The Role of Lab Values in clinical decision making and patient safety for the acutely ill patient.

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Objectives
1. Discuss why lab values and vital signs are essential clinical tools to determining appropriateness of acute care rehab intervention.
2. List the normal values for BP, HR, SaO2, Hemoglobin, Potassium, Glucose, Platelets, Troponin, CPK and other lab values.
3. Describe the effects of abnormal lab values and discuss precautions and monitoring techniques.
4. Determine when to implement, modify or hold rehab interventions based on assessment of lab values and vital

Introduction
• Pawlik et al states in a 2013 article that patients with acute illness “require timely and accurate assessment and modification of activity by the intervening PT (or OT) and titration of activity in response to changes in physiological status.”
Introduction

• Laboratory diagnostic tests are one factor in determining the overall health of our patients

• Lab tests evaluate the kidneys, liver, thyroid, and heart and other aspects of health.

Introduction

• In acute care, most common blood tests include Complete Blood Count (CBC) and Differential and Basic Metabolic Profile or Routine Chemistry

• Normal values are typically determined based on 95 percent of healthy people in a certain group. For many tests, normal ranges vary depending on your age, gender, race, and other factors

Introduction

• Abnormal values and appropriateness for rehab intervention is based on:
  – APTA Lab Value Resource – 2011 revised 2013
  – Evidence Based Literature
  – Expert Physician recommendations
  – At Henry Ford Hospital, a Lab Values Manual was created in 1996, revised in 2007 and 2011, reviewed every 2 years to assist PT, OT, PTA and COTAs in clinical decision making.
Introduction

• Henry Ford Hospital is an 877-bed (130 ICU) level 1 trauma hospital, education and research complex
• Henry Ford Medical Group
  – One of the nation’s largest and most experienced group practices, with more than 1,200 physicians and researchers in more than 40 specialties

Introduction

• Basic understanding of normal Lab Values, Vitals Signs and the physiologic response are essential
• Individual physicians may have guidelines based on their own clinical research or preference
• Discussions with the physicians at your facility is important for professional exchange.

Clinical Decision Making

• To begin or continue interventions on patients whose lab values are outside of normal ranges or guidelines, clinical decision making based on the following is key:
  – Thorough medical record review
  – Graph trends of labs or vitals
  – Clinical discussion with medical team
  – Ability to monitor clinical signs and hemodynamics during intervention
Documentation

- Always document rationale for treatment, the patient’s response to treatment and any modifications made during the treatment session.

Vital Signs

- Important to understand normal values for vital signs in order to monitor patients with abnormal lab values
- Abnormal resting vitals signs may also be an indicator for modifying or deferring intervention on a given day.
Vital Signs Guidelines

Resting Values
- Heart Rate (HR) 50-120 bpm
- Systolic Blood Pressure (SBP): 80-180
- Diastolic Blood Pressure (DBP): 40-110 mmHg
- SaO2: > 90%
- Respiratory rate: 12-20 bpm

Vital Signs Guidelines

If you mobilize a patient whose vital signs fall outside of the "normal" parameters, treatment should be terminated if any of the following symptoms are observed:
- Numbness or tingling in any body part.
- Dizziness not resolved within 60 seconds of obtaining upright.
- Nausea
- Blurred vision
- Dilated pupils
- A change in patient’s heart rate of 30 bpm over baseline.
- A change in patient’s systolic blood pressure of 30 mmHg or a change in the diastolic blood pressure of 10 mmHg.
- Anginal pain
- Shortness of breath

Vital Signs Guidelines

Values for Resting rates outside of the listed guidelines, do not mean automatically defer treatment.

Consider the following:
- What has been the trend over the last 24 hours?
- Is the patient asymptomatic?
- Are other factors involved (i.e., pain, hemoglobin, sepsis, medications)
- Interventions provided by nursing may help with evaluation and treatment (i.e., pain meds, BP meds, suctioning, position change, anti-anxiety meds)
Vital Signs Guidelines

- Vitals may fall within the normal values, but you may decide to modify or defer treatment based on the following:
  - What has been the trend over the last 24 hour? Has it been consistent?
  - Have trends in the first 24 hours significantly changed from baseline measures?
    - For example: SBP is 120/80 in the a.m. and 140/90 – 180/100 over the next few readings. Although the values are within our guidelines, the patient’s BP is gradually trending up so treatment may be deferred. This may also happen if there is a sudden, significant change (↑ or ↓) in the values.

Clinical Example

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- Considerations:
  - What position was patient tested in?
  - When were BP meds given?

