Lab Values

- **ABG (arterial blood gases)** – measure the amount of oxygenation, ventilation (carbon dioxide) and pH of the blood. Shows how well the lungs are delivering oxygen to the blood as well as eliminating carbon dioxide and how well the lungs and the kidneys are working to maintain normal pH of the blood. Reported as pH/CO2/PO2/HCO3. It helps to determine the need for supplemental oxygenation and mechanical ventilation for patients with CHF, s/p MI
  
  Normals: PO2 – 75 -100 mmHg drops 1 mmHg every year as we age (oxygen delivered to blood); PCO2 – 34 -45 mmHg (lungs eliminate co2); pH – 7.35 to 7.45 (acidity/alkalinity)

- **Hemoglobin** – 12 – 16 g/dL females; 13 – 18 men; necessary for effective oxygen carrying capacity of the blood

- **Hematocrit** – Refers to the number of red blood cells per 100 ml of blood; viscosity of the blood; varies with the total red blood cell count but also with blood volume. 37 – 48% females; 42-52% males.
  
  *High hematocrit* may be due to dehydration and exhibits an increased blood viscosity which may affect tissue perfusion.
  
  *Low hemoglobin/hematocrit* indicative of anemia; this may decrease activity tolerance and make a patient more susceptible to ischemia because of the decrease oxygen-carrying capacity for the blood.

- **Cardiac enzymes** – these are biochemical markers that are often used to diagnose and determine extent of damage of MI; increased with recent MI; released after cell injury or cell death. Examples: creatine phosphokinase (CK); lactate dehydrogenase (LDH). After MI/tissue damage they have periods where the enzymes peak and then begin to fall back to normal. Aggressive activity should be withheld until these enzymes have peaked and begun to fall.

- **Prothrombin**: measures blood’s ability to clot; coagulation profile.
  
  Normal PT: 11 – 16 sec.; PTT 30 –45 sec.
  
  Low PT : higher risk for thrombosis  High PT: higher risk for bleed. Patients with PT 2.5 times the normal range should not receive therapy due to the increased potential for spontaneous bleed.

- **BUN – Blood Urine Nitrogen** (8 – 25 mg/dL) Increased – renal failure, CHF, GI bleed, acute MI. Decreased - severe liver disease/hepatitis; increased use of protein due to malnutrition, steroids, IV feedings.

- **WBC/Neutrophils/polys/lymphocytes** – increased indicates infection

- **Diabetes**- Blood sugar Normal range 80 to 120 mg/dl. If greater then 250 mg/dl session should be postponed. If less than 100 mg/dl – give carbohydrate … exercise at this level may lead to hypoglycemia (blood glucose below 70 mg/dl - pale, sweating, increased heart rate, palpitations, irritable/nervous, hunger, shakiness, headache, blurred vision, fatigue, confused, convulsions/coma. Schedule visits around meals and insulin schedule; monitor exercise in the extremity that the patient receives insulin; monitor signs of hypoglycemia.
**Absolute Contraindications**

The presence of any of these conditions contraindicate exercise testing, exercise training, and moderate to intense level of physical activity. All of the listed items are absolute contraindications to exercise testing:

- Recent MI or ECG changes reflecting recent MI or unstable angina
- Uncontrolled (malignant) ventricular dysrhythmias including 3rd degree heart block
- Uncontrolled symptomatic heart failure
- Inoperable aortic aneurysm
- Symptomatic, severe aortic stenosis
- Suspected or known dissecting aneurysm, including cerebral aneurysm
- Acute myocarditis or pericarditis
- Acute pulmonary embolus or pulmonary infarction
- Acute systemic infection accompanied by fever, body aches or swollen lymph glands

**Relative contraindications**

A relative contraindication indicates that the clinician will need to carefully consider the clinical presentation of the individual and consult with the physician to identify whether exercise training/physical activity is warranted and, if so, what specific parameters need to be followed in order to prevent any adverse responses to the intervention.

- **Resting vital signs:**
  - BP
    - SBP >200
    - DBP >110
  - Left main coronary stenosis
  - Moderate stenotic valvular heart disease
  - Electrolyte abnormalities
  - Tachydysrhythmia or bradydysrhythmia
  - Hypertrophic cardiomyopathy
  - Neuromuscular, musculoskeletal, or rheumatoid disorders that are exacerbated by exercise
  - High degree AV block (very slow HR)
  - Ventricular aneurysm
  - Chronic infectious disease
  - Abnormal lab values:
    - Platelet count
    - White blood cell count
    - Pro-thrombin time (PT)
    - Hemoglobin (Hg) Potassium below 3.5 Partial thromboplastin time (PTT)
    - (dysrhythmias)
    - Hematocrit (Hct) Blood glucose <100 or > 250-300
Indications for modification or termination of exercise training/physical activity

- Heart rate:
  - Failure of HR to increase with activity
  - Decrease of 10 bpm
  - Noticeable change in heart rhythm
- Blood pressure:
  - Systolic >250 mmHg
  - Systolic decrease of > 10 mmHg from baseline with an increase in workload
  - Diastolic: >115 mmHg
- Respiration rate > 40 breaths per minute during exercise
- Oxygen saturation below 90%; for patients with pulmonary disease this may be 5% below resting
- Heart & breath sounds
  - Development of an S3 heart sound with exercise
  - Development / worsening of pulmonary crackles with exercise
  - Pulmonary wheezes at rest or with exercise
- Significant arrhythmia
- Change is resting arrhythmia
- Patient request
- Undue dyspnea
- Excessive fatigue
- Mental confusion
- Dizziness
- Muscle discomfort
- Ataxia
- Angina
- Pallor
- Diaphoresis
- Claudication with patient reporting >8 on visual analog pain scale
- Weight gain greater than or equal to 3# (combined with other symptoms)