Medical Screening for the Practicing Physical Therapist: Outpatient and Inpatient Settings

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Disclosures

Much of the information on medical screening comes from Dr. Bill Boissonnault

We did NOT break the curtain in the Indiana suite at the 2016 HOD

IMPORRTANCE OF MEDICAL SCREENING

Co Morbidities

- Orthopedic population
  - 15.3% High BP
  - 15.2% Arthritis
  - 11.4% Depression
  Boissonnault JOSPT. 1994;20:2-10

- Physical therapy outpatient population:
  - 21% Hypertension
  - 15% Depression
  - 4.1% Skin Cancer
  Boissonnault JOSPT 1999.29:506-525

"Oh, head. I’ll say you’re suffering from an arrow through your head, but just to play it safe, I’m ordering a bunch of tests."
IMPORTANCE OF MEDICAL SCREENING
Co Morbidities

Medical Free Clinic of Greater Cleveland
- 31.9% High BP
- 31.5% Arthritis
- 29.8% Depression
- 21.2% Diabetes
- 14.0% COPD
- 52.8% Obesity
Euelp, Schulte, Snyder, O’Loughlin 2010

IMPORTANCE OF MEDICAL SCREENING
Musculoskeletal Pathologies

Patients with LBP: primary care settings
- 4% osteoporotic compression fracture
- 2% visceral disorders
- <1% traumatic fracture
- <1% neoplasms
- <1% inflammatory arthritis
- <0.01% infection

Primary Care Screening and RED Flags

- 1,172 patients with acute low back (>24hrs / < 6 weeks)
- Primary care clinicians
  - 73 MDs, 77 physiotherapists, 20 chiropractors
- 11 cases of serious pathology
  - 0.7% Spinal fracture
  - 0.2% Inflammatory disorder
  - 0.1% Cauda equina
- 80.4% of patients had at least 1 Red flag
- Clinicians identified 5 out of 11 cases of serious pathology

Medical Screening

**Bottom line:**

With pathologies being so small, do we really even need to do Medical Screening?

Screening Back Pain in the Emergency Department

- Between 2002-2006 LBP related disorders caused 2.63 million annual ED visits in the US (2.3% of all visits to US EDs)
  - 30.5% had a plain radiograph
  - 6.1% had a CT or MRI
  - 61.7% were prescribed opioids
  - 63.5% were given ICD9 code 724 (unspecified back disorder: lumbago, sciatica, backache, etc)
  - 21.7% ICD9 code 847 sprain/strain back
  - 0.2% spondylosis, 1.3% Injury, 1.9% intervertebral disc d/o, 2.4% soft tissue injury


Full page ad in The Legislative Gazette of New York, May 22nd, 2006 by the New York State Society of Orthopaedic Surgeons.

Other medical providers do not believe PTs are qualified to see patients directly; without a referral
Direct Access for Physical Therapy

Direct Access and Ohio Physical Therapy

- 13 Year Anniversary
- Despite this, not many PTs in Ohio see patients directly
  - Why?
  - PTs in Ohio can not diagnose, or refer for diagnostic tests/imaging

https://www.youtube.com/watch?v=SJI2hd2NfzU

Direct Access = Cost Effective

- Self referred episodes of PT demonstrated fewer PT visits than those from MD based referrals
- Also at a lower amount
  - $0.87 for every $1.00

DIRECT ACCESS: Cost Effective?
Comparing Direct Access versus Physician Referral

<table>
<thead>
<tr>
<th></th>
<th>Direct Access</th>
<th>Physician Referral</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT Visits</td>
<td>3.9</td>
<td>5.4</td>
</tr>
<tr>
<td>Treatment Duration</td>
<td>8.4</td>
<td>10.2</td>
</tr>
<tr>
<td>Expense</td>
<td>$2,423.50</td>
<td>$3,878.70</td>
</tr>
</tbody>
</table>


Direct Access

Moore, JH et al. 2005 JOSPT
- Over a 40 month period, 50,799 new patients were seen via direct access (military bases)
- No adverse events, no litigations, no licenses revoked or modified