Clinical Example

- Considerations:
  - HR/BP is fluctuating; likely taken at rest by RN
  - Most recent is greater than 120 at rest, Tachypnea also
Vital Signs Tips

• Choose the manual BP machine for patients with significantly low or high blood pressure readings.
• Electronic BP machines tend to over read at low BP and under read at very high BP.

Vital Signs Tips

• Additional Tips to improve BP reading technique/accuracy:
  – Choose the right cuff size. Too small of a cuff on a large arm will register an inaccurately high BP.
  – Have stethoscope ear pieces rotated forward, following the direction of your ear canals.
  – Try to keep the patients arm at the level of the heart to avoid hydrostatic and gravitational forces in the blood vessels.
  – Instruct the patient to not move or talk. Electronic cuffs are especially sensitive to any motion in arm/hand.
  – Wait 1-2 minutes before re-inflating the cuff so that blood trapped in the vessels can be released.

Orthostatic Hypotension

• Defined as a decrease in SBP of 20 mmHg or more; DBP of 10 mmHg or more within 3 minutes of standing up
• To Monitor Orthostatic Hypotension
  – measure and document HR and BP with 2-3 minutes between position changes:
    • Supine
    • Sitting
    • Standing
Questions?

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Lab values

Hemoglobin
HEMOGLOBIN

• Red, iron-based pigment in the blood that carries oxygen.
• Major protein of erythrocytes that transports oxygen from the lungs to peripheral tissues.

HEMOGLOBIN

• NORMAL RANGES
  • 12-16 Gm/dL for women
  • 14-17 Gm/dL for men

• Values differ in men and women due to body size and muscle mass.

Causes of Low Hemoglobin

• Macrocytic anemia
  – Liver disease
  – Hypothyroidism
  – Vitamin B12 deficiency
  – Folate deficiency
  – Myelodysplasia

• Microcytic anemia
  – Iron deficiency
  – Sickle Cell Anemia
  – Hemodilution (increased IV fluids or plasma)

• Normocytic anemia
  – Early iron deficiency
  – Anemia of chronic disease
  – Hemolytic anemia
  – Acute hemorrhage s/p surgery or trauma
  – Bone marrow infiltrates
Physiological Impact of low Hgb

- Decreased exercise tolerance
- Increased fatigue
- Tachycardia

When the blood has low oxygen-carrying capacity, there are limited levels of oxygen available to the tissues.

- To get oxygen to the tissues, heart rate and cardiac output will increase, thus causing increased work on the myocardium.

APTA Hemoglobin guidelines

- APTA Lab Values resource was updated in 2013 with the following:

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<tr>
<td>Hgb &lt; 10 gm/dL</td>
<td>Essential activities of daily living, assistance as needed for safety; light aerobic activities (1-2 lbs)</td>
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<tr>
<td>Hgb &gt; 10 gm/dL</td>
<td>Ambulation and self care as tolerated; resistance exercises</td>
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HFH Hemoglobin Guidelines

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<th>Value</th>
<th>HFH Hemoglobin Guidelines</th>
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<tr>
<td>Hgb &lt; 7 gm/dL</td>
<td>No Occupational or Physical Therapy that day*</td>
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</table>
| Hgb 7.1 – 7.9 gm/dL | - Activity orders must be clarified with the patient’s primary physician.  
|               | - The patient’s heart rate and blood pressure must be monitored pre-, mid- and post-treatment.  
|               | - Oxygen saturation levels must be >90% prior to treatment.  
|               | - Treatment will be terminated if any of the following symptoms are observed:  
|               | - Numbness or tingling in any body part  
|               | - Diarrhea not resolved within 60 seconds of obtaining upright  
|               | - Nausea  
|               | - Blurred vision  
|               | - Dilated pupils  
|               | - Increase in patient’s heart rate of 30 bpm over baseline  
|               | - A change in the patient’s systolic blood pressure of 30 mmHg or a change in the diastolic blood pressure of 10 mmHg  
|               | - Anginal pain  
|               | - Shortness of breath  |
| Hgb > 8 gm/dL | Routine Occupational and Physical Therapy                                                 |

*exception: Persons who decline blood transfusions for religious reasons
Blood Transfusion

For patients receiving a blood transfusion, the following guidelines should be observed:

• No mobilization/treatment during the first 30 minutes of the transfusion for each bag of blood.
  – Nursing is monitoring for transfusion reaction
• Patient’s hemoglobin must be at least 7.1g/dL
• If the patient’s hemoglobin levels fall between 7.1 and 7.9, refer to the above guidelines

Questions?

