volume. Most of the variability in results obtained from spirometry relates to inadequate and variable inspiration to TLC, ending the expiration prematurely, and variable effort. See table 6 on the next page.

You must keep in mind that since the 2019 Update Standard requirement for FET (forced Expiratory time) has been eliminated, increased vigilance and training by the operator and interpreter are required in the assessment of whether expiration was complete or there was early termination.

OSHA Medical Clearance Questionnaire

(Appendix C to Sec. 1910.134: OSHA Respirator Medical Evaluation Questionnaire (Mandatory))

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee:

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date: _____
 2. Your name: _____
 3. Your age (to nearest year): _____
 4. Sex (circle one): Male/Female
 5. Your height: _____ ft. _____ in.
 6. Your weight: _____ lbs.
 7. Your job title: _____
 8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): _____
 9. The best time to phone you at this number: _____
 10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes/No
 11. Check the type of respirator you will use (you can check more than one category):
 - a. _____ N, R, or P disposable respirator (filter-mask, non-cartridge type only).
 - b. _____ Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).
 12. Have you worn a respirator (circle one): Yes/No
- If "yes," what type(s): _____

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you *currently* smoke tobacco, or have you smoked tobacco in the last month: Yes/No

2. Have you *ever had* any of the following conditions?

a. Seizures: Yes/No

b. Diabetes (sugar disease): Yes/No

c. Allergic reactions that interfere with your breathing: Yes/No

d. Claustrophobia (fear of closed-in places): Yes/No

e. Trouble smelling odors: Yes/No

3. Have you *ever had* any of the following pulmonary or lung problems?

a. Asbestosis: Yes/No

b. Asthma: Yes/No

c. Chronic bronchitis: Yes/No

d. Emphysema: Yes/No

e. Pneumonia: Yes/No

f. Tuberculosis: Yes/No

g. Silicosis: Yes/No

h. Pneumothorax (collapsed lung): Yes/No

i. Lung cancer: Yes/No

j. Broken ribs: Yes/No

k. Any chest injuries or surgeries: Yes/No

l. Any other lung problem that you've been told about: Yes/No

4. Do you *currently* have any of the following symptoms of pulmonary or lung illness?

a. Shortness of breath: Yes/No