Daker-White, G et al. 1999 J Epidemiol Community Health
- “orthopaedic physiotherapy specialists are as effective as post-Fellowship junior staff and clinical assistant orthopaedic surgeons in the initial assessment and management of new referrals to outpatient orthopaedic departments”
- The only outcome that showed statistical significance . . . . . Patient satisfaction was higher for the physical therapy group

Clinical Decision Making of the Physical Therapist

- Agreement of clinical diagnosis accuracy between an MRI and physical therapists was 74.5%
- No significant difference between PT and orthopaedic surgeon, but there was a significant difference between a PT and non-orthopaedic physician
Clinical Decision Making of the Physical Therapist

<table>
<thead>
<tr>
<th>Providers</th>
<th>Number</th>
<th>Years of Experience</th>
<th>CD Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Therapists</td>
<td>3</td>
<td>21.5</td>
<td>86% (59/70)</td>
</tr>
<tr>
<td>Non-PT licensed</td>
<td>2</td>
<td>19.5</td>
<td>80% (18/22)</td>
</tr>
</tbody>
</table>


Musculoskeletal Knowledge and PTs

Childs et al. A description of physical therapists' knowledge in managing musculoskeletal conditions. JMC. 2007;6:32

Direct Access

- How often do we see patients through direct access?
- Should we be the first person to see patients with musculoskeletal complaints?
- Are we confident enough??
- Can PTs see patients directly in all practice settings?
Direct Access

Proposed that after making clinical judgments regarding the examination findings, the physical therapist makes 1 of 3 decisions:

1. Referral or consultation
2. Diagnose and intervene
3. Refer and Treat


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**Physiotherapy Examination**

Alteration of Symptoms
Impairments
Systems Review
CVS, PS NS, Skin

**Evaluation of Findings**

Treat
Treat and Refer
Refer

Response to Treatment

Bosworth, 2006

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**Primary Care in the Emergency Department**

- Majority of patients managed by PTs in the ED are within the Musculoskeletal Practice Pattern
  - 39-45% lumbar & thoracic spine conditions
  - 12-18% neck/cervical spine conditions
  - 11-17% hip/hip conditions
  - 8-9% shoulder conditions
  - 7-8% foot/ankle conditions
  - 3% hand/wrist/elbow conditions

- May also provide primary care for vestibular or balance disorders, acute or chronic wound presentations, injury from a fall or recent history of falls, and signs & symptoms of chronic neurological deficits


APTA. Incorporating Physical Therapist Practice in the Emergency Department: A Toolkit for Practitioners. 2015
Primary Care and the Role of the Physical Therapist

- APTA House of Delegates (HOD P06-07-03)
  - Adopted a resolution that stated,
    - "Physical therapists provide patient/client management in primary care through the processes of screening, examination, evaluation, diagnosis, prognosis, intervention, education, prevention, coordination of care, and referral to other providers."

- Health Care Reform Changes
  - Need for additional Primary Care Providers
  - Are PTs qualified to be considered a primary care provider?

Primary Care and the Role of the Physical Therapist

Scope of PT practice needs to be defined for all practice areas

Out patient Direct Access Uses a Health History Intake Form

- Priority Data
  - Current illness
  - Recent surgeries / Injuries
  - Medication Use
  - Substance Use
  - Family History??
### Non-Mechanical Symptoms

**Within the past year, have you had any of the following?**

- Unintentional Weight loss
- Fever/chills
- Night sweats
- Shortness of breath
- Skin problems or changes
- Vision problems
- Hearing problems
- Loss of balance
- Urinary problems or changes
- Sore throat
- Difficulty swallowing
- Indigestion/burping

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Change in mentation</th>
<th>Numbness/numbness</th>
<th>Memory impairments/changes</th>
<th>Coordination problems</th>
<th>Weakness in arms or legs</th>
<th>Difficulty walking</th>
</tr>
</thead>
</table>
- Headaches                  |                     |                   |                           |                       |                          |                   |
- Change in mentation         |                     |                   |                           |                       |                          |                   |
- Numbness/numbness          |                     |                   |                           |                       |                          |                   |
- Memory impairments/changes  |                     |                   |                           |                       |                          |                   |
- Coordination problems       |                     |                   |                           |                       |                          |                   |
- Weakness in arms or legs    |                     |                   |                           |                       |                          |                   |
- Difficulty walking          |                     |                   |                           |                       |                          |                   |

**Health history found in medical record**

What Information is needed to determine patient is safe to be seen by PT?

