Top Ten Things to Know
2016 Focused Update: Clinical Recommendations for Cardiopulmonary Exercise Testing Data Assessment in Specific Patient Populations

1. The scientific statement is a focused update to the 2012 Joint Scientific Statement on Clinical Recommendations for Cardiopulmonary Exercise (CPX) Testing Data Assessment in Specific Patient Populations from the European Association for Cardiovascular Prevention & Rehabilitation (EACPR) and the American Heart Association (AHA). The Writing Group identified 5 conditions for which the algorithms do not require revision at this time and the recommended algorithms in the 2012 statement should continue to be used:
   • Heart failure,
   • Confirmed or suspected hypertrophic cardiomyopathy,
   • Confirmed or suspected pulmonary arterial hypertension/secondary pulmonary hypertension,
   • Suspected myocardial ischemia, and
   • Suspected mitochondrial myopathy.

2. The Writing Group identified 3 conditions for which the 2012 algorithms should be revised to include flow volume loop assessment when available:
   • Unexplained exertional dyspnea,
   • Chronic obstructive pulmonary disease, and
   • Interstitial lung disease.

3. The evidence for pre-surgical CPX testing to assess the risk for adverse events peri- and post-operatively as well as long-term prognosis has continued to grow. A pre-surgical CPX algorithm has been included in this update. Surgical procedures where CPX has demonstrated prognostic value include the following:
   • Abdominal aortic aneurysm repair,
   • Radical cystectomy,
   • Liver transplant,
   • Hepatic resection,
   • Lung resection,
   • Bariatric surgery, and
   • Colorectal surgery.

4. In addition to the 7 conditions listed above, the Writing Group noted that ventilator efficiency is a primary marker in assessing severity, prognosis, and post-surgical improvements in patients with valvular disease/dysfunction such as severe aortic stenosis and mitral valve disease or dysfunction.

5. The Writing Group developed a CPX algorithm for apparently healthy individuals because there is sufficient evidence and opportunities for apparently healthy individuals to access CPX services. While the group does not currently recommend CPX testing for apparently healthy individuals as a standard of care, nor are the services currently reimbursable, the data from this testing are valuable towards predicting risk of future adverse events and should be considered when available.

6. While it is not a required measurement, the Writing Group revised the Universal Reporting Sheet to include a section comparing and reporting the relationship between the exercise tidal volume loop and maximal flow volume loop. This addition is used to identify a possible expiratory flow limitation, which could help to explain the mechanism for exercise intolerance and abnormal symptomatology.
7. Two CPX variables consistently provide prognostic value: peak oxygen consumption (VO₂) and the minute ventilation – carbon dioxide production (VE-VCO₂) relationship (i.e., ventilatory efficiency). VO₂ at ventilatory threshold (VT) was not included in the 2012 algorithms for prognostic assessment, however the data now support its inclusion as a significant prognostic marker for pre-surgical CPX assessments.

8. The 2012 CPX reporting sheet included assessments of VO₂ at VT and this focused update describes how this information can be used to identify appropriate targets for aerobic exercise training in apparently healthy and medically-stable individuals (e.g., heart rate and workload).

9. The Writing Group provided an overview of several CPX variables that have demonstrated clinical promise and may be included in future updates to the algorithms as more data become available:
   - Oxygen uptake efficiency slope,
   - Exercise ventilatory power,
   - Circulatory power, and
   - Noninvasive determination of cardiac output.

10. This focused update and the 2012 Scientific Statement can be used as companion statements to the 2014 Scientific Statement on Supervision of Exercise Testing by Nonphysicians to guide CPX laboratory personnel decisions and competency training.