Seminar # 3701 - Reviewing the 2017 ATS Updates to the 2005 ATS/ERS Guidelines: How to Perform, Interpret and Report Spirometry

James M. Quinn, MD, FACP, FAAAAI and Karla E. Adams, MD FAAP, FAAAI

Bonus: Includes information from 2019 ATS/ERS Statement: Standardization of Spirometry a 2019 Update

Approach to the Patient

- Data - measure and record height, age, birth sex, ethnicity, weight
- Discuss and explain the testing with the patient
  - Ask about smoking within 1 hour, alcohol within 8 hours, vigorous exercise within 1 hour, loose fitting dentures, pain, recent surgery, cardiac history, pregnancy, etc
  - Ask if the patient has any concerns that would impair testing (ie pain, anxiety, prior bad experience, etc)
  - Explain that the test is to be done seated to maximize safety (chair with arms, no wheels, feet flat on floor)
  - Reinforce the need for maximal inhalation (as deeply as possible, enormous breath in) and need to inhale rapidly & completely with only a brief pause at TLC (full lungs) (<1 sec)
  - Explain and reinforce the need for complete exhalation with maximal force until no more air can be expelled - warn the patient regarding "coaching" (yelling? ie – "Blast it out"," hard and fast", "all you can", "more - more - more", "squeeze it all out", etc.) and the need for length of test up to and possibly beyond 6 seconds but no more than 15 seconds (depending on age/plateau, etc.)
  - Reinforce that the test will finish with maximal rapid inspiration back to TLC (full lungs)
  - Explain proper mouthpiece placement - teeth should be outside/around mouthpiece with lips tightly sealed
  - Instruct on the need to remain seated erect with shoulders slightly back, chin elevated, do not bend at the waist
  - Reinforce the need for maximal effort
  - Use nose-clip
  - Ask if the patient has any questions
- Demonstrate a maneuver for the patient

Testing

- Calibrated well maintained equipment
- Perform at least 3 maneuvers, no more than 8 typically required – stop testing if continued performance leads to cumulative drop in FVC or FEV_1 exceeds 20%
- Within maneuver criteria
  - Free from artifact
  - Ensure maximal effort throughout - desire smooth FVC tracing with rapid sharp peak (within first 25% of FVC, rule of thumb – not ATS)
  - Good start ensuring absence of hesitation (back-extrapolated volume (BEV) should be <5% of FVC or 0.100 L, whichever is greater)
  - Ensure absence of early cough (within first second)
  - Ensure absence of early termination, glottis closure, valsalva
  - Ensure absence of leak and non-obstructed mouthpiece (think tongue and teeth)
  - Duration based upon 2019 ATS/ERS Statement Standardization of Spirometry a 2019 Update
    - No minimum time
    - No change in volume = plateaued VT curve = (<0.025 L for >1 second)
    - Efforts of otherwise acceptable FVC maneuvers are reproducible
    - If other criteria not met, stop effort at 15 sec

- Between maneuver criteria
  - 2019 ATS/ERS Statement Standardization of Spirometry a 2019 Update
    - If adequate then 3 tests enough, if inadequate up to 8 maneuvers may be repeated
    - Grades adequacy on A, B, C, D, E, U, and F scale
    - Grade A = 3 acceptable and repeatable within 0.15 L for ages > 6 (0.10 L or 10% of best for age 2-6)
    - Always strive for Grade A but lower grades may have clinically useful data
  - 2017 ATS Recommendations for a Standardized Pulmonary Function Report
    - Grades A, B, and C likely clinically useful
    - Grades A and B (2 acceptable with 2 best FEV_1 and FVC within 0.15 L)
    - Grade C (2 acceptable with 2 best FEV_1 and FVC within 0.2 L)

Reporting Format and Interpretation

- FEV_1/FVC Ratio
  - 2017 ATS Recommendations for a Standardized Pulmonary Function Report
    - Presented as an absolute ratio (ie 0.72), do not present as % (not 72%)
    - Present as referenced to LLN (Lower limit of normal)
    - < LLN defines obstruction
      - Comment: Low ratio FEV_1/FVC with normal FEV_1 – this is mild obstruction. Patients with respiratory disease and a low ratio but normal FEV_1 still have increased morbidity/mortality
    - Present referenced Z score preferably also with graphic representation
    - Do not present referenced % predicted

- FEV_1
  - 2017 ATS Recommendations for a Standardized Pulmonary Function Report
    - Present value in liters
    - Present as referenced to LLN (Lower limit of normal)
    - < LLN defines abnormal
    - Present referenced Z score preferably also with graphic representation
    - Present referenced % predicted
    - Do not present the predicted value

- FVC
  - *If FVC reduced, lung volumes are needed to make definitive determination of pathology
  - 2017 ATS Recommendations for a Standardized Pulmonary Function Report
    - Present value in liters
    - Present as referenced to LLN (Lower limit of normal)
    - < LLN defines abnormal
    - Present referenced Z score preferably also with graphic representation
    - Present referenced % predicted
    - Do not present the predicted value

- FEF_{25-75}
  - 2019 ATS/ERS Statement Standardization of Spirometry a 2019 Update
    - Discussed that FEF_{25-75} may be reported without endorsing use
  - 2017 ATS Recommendations for a Standardized Pulmonary Function Report
    - Not recommended for use or in report
    - Have not demonstrated added value for identifying obstruction in adults or children

- Other Values
  - 2019 ATS/ERS Statement Standardization of Spirometry a 2019 Update
    - Continued endorsement of PEF, FET and added FIVC
    - Endorsed consideration of $FEV_{0.75}$, $FEV_{0.75}$/FVC in ages $\leq$ 6 yo
    - Discussed "other derived indices" that may have possible value = FEV_6, FEV_6/FVC, FEF_{50}/FIF_{50}

References

- Standardization of Spirometry 2019 Update – Am J Respir Crit Care Med 2019, Vol 200, 70-88.
- Recommendations for a Standardized Pulmonary Function Report - Am J Respir Crit Care Med 2017, Vol 196, 1463-1472.
- General considerations for lung function testing - European Respiratory Journal, Vol 26 (1), July 2005, 153-161.
- Standardisation of spirometry - European Respiratory Journal, Vol 26 (2), August 2005, 319-338.
- Interpretive strategies for lung function testing - European Respiratory Journal, Vol 26 (5), November 2005, 948-968.
- Guidelines for the Diagnosis and Management of Asthma (EPR-3). Bethesda, MD: National Institutes of Health; August 2007. http://www.nhlbi.nih.gov/**guidelines**/**asthma**/asthsumm.pdf
- Standardization of Spirometry: 1994 Update – Am J Respir Crit Care Med 1995, Vol 152, 1107-1136.

* The views expressed are those of the presenter and do not reflect the official views or policy of the Department of Defense or its Components