- Lab values
- Imaging
- Surgical Reports
- Vital Signs
- Medications
- EHR notes

Does the patient have systemic or mechanical symptoms?
Medical Screening for Acute Care PT

- The acute care setting is where medically unstable patients are treated with physical therapy.
- It requires clinical reasoning to be combined with physical therapy knowledge and skills.
- Rapid decision making, continual dynamic assessments, and constant communication with an interdisciplinary team are all necessary skills a therapist needs in this environment.
- Therapists must have knowledge about pathophysiology, symptoms and findings related to red flags, treatment precautions and contraindications, pharmaceutical benefits, adverse effects and interactions, and normal versus abnormal physiological responses to movement both before and during treatment sessions.


Acute Physical Therapy Research

- Patients were found to be 2.9 times more likely to be readmitted when the therapist’s discharge recommendation was not implemented. Smith BA, Fields CJ, Fernandez N. Physical Therapists Make Accurate and Appropriate Discharge Recommendations for Patients Who are Acutely Ill. Phys Ther. 2010; 90 (5):693-703.
- Early and intense rehabilitation is recommended for acute stroke patients admitted to the ICU to improve basic functions such as walking. Hu MH et al. Early and intensive rehabilitation predicts good functional outcomes in patients admitted to the stroke intensive care unit. Disabil Rehabil. 2010; 32(5):475-8.

Medical History & Physical Examination
Physical Examination: History

History broken into 6-parts:
- Profile
- Location and description of symptoms
- Behavior of symptoms
- History of symptoms
- Medical history
- Review of systems

Patient Profile

Age
- Prostate CA: Men > 50 years old
- Ankylosing Spondylitis: Men 15-35 years old

Sex
- Males: Bladder CA
- Females: Migraine HA, R

Race
- African-American: Sickle Cell
- Osteoporosis: Caucasian females

Occupation
- Exposure to Hot/Cold extremes
- Exposure to hazardous materials

Behavior of Symptoms

Questions to rule out pathology
- Are symptoms intermittent or constant?
- Are symptoms worse at night time (Exception: Acute conditions)

Look for variation in symptoms over 24-hour period
- What aggravates symptoms
- What alleviates symptoms
Physical Examination: History

Location and Description of symptoms

- **Cramping**: Gastroenteritis, constipation, menstruation
- **Throbbing, cramping, aching**: Cardiovascular
- **Weakness, pins and needles, imbalance**: Neurological

Symptom Location and Relationship to System

Cervical Spine and Shoulders

- Cardiovascular
- Pulmonary
- Gastrointestinal

Thoracic Spine

- Cardiovascular
- Pulmonary
- Gastrointestinal
- Genitourinary

Lumbopelvic pain

- Gastrointestinal
- Urogenital
- Peripheral vascular

Visceral Pain Patterns

### Cardiopulmonary System

<table>
<thead>
<tr>
<th>Structures</th>
<th>Segmental Innervation</th>
<th>Possible areas of referral / Local pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>T1-5</td>
<td>Cervical anterior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper thoracic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Left upper extremity</td>
</tr>
<tr>
<td>Lungs and Bronchi</td>
<td>T5-6</td>
<td>Ipsilateral thoracic spine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cervical (diaphragm involved)</td>
</tr>
<tr>
<td>Diaphragm (central portion)</td>
<td>C3-5</td>
<td>Cervical Spine</td>
</tr>
</tbody>
</table>

Boissonnault WG. Primary care for the physical therapist: examination and triage. St. Louis, MO: Elsevier Saunders;2005

### Digestive System Organs

<table>
<thead>
<tr>
<th>Structures</th>
<th>Segmental Innervation</th>
<th>Possible Areas of Pain Referral/Local Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esophagus</td>
<td>T4-6</td>
<td>Subcostal and upper abdominal</td>
</tr>
<tr>
<td>Stomach</td>
<td>T6-10</td>
<td>Upper abdominal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle and lower thoracic spine</td>
</tr>
<tr>
<td>Small Intestine</td>
<td>T7-10</td>
<td>Middle thoracic spine</td>
</tr>
<tr>
<td>Pancreas</td>
<td>T7-10</td>
<td>Upper abdominal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower thoracic spine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper lumbar spine</td>
</tr>
<tr>
<td>Gall Bladder</td>
<td>T7-9</td>
<td>Right upper abdominal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right middle and lower thoracic spine,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>including caudal aspect scapula</td>
</tr>
</tbody>
</table>