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Hematocrit
Hematocrit

- Represents the percentage of whole blood volume composed of erythrocytes.
- Normal ranges
  - Males: 39–49%
  - Females: 35–45%

Hematocrit

Increased in:
- Hemoconcentration
  - Dehydration
  - Burns
  - Vomiting
- Polycythemia (erythrocytosis)
- Extreme physical exercise

Decreased in:
- Same as Hemoglobin
- Macrocytic anemia (liver disease, hypothyroidism, vitamin B12 deficiency, folate deficiency, myelodysplasia), normocytic anemia (early iron deficiency, anemia of chronic disease, hemolytic anemia, acute hemorrhage, bone marrow infiltrates), and microcytic anemia (iron deficiency, sickle cell). Hemodilution

APTA Guidelines: Hematocrit

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<tr>
<th>Activity Level</th>
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<td>Essential activities of daily living; assistance as needed for safety; light aerobic, light weights (1-2 lbs)</td>
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<td>Ambulation and self care as tolerated</td>
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**Oxygen, Partial Pressure (PO₂)**

- Measures oxygen tension (partial pressure) in arterial blood.
- Determines tissue oxygen supply, along with hemoglobin and blood supply.

- **Normal ranges > 80 mmHg**

**Increased in:**
- Oxygen therapy

**Decreased in:**
- Ventilation/perfusion mismatching (asthma, COPD, atelectasis, pulmonary embolism, pneumonia, interstitial lung disease, airway obstruction by foreign body, shock)
- Alveolar hypoventilation (kyphoscoliosis, neuromuscular disease, head injury, stroke)
- Drugs: barbiturates, opioids.
HFH Guidelines for PO₂

• No PT or OT intervention with PaO₂ > 60 mmHg

• Once the PaO₂ reaches 60 mm Hg the curve is almost flat, indicating there is little change in saturation above this point. So, PaO₂ of 60 or more is usually considered adequate.

Potassium

POTASSIUM (K)

• Potassium is predominantly an intracellular ion whose plasma level is regulated by renal excretion.
• Plasma potassium concentration determines neuromuscular irritability. Elevated or depressed potassium concentrations interfere with muscle contraction and cardiac conductivity

• NORMAL VALUES = 3.5 - 5.0
POTASSIUM (K)

**Increased in:**
- Massive hemolysis
- Severe tissue damage
- Rhabdomyolysis
- Acidosis
- Dehydration
- Acute or chronic renal failure
- Addison disease
- Medications

**Decreased in:**
- Low potassium intake
- Prolonged vomiting or diarrhea
- Cushing syndrome
- Osmotic diuresis (eg, hyperglycemia)
- Alkalosis, (hypokalemic)
- Trauma (transient),
- Subarachnoid hemorrhage,
- Diuretics

**HFH Potassium(K) Guidelines**

\[
<3.0 \quad 3.1-3.4 \quad 3.5-5.0 \quad 5.1-6.0 \quad >6.0
\]

- Patients with potassium levels <3.0m Eq/L or >6.0 Eq/L will not receive any Physical or Occupational Therapy for that day.

**HFH Potassium(K) Guidelines**

- The following guidelines will be observed for patients whose potassium levels are 3.0-3.4 and 5.1-6.0:
  - Review chart and note any orders for cardiac workup. If cardiac workup is pending or completed, follow departmental guidelines for troponin.
HFH Potassium(K) Guidelines

| <3.0 | 3.1-3.4 | 3.5-5.0 | 5.1-6.0 | >6.0 |

- The following guidelines will be observed for patients whose potassium levels are 3.0-3.4 and 5.1-6.0:
  - Vital Signs within normal resting values
  - Vitals monitored pre, mid and post treatment
  - Oxygen saturation levels must be ≥ 90% prior to treatment

HFH Potassium(K) Guidelines

- Treatment will be terminated with the onset or increase in any of the following:
  - Numbness or tingling in any body part.
  - Dizziness not resolved/improved within 60 seconds of obtaining upright.
  - Nausea/Vomiting
  - Blurred vision.
  - Increase in the patient’s heart rate of 30 bpm over baseline.
  - Change in the patient’s systolic blood pressure of 30 mm Hg or a change in the diastolic blood pressure of 10 mm Hg
  - Anginal pain
  - Shortness of breath

Questions?

