HOW TO READ A CPET

Overall CPET eval:
How many watts achieved and why was exercise stopped?
(?dyspnea, ?claudication, ?chest pain, , ?any wheezing)

Review CPET data:
1. **VO2 max**; defines normal from abnormal exercise tolerance

Next find the system/organ malfunction: pulmonary (ventilatory parameters and ABG) or non-pulmonary
(HRR, O2 flow indices, EKG, HRR, BP)

2. **Anaerobic threshold (AT)** (normal=>40% predicted VO2 max)

3. **Heart Rate Reserve (HRR)** (=max HR achived-predicted max HR; pred max HR=220-age) (normally peak exercise is cardiac limited with a HRR<15)

4. EKG and BP

5. **O2 FLOW INDICES:**
   a. **O2 Pulse** (=VO2 max/HR max in ml/beat; correlates with stroke volume)
      Preferably calculate normal predicted O2 pulse or use rough rule of thumb of 12 ml/beat for men; 8 ml/beat for women)
   b. **Slope of Work efficiency** (AVO2/ΔWR) ; check position, slope and linearity. Normals have linear relationship with a slope of 10.2 +/-1.
   c. **Slope of heart rate rise** (ΔHR/ΔVO2) ; normally is linear and <50

6. **VENTILATORY PARAMETERS:**
   a. **Breathing Reserve (BR**= MVV-VE max) ; Normally is >15 L/min
   b. **Dead space (Vd/Vt)** ; normally is 1/3 of a breath at rest, decreasing to 1/5 of a breath with exercise.
   c. **A-a gradient**: PaO2 and P(A-a)O2; normally PaO2 does not decrease with exercise but A-a gradient widens (PAO2 goes up.)

P(A-a)O2 normals (mean +/- SD)=

<table>
<thead>
<tr>
<th>Age</th>
<th>Rest</th>
<th>AT</th>
<th>Peak ex.</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>8</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>40-69</td>
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   Upper limit of normal (95% CI)= 28 at AT and 35 at peak exercise

d. **P(a-et)CO2** ; normally PaCO2 at rest is 2 higher than PetCO2, and decreases to a lower value than PetCO2 with exercise (normal P(a-et)CO2= -0.3 +/-2.9 at rest, -4.1+/-3.2 at peak)

e. **ABG** – metabolic acidosis is normal after AT has been reached. Respiratory acidosis at peak exercise is highly suggestive of ventilatory limitation.

7. Review all graphic data, and optionally review any other parameters provided during CPET: PFT's, VT, VE/VCO2 at AT, VT/IC, RQ, RR, hemoglobin (?rare additional invasive monitoring data: Swan-Ganz cath, lactate levels, esophageal balloon data.)