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### Retroperitoneal Region

<table>
<thead>
<tr>
<th>Structures</th>
<th>Segmental Innervation</th>
<th>Possible Areas of Pain Referral/Local Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney</td>
<td>T12-L1</td>
<td>Lumbar spine (ipsilateral)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower abdominal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper abdominal</td>
</tr>
<tr>
<td>Ureter</td>
<td>T11-L2, S2-4</td>
<td>Groin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper abdominal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medial, proximal thigh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thigh/abdominal</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>T11-L2, S2-4</td>
<td>Sciatic nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Symptomatic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thigh/abdominal</td>
</tr>
<tr>
<td>Prostate gland</td>
<td>T11-L2, S2-4</td>
<td>Sciatic nerve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Symptomatic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thigh/abdominal</td>
</tr>
</tbody>
</table>

Boissonnault WG. Primary care for the physical therapist: examination and triage. St. Louis, MO: Elsevier Saunders;2005
Pelvic Organs

<table>
<thead>
<tr>
<th>Structure</th>
<th>Segmental Innervation</th>
<th>Possible Areas of Pain Referral/Local Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uterus including uterine ligaments</td>
<td>T10-L1, L2-4</td>
<td>Lumbosacral junction Thoracolumbar Sacral</td>
</tr>
<tr>
<td>Ovaries</td>
<td>T10-11</td>
<td>Lower abdominal Sacral</td>
</tr>
<tr>
<td>Testes</td>
<td>T10-11</td>
<td>Lower abdominal Sacral</td>
</tr>
</tbody>
</table>

Boissonnault WG. Primary care for the physical therapist: examination and imaging. St Louis, MO: Elsevier Saunders; 2005

REVIEW OF SYSTEMS
General Health Check List

- Fatigue
- Malaise
- Fever, chills, sweats
- Nausea
- Unexplained weight change

- Paresthesias, numbness
- Weakness
- Dizziness, lightheadedness
- Mentation or cognitive deficits

Follow-up Questions
- “Is there an explanation?”
- “Have you mentioned this to the physician?”
- “If the physician knows, have your symptoms become worse?”
**REVIEW OF SYSTEMS**

**General Health**

**Fatigue**

- Sense of tiredness or weariness marked by a change in ability to carry out normal daily activities
- Duration of 2 or more weeks
  - Psychological
  - Metabolic
  - Infections
  - Neoplasms
  - Cardiopulmonary
  - Connective tissue disease
  - Sleep

**Follow-up questions**

- “Describe your fatigue to me.”

- Rarely is Fatigue a **Red** Flag…more of a **Yellow** flag

**Malaise**

- Sense of lethargy; impending illness
- Patient’s intuition; something “isn’t right”
- Out of sorts
- Most patients do not even know if they feel malaise or not
REVIEW OF SYSTEMS
General Health

Fever, Sweat, Chills

- 99.5° F (37.5° C) or higher for more than 2 weeks.
  - As a rule, a fever of 102° F or higher warrants a call to the physician.
- Elderly: 98.9° F (37.2° C) or an increase of 1.3° C over baseline.
- Associated with systemic illnesses
  - Pyrogens released into bloodstream by toxic bacteria

Unexplained Weight Loss

- 5% to 10% body weight change
- Unexplained
- Over a 4-week period
- Disorders most frequently associated with weight loss:
  - Depression (18%)
  - Cancer (16%)
  - Gastrointestinal disease (11%)

Unexplained Weight Gain

- Associated with fluid retention
  - CHF
  - Liver or renal disease
  - Preeclampsia
- Other disorders often seen with weight gain
  - Depression
  - Hypothyroidism
  - Cushing’s Syndrome
- Women who are pregnant with more than 5 lb loss in first trimester should be reported
REVIEW OF SYSTEMS
General Health

Nausea / Vomiting
– Constant / Intermittent?
– How long?
– Do you have vomiting without nausea?
– Does your physician know?
– Taking OTC treatment?