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Sodium

SODIUM (Na)
• Maintains cell membrane potential; acid-base balance
• Promote neuromuscular, renal and adrenal functions
• Values show hydration state of patient
• The brain is most susceptible to changes in sodium.

• NORMAL VALUES = 135 – 145

SODIUM (Na)

Increased due to:
• Dehydration (excessive sweating, severe vomiting, or diarrhea)
• Polyuria (diabetes mellitus, diabetes insipidus)
• Hypersaldosteronism
• Impaired renal function
• Inadequate water intake (coma, hypothalamic disease).
• Drugs: steroids, licorice, oral contraceptives.

Decreased due to:
• Decreased food intake
• Increased water intake
• Diuretic therapies
• Burns
• Chronic Renal Failure
• Diarrhea
• Adrenal insufficiency
• Drugs: insulin, ethanol, propranolol and other oral hypoglycemic agents
• Dehydration (excessive sweating, severe vomiting, or diarrhea)
• Polyuria (diabetes mellitus, diabetes insipidus)
• Hypersaldosteronism
• Impaired renal function
• Inadequate water intake (coma, hypothalamic disease).
• Drugs: steroids, licorice, oral contraceptives.
Sodium (Na)

- **Hold intervention**
  - <125 or >155 mEq/L

Clinical Example

- 58 year old male s/p Suboccipital craniotomy
- New onset balance issues and motor planning since initial evaluation
- Slow to respond; Agitated
- MD notified
- BP low; Na level = 117 mEq/L

Questions?

- Note: please click hand up to alter me that you are typing a question. If needed I will finished the next section and return to the question. Thank you.
Glucose

- **NORMAL RANGE = 80 – 120 mg/dL**
- **Some sources report normal range is 60–110 mg/dL**

Glucose Increased in:
- Diabetes mellitus
- Cushing syndrome (10–15%)
- Chronic pancreatitis (30%)
- Sepsis
- Brain Tumors
- Medications such as corticosteroids, estrogen, thiazides.
- After a meal
- After IV glucose

Glucose Decreased in:
- Excess insulin
- Brain damage
- Pituitary deficiency
- Addison’s disease
- Malignancy (adrenocortical, stomach, fibrosarcoma),
- Drugs: insulin, ethanol, propranolol; sulfonylureas, and other oral hypoglycemic agents.
HFH Glucose Guideline

• Important to monitor in all patients, not just those with diabetes.

• No Physical or Occupational Therapy intervention < 70 mg/DL or >300 mg/dL

Glucose >300mg/dL

• If glucose is >300mg/dL = severe hyperglycemia
• If glucose >300 and ketones are present, exercise could cause diabetic ketoacidosis (DKA) Cells lack their energy source to function
• May have severe fatigue
• Patient in need of insulin

Glucose < 70mg/dL

• Hypoglycemia is usually defined as < 70 mg/dL
• May demonstrate:
  – Confusion or delirium
  – Lightheadedness or dizziness
  – Seizures
  – Lack of coordination
  – Weakness or fatigue
  – Blurred/impaired vision
Clinical example

- 54 year old admit with dehydration s/p chemo for stomach cancer.
- 0700 blood glucose is 65
- Breakfast due at 0800
- OT initiated for morning ADLs at 0730
- After walk to bathroom and ADLs standing at sink, patient becomes confused, complains of dizziness and blurred vision.
- RN notified; metered glucose = 45
- Likely due to diagnosis, pre-breakfast and energy expenditure.

Clinical example

- 43 year old female admit with uncontrolled diabetes.
- Glucose levels range from 350-600 for the last several days
- Patient fatigues easily but is ready for discharge and MD writes order for PT to evaluate despite glucose 300+
- PT assessment includes activities to assess for safe discharge home only; vitals monitored and response documented.

Questions?

- Note: please click hand up to alter me that you are typing a question. If needed I will finished the next section and return to the question. Thank you.
White Blood Cells

• A marker for disease process
• Monitors body’s response to infectious disease processes.

White Blood Cells

• The WBC count and differential determine the total number of white blood cells as well as the percentage and absolute number of each type of white cell in a blood sample.
• There are five types of white cells, each with different functions: neutrophils, lymphocytes, monocytes, eosinophils, and basophils.
White Blood Cells

- NORMAL RANGE = 380,000 – 1,060,000 cells/mm3
- Adult female white blood cells (WBCs): 4,500-11,000 cells/mm3

White Blood Cells

Increased in:
- Parasitic infections
- Bacterial infections
- Inflammation
- Tissue injury/necrosis
- Leukemia/Lymphoma
- Allergic reactions
- Hypersensitivity reactions
- Stress
- Smoking
- Corticosteroids

Decreased in:
- Viral infections
- Chemotherapy/Radiation
- Bone marrow transplant
- Immune compromise
- Neutropenia
- Myelodyplasia
- Alcoholism

White Blood Cells

- No critical values for PT and OT intervention but awareness of increase or decrease may assist in clinical picture.
Platelets

- Initiate clotting sequence & plugging of damaged blood vessels.
- Platelets are released from megakaryocytes in bone marrow and are important for normal hemostasis.