Numbness / Weakness
– Non-dermatomic
  • “Glove Stocking” Distribution
– Multiple spinal nerve root levels
– Multiple peripheral nerve distribution from multiple spinal nerve root levels
– More than one extremity

Questions to clarify “dizziness”
Do you feel light headed or faint
Do you have a spinning sensation
Is the room spinning
Is it associated with different postures
Is it associated with nausea, vomiting, diaphoresis, hearing loss, tinnitus, visual disturbance
Have you fallen because of the disease
REVIEW OF SYSTEMS
General Health

Mentation
Disorders in this can be due to:
- Dementia
- Head injury
- Adverse drug reactions
- Infection

Questions to clarify:
- Level of consciousness
  - Alertness
- Attention
  - Focus on task
- Memory
  - Short term versus long term

- Orientation
- Person, place, time
- Thought processes
- Logical, directed toward a goal
- Judgment

- “Yes” Answer, Now What?
  - Is there an explanation?
  - Have patient mentioned it to a physician?
  - If yes, has it worsened?

- For whom?
  - All patients. In essence doing a general screening for all body systems, multi-system illnesses, and systemic illnesses

- When?
  - At which visit? Initial visit, to help prioritize the remaining relevant checklists
General Red Flag: Night Pain

- How many nights per week?
- Is there a consistent time when you wake up?
- How is intensity of pain at night compare to that during the day?
- What do you have to do to fall back asleep?

Red Flag Findings in patient History

Cancer

- > 50 years old
- Persistent pain at night
- Unexplained weight loss (10-15 lbs in < 2-weeks)
- Loss of appetite
- Unusual lumps or growths
- Unusual fatigue
- Previous Cancer

(+ ) Likelihood Ratio: 23.7

Henschke, Maher, Refshauge. Eur Spine J. 2007

REVIEW OF SYSTEMS: ACUTE CARE Labs

- WBC
- Platelets
- Hemoglobin
- Hematocrit
- Sodium
- Potassium
- Calcium
- Chloride
- Phosphate
- Magnesium
- INR
- Activated partial Thromboplastin Time (aPTT (Heparin))
- Prothrombin Time (Coumadin)
- Anti-factor Xa Assay
- Troponin
- Creatine Kinase
- Blood Urea Nitrogen
- Serum Creatinine
- Glucose
- A1C
General RED FLAG information for ACUTE CARE

- Does the patient’s presentation agree with the chart review you did?
- Are all the lines and tubes intact, working?
- Check cognition and vitals for abnormalities
- Know the codes in your hospital (i.e. Code blue, Code white, Brain Attack etc)
- Don’t leave the patient until someone has taken over care

REVIEW OF SYSTEMS: Infection

A patient may be admitted to the hospital with an infectious disease process acquired in the community or they may develop one as a complication from the hospital environment

“Health Care Associated Infection (HAI)”

Major source of HAIs in the US: major source likely related to the patient’s own endogenous flora, 40% associated with cross infection from poor hand hygiene

REVIEW OF SYSTEMS: Infection

Clinical Presentation

- Highly specific to the specific system that is involved
- Common physical findings that occur include sweating & inflammation
- Classic signs of inflammation (redness & swelling) can help to pinpoint the source of the infection (which is very important to help with diagnosis & treatment)
**REVIEW OF SYSTEMS: Infection**

**Vital Signs**

- **Heart Rate**: elevated due to the increased metabolic rate
- **Respiratory Rate**: elevated due to the increased metabolic rate
- **Blood Pressure**: elevated when metabolism is elevated BUT can be decreased d/t vasodilation from inflammatory response
- **Temperature**: Can provide information on progression of the infection (a rise in temperature) or a regression (a fall in temperature)

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**Labs**

**White Blood Cells**

<table>
<thead>
<tr>
<th>Normal range</th>
<th>5.0-10.0 X 10^9/L</th>
</tr>
</thead>
</table>

- **Causes for trend up (>11)**: infection, leukemia, neoplasm, trauma/surgery, obesity, inflammation, connective tissue disease
- **Presentation for increase**: Fever, malaise, lethargy, dizziness, bleeding, bruising, wt loss
- **Causes for trend down (<4)**: infections, chemo, aplastic anemia, autoimmune disease, hepatitis
- **Presentation for decrease**: anemia, weakness, fatigue, headache, dyspnea, fever