- NORMAL RANGE = 150,000 – 450,000 mcL

Increased in:
- Myeloproliferative disorders (polycythemia vera, chronic myeloid leukemia, essential thrombocytosis, myelofibrosis).
- Acute blood loss
- Reactive thrombocytosis secondary to inflammatory disorders
- Infection
- Tissue injury
- Iron deficiency
- Some Malignancies

Decreased in:
- Leukemia/lymphoma
- Other Cancers
- Bone marrow suppression or replacement/infiltration
- Post-bone marrow transplant
- Myelodysplasia,
- Chemotherapy
- Drugs, Alcohol
- Infection (eg, HIV)
HFH Guidelines - Platelets

• Increased count does not contraindicate treatment except if it is so high that the blood flow to organs is compromised.
• Decreased count may lead to spontaneous bleeding.

HFH Guidelines - Platelets

• >50,000 - can Ambulate as tolerated do bike and moderate resistance strength training.
• 20,000 - 50,000 - can do ambulation and light resistance training.
• 5,000 - 20,000 - can do active ROM, ambulation in room, light daily activities.
• <5,000 for less than 1 week - can do transfers.
• <5,000 for greater than 1 week - can do same as for 5,000 - 20,000 range.

APTA Updated Guidelines

• PLT < 10,000 and /or temperature > 100.5 degrees:
  – No therapeutic exercise/Hold therapy
• PLT: 10,000-20,000:
  – Therapeutic exercise/bike without resistance
• PLT > 20,000:
  – Therapeutic exercise/bike with or without resistance
Clinical Example

- 24 year old male admit for Bone Marrow Transplant
- Platelets have been 4,000-6,000 for 3 weeks
- Consult is for update to exercise program
- According to HFH guidelines, education for patient to complete active ROM, ambulation in room and light daily activities.

Questions?

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Cardiac Markers
CARDIAC MARKERS

• When damage occurs to myocardial tissue, there is a loss of cellular integrity and intracellular cardiac enzymes are released into the circulation at variable rates.
• These enzymes include CPK and Troponins.

CPK

Creatine Phosphokinase (CPK)

• Found in cardiac muscle as CPK-MB (released after MI, cardiac injury)
• Found in skeletal muscle as CPK-MM (released after trauma, with muscular dystrophy)
• Found in brain tissue as CPK-BB (released after brain injury, with severe shock)
CPK

- Normal values: 30-170 U/L
- To be positive for an MI, >5% of the total CPK levels must be in the CPK-MB form (cardiac muscle)
- CPK-MB begins to rise at 4-6 hours
- Peaks in 12-24 hours
- Returns to normal within 48-72 hours

HFH Guidelines - CPK

- Be aware that CPK-MB can also be elevated after surgery or after cardiopulmonary resuscitation especially with defibrillation.
- Note: at HFH, Troponin I has been found to have greater sensitivity and specificity in the diagnosis of MI over CK-MB.

Clinical Example

- 77 year old woman s/p fall at home, found down after 2 days, no loss of consciousness reported.
- X-rays + right wrist fracture, CT head negative
- CPK = 400 U/L (CPK-MB is 15 U/L)
  - CPK-MB is 3.8% of total CPK
- Vitals stable, Troponin negative
- Diagnosis: Rhabdomyolysis
Questions?

• Note: please click hand up to alter me that you are typing a question. If needed I will finished the next section and return to the question. Thank you.

Troponin

• Found in striated muscle cells.
• 3 isoforms
  – 2 cardiac muscle (TnC and TnI)
  – 1 skeletal muscle.
• Cell necrosis leads to the release of troponins into the circulation.
• TnC and TnI are only expressed from cardiac muscle and are the only 2 that are tested during severe ischemia and infarction.
Troponin

- Normal Range: less than 0.04
- Troponin enzyme begins to rise at 8 hours
- Peak Time: 12-16 hours
- Typical lab orders are for Troponin x 3, series 8 hours apart
- Returns to normal within one week

HFH Guidelines - Troponin

- **Troponin Levels < 0.04**: Negative for myocardial damage
  - No restrictions

- **Troponin Levels 0.05 to 0.2**: Indeterminate for Myocardial Damage
  - Guidelines: Review chart to ascertain why troponin was ordered; check to see if it is a one time order; look for any notes that may indicate that a cardiac component is NOT suspected for the troponin elevation (Cardiology notes or other MD notes in chart after the troponin became positive)

- **Troponin Levels > 0.2**: Positive for Myocardial Damage.
  - Once it has been determined that a patient has had an MI, therapy can usually be initiated within 24 hours of the diagnosis if the patient is hemodynamically stable.
TROPNON

• Always look for the trend since a NEW peak indicates further cardiac damage.

Troponin Leak

• Conditions commonly associated with cardiac troponin elevation in absence of Acute Myocardial Infarction:
  • Acute PE
  • Acute Pericarditis
  • Acute or Severe Heart Failure
  • Myocarditis
  • Sepsis and/or Shock
  • Renal Failure
  • False-Positive Troponin
  • Stroke
  • Hypertensive Emergency

Clinical Example

• 82 year old male admit with chest pain.
• BP 168/72 HR 92-108 SaO2 94% on 4 L NC
• Troponin levels:

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Lab Values associated with DVT

- Based on the type of anticoagulation medication
- PTT = Partial Thromboplastin Time
- PT = Prothrombin Time
- INR = International Normalized Ratio

PTT
PTT = Partial Thromboplastin Time

- An intrinsic clotting factor used to monitor the effectiveness of Heparin therapy and for screening for bleeding disorders.
- Increased PTT levels will occur following thrombolytic or Heparin infusion causing an increased time for blood to clot and subsequently, an increased chance of bleeding or bruising.

PTT = Partial Thromboplastin Time

- NORMAL RANGE = 22 - 36 seconds
  - No anticoagulation medication

- THERAPEUTIC RANGE IF ON HEPARIN = 2-3 times the normal range
  - Appropriately 60-109 seconds

Prothrombin Time
PT = Prothrombin Time

- Monitors effectiveness of Coumadin or Warfarin therapy (Oral anticoagulation)
- NORMAL RANGE = 9.5 - 13 seconds
- Therapeutic Range = 2-3 times the normal range
  - Appropriately 18 - 30 seconds

INR = International Normalized Ratio

- Most applicable for patients on oral anticoagulant therapy for at least 2 weeks.
- NORMAL RANGE = 0.8 – 1.20
- Therapeutic Range on standard dose oral anticoagulant = 2 – 3
- Therapeutic Range on HIGH dose oral anticoagulant = 2.5 – 3.5
Lovenox

- No lab test are associated with subcutaneous injections of low molecular weight Heparin such as Lovenox
- Therefore, therapy is typically initiated > 3 hours post anticoagulation
- For patients on prophylactic doses of lovenox such as TKA/THA and diagnosed with DVT, a therapeutic dose must be given

APTA Anticoagulation Reference

<table>
<thead>
<tr>
<th>Medication</th>
<th>Anticoagulation Therapy</th>
<th>Risk of Bleeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lovenox</td>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>

HFH PTT and INR GUIDELINES

- For patients with INR >6 or PTT >200, PT/OT will confer with the patient’s physician to determine appropriate activity level prior to initiating treatment. PT/OT will document physician recommendations in the patient’s chart.
- Due to increased risk of bleeding
HFH Guidelines related to DVT

• Patients in which a DVT or PE is suspected will NOT be mobilized by PT/OT until testing (UE/LE Venous Doppler, CT scan, and/or V/Q scan) has been completed to rule out DVT or PE.

HFH Guidelines related to DVT

• For patients with suspected DVT (red/swollen/painful extremities, +Homan’s test) PT/OT will notify MD and defer mobility or modify activity to avoid aggravation of symptoms.

HFH Guidelines related to DVT

• In 2011, HF Medical Group Physicians decided that the risks of delayed mobilization and PT/OT prior to reaching therapeutic doses outweighed the risk of complications or embolism.
New HFH Guidelines

- Patients diagnosed with ACUTE UE DVT, LE DVT, and/or PE will be mobilized by PT/OT without restrictions once anticoagulation (Heparin, Lovenox) has been started.
- No minimum time period between anticoagulation initiation and mobilization by PT/OT is required.
- No minimum PTT and/or INR values need to be reached prior to mobilization by PT/OT after anticoagulation initiation.

HFH Guidelines related to DVT

- Patients with ACUTE LE DVT and/or PE who cannot be anticoagulated due to medical reasons may have an Inferior Vena Cava (IVC) filter placed.
- In this case, the patient can be mobilized without restrictions once the IVC filter has been placed.

IVC Filters
HFH Guidelines related to DVT

• For the small percentage of patients who fall outside the guidelines or who do not qualify for anticoagulation, PT/OT will confer with the patient's medical team prior to initiating mobility/exercise to determine appropriate activity level.
• Document medical team recommendations for mobilization/exercise in the patient's chart.
• Monitor vitals

Questions?

• Note: please click hand up to alter me that you are typing a question. If needed I will finished the next section and return to the question. Thank you.

Other Lab Values
Other Lab Values

<table>
<thead>
<tr>
<th>Lab Value</th>
<th>Normal value</th>
<th>Causes of Increase</th>
<th>Cause of Decrease</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>96-108</td>
<td>Dehydration, Nephrosis (with diabetes inquired)</td>
<td>None</td>
<td>Monitor patient, NG suctioning</td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.9-1.3</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Creatinine clearance</td>
<td>100-180 1/24 hrs.</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Urea</td>
<td>10-24</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Clinical Cases

Clinical Case #1 of 6

Mr. J. is admitted to H2 with kidney failure and is having an exacerbation of gouty arthritis. He received his morning medications within the last hour. He is NPO for TEE this am.

His PMH is as follows:
- Hypertension
- Diabetes
- Arthritis, Gout
- Previous MI
- Renal Failure

In reviewing his Medication Administration Record, these are the medications he received:
- Lisinopril for lowering blood pressure
- Insulin on a sliding scale
- Ibuprofen for joint pain
Clinical Case #1

- Is this patient appropriate for intervention?
- Why or Why Not?
  - Yes, vitals are stable, though BP is high; glucose is WNL

<table>
<thead>
<tr>
<th>Lab Value</th>
<th>4/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>250</td>
</tr>
<tr>
<td>HCT</td>
<td>42%</td>
</tr>
<tr>
<td>HGB</td>
<td>9.9</td>
</tr>
<tr>
<td>K+</td>
<td>3.6</td>
</tr>
<tr>
<td>Na</td>
<td>138</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>BP</th>
<th>HR</th>
<th>SaO2</th>
<th>Oxygen Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:00</td>
<td>145/72</td>
<td>100</td>
<td>99</td>
<td>2L NC</td>
</tr>
<tr>
<td>09:00</td>
<td>162/78</td>
<td>102</td>
<td>98</td>
<td>2L NC</td>
</tr>
<tr>
<td>10:00</td>
<td>179/75</td>
<td>110</td>
<td>100</td>
<td>2L NC</td>
</tr>
<tr>
<td>11:00</td>
<td>168/98</td>
<td>99</td>
<td>99</td>
<td>2L NC</td>
</tr>
</tbody>
</table>

Clinical Case #1

- Upon sitting up, Mr. J reports that he feels dizzy and like he might faint. What issues might be causing these symptoms?
  - Orthostatic hypotension
  - Increased glucose OR Decreased glucose 2° NPO and receiving insulin
  - Medications (Lisinopril for lowering blood pressure, insulin)

- What would you monitor? What would you do in this situation?
  - Monitor HR, BP, SpO2
  - See if symptoms resolve within 1-2 minutes
  - Lie patient back down
  - Recheck vitals
  - Communicate with RN/MD

Clinical Case #2 of 6

Mr. D has been in the hospital for 4 days following a total shoulder replacement. He has had a complicated hospital stay with increased pain, decreased PO intake and increased UE swelling. He was given Lovenox prophylactically starting on post op day 1. On post op day 3 he was diagnosed with a left UE DVT. Heparin therapy was initiated to treat the clot.

<table>
<thead>
<tr>
<th>Lab Value</th>
<th>4/6</th>
<th>4/7</th>
<th>4/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>79</td>
<td>69</td>
<td>40</td>
</tr>
<tr>
<td>HCT</td>
<td>40%</td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>HGB</td>
<td>11.8</td>
<td>9.8</td>
<td>8.2</td>
</tr>
<tr>
<td>K+</td>
<td>3.4</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Na</td>
<td>133</td>
<td>136</td>
<td>137</td>
</tr>
<tr>
<td>Troponin</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>WBC</td>
<td>8500</td>
<td>9000</td>
<td>8800</td>
</tr>
<tr>
<td>PTT</td>
<td>50</td>
<td>56</td>
<td>54</td>
</tr>
</tbody>
</table>

- According to his Lab Values, can treatment be initiated?
  - No at this time; glucose 60

- Are you concerned that Mr. D has had an MI?
  - No, troponin less than 0.04
Clinical Case #3 of 6

- Mr. Johnson is a 46 year morbidly obese male with new onset ESRD s/p dialysis MWF.

<table>
<thead>
<tr>
<th></th>
<th>4/6</th>
<th>4/7</th>
<th>4/8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>110</td>
<td>150</td>
<td>114</td>
</tr>
<tr>
<td>HCT</td>
<td>44</td>
<td>42</td>
<td>40</td>
</tr>
<tr>
<td>HGB</td>
<td>12.1</td>
<td>11.5</td>
<td>10.8</td>
</tr>
<tr>
<td>K+</td>
<td>3.4</td>
<td>3.3</td>
<td>3.1</td>
</tr>
<tr>
<td>Na</td>
<td>129</td>
<td>130</td>
<td>128</td>
</tr>
</tbody>
</table>

- Can intervention be initiated?
  - Why or why not?
  - What would you monitor?

  Yes, K+ is within treatable range

Vital Signs and Physiologic response

Clinical Example # 3 of 6

- Treatment will be terminated with the onset or increase in any of the following:
  - Numbness or tingling in any body part.
  - Dizziness not resolved/improved within 60 seconds of obtaining upright.
  - Nausea/Vomiting
  - Blurred vision.
  - Increase in the patient’s heart rate of 30 bpm over baseline.
  - Change in the patient’s systolic blood pressure of 30 mm Hg or a change in the diastolic blood pressure of 10 mm Hg.
  - Anginal pain.
  - Shortness of breath

Clinical Case #4 of 6

Mrs. J is an 80 year old female admitted to the hospital with a CHF exacerbation. She has a PMH of DM and HTN and a SxH of 3 Vessel CABG 5 years ago. Vital Signs have been stable; however, troponins x 3 were ordered yesterday at 1400. The results were as follows:

- 1400: Troponin <0.04
- 2000: Troponin 0.08
- 2400: Troponin 0.08

Current Vital Signs taken at 0800:
- BP 140/82 HR 98 SaO₂ 94% on 2L O₂

Would you initiate treatment with Mrs. J?
- Yes, troponins are indeterminate, history of CHF
Clinical Case #5 of 6

Mrs. T. is admitted s/p NSTEMI. Therapy has been consulted for initiation of Cardiac Rehab after she has been in the hospital for 2 days. Her Troponin level peaked at 5.0 in the Emergency Department; current Troponin level is 2.0. BP is 130/85, HR is 80, SaO2 is 95% on Room Air. Dr. N. wants her to go home today.

What indicates that Mrs. T. had an actual heart attack?
• Troponin level

Why might her Troponin levels still be high after 2 days?
• Troponins remain in bloodstream for a week
Does her Troponin level indicate initiation of therapy for Cardiac Rehab today?
• YES, it has been more than 24 hours since troponin peak, hemodynamically stable

Clinical Case #6 of 6

Mr. X comes into the hospital after being involved in an MVA. He has a large, infected wound on his left leg, which is being treated with IV antibiotics. He also has a broken left femur. He has been in the ICU for 3 days and PT and OT services have been requested to mobilize him out of bed and begin working on gait and ADL's.

His lab values are as follows:
- Hemoglobin = 8.4
- WBC count = 12,000
- PTT = 30
- CPK = 340 (CPK-MB is less than 5% of total CPK)

What issues might the therapist have to deal with when treating this patient because of his Hemoglobin level?
- Increased fatigue
- Mental status changes
- decreased exercise tolerance
- Tachycardia
- Orthostatic hypotension

Why might his WBC count be elevated?
- WBC increases with bacterial infections and most illnesses

What is the normal range for this patient for PTT levels?
- 22-36 seconds

Why might this patient's CPK be elevated?
- Injury to skeletal muscle can cause CPK to be elevated

Questions?
References

- de Lemos, J.A. Increasingly Sensitive Assays for Cardiac Troponins A Review. JAMA, June 5, 2013—Vol 309, No. 21 2262-2269

References

- National Institutes for Health - January 06, 2012
  http://www.nhlbi.nih.gov/health/health-topics/topics/bdt/
- Lab Values Interpretation Resources – APTA – Acute Care Section, www.acutept.org