**Platelets**

<table>
<thead>
<tr>
<th>Normal range</th>
<th>140-400 k/uL</th>
</tr>
</thead>
</table>

- **Causes for trend up (>450)**: splenectomy, inflammation, cancer, stress, iron deficiency, infection, hemorrhage
- **Presentation for increase**: weakness, headache, dizziness, chest pain, tingling in hands/feet
- **Causes for trend down (<150)**: infection, leukemia, radiation/chemotherapy, malignancy, liver disease, aplastic anemia
- **Presentation for decrease**: petechiae, ecchymosis, fatigue, risk for bleeding, jaundice, splenomegaly

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**Causes for trend down (<1.5)**: stem cell disorder, viral/bacterial infection, radiation

**Presentation for decrease**: fever, skin abscesses, sore mouth, pneumonia

Symptoms-based approach when determining appropriateness for activity, especially when there is a fever

Consider timing of therapy based on early-morning low level & late-afternoon peak

**Elevated levels can lead to Venous Thrombotic Embolism**

**Fall risk awareness d/t risk of spontaneous hemorrhage**
### PRECAUTIONS TO PREVENT INFECTION

<table>
<thead>
<tr>
<th>Precaution</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td>Wash all patient situations as potentially infectious. Wash hands before and after each patient contact. Wear a clean set of gloves with each patient. If splashing of body fluids is likely, wear a mask or face shield, or both, and a gown.</td>
</tr>
<tr>
<td><strong>Aerosol</strong></td>
<td>A mask is required in situations where contagious pathogens can be transmitted by airborne droplet nuclei, as in the case of measles, varicella (chickenpox), or tuberculosis.</td>
</tr>
<tr>
<td><strong>Droplet</strong></td>
<td>A mask or face shield, or both, are required when large-particle droplet transmission (usually 3 ft or less) is likely. Droplet transmission involves contact of the conjunctiva or the mucous membranes of the nose or mouth with large-particle droplets (larger than 5 µm in size) generated from coughing, sneezing, talking, and certain procedures, such as suctioning and bronchoscopy. Examples of pathogens requiring droplet precautions are <em>Haemophilus influenzae</em>, <em>Neisseria meningitidis</em>, mycoplasmal pneumonia, streptococcal pneumonia, mumps, and rubella.</td>
</tr>
<tr>
<td><strong>Contact</strong></td>
<td>Gown and gloves are required when pathogens are transmitted by direct person-to-person contact or person-to-object contact. Examples of these pathogens include <em>Acinetobacter baumannii</em>, <em>Clostridium difficile</em>, <em>Escherichia coli</em>, herpes simplex virus, herpes zoster, methicillin-resistant <em>Staphylococcus aureus</em>, and vancomycin-resistant <em>Enterococcus</em>.</td>
</tr>
</tbody>
</table>

### REVIEW OF SYSTEMS: Infection

**INFLUENZA**: Clinical manifestations: Severe cough, abrupt onset of fever & chills, headache, backache, myalgia, exhaustion, nasal inflammation with discharge, and mild sore throat. GI signs & symptoms may also be present which include: nausea, vomiting, abdominal pain & diarrhea

**MRSA**: Clinical manifestations: Usually appears as a bump or infected area, red, swollen, warm to touch, filled with pus

**TUBERCULOSIS**: Clinical manifestations: Fever, an initial nonproductive cough, mucopurulent secretions that present later, and hemoptysis, dyspnea at rest or with exertion, adventitious breath sounds at lung apices, rales, pleural effusion, or pleuritic chest pain, hoarseness, and dysphagia, all of which may occur in the later stages.

**MENINGITIS / ENCEPHALITIS**: Clinical manifestations: Fever, Signs of meningeal irritation from increased ICP (severe frontal HA, nausea, vomiting, dizziness), altered level of consciousness, bizarre behaviors, seizures, aphasia, weakness, altered DTRs, ataxia, spasticity, tremors, flaccidity, hypothermia

**ONSTEOMYELITIS**: Clinical manifestations: Delayed onset of pain, tenderness, swelling, and warmth in the affected area. (Clarify weight bearing order only choose appropriate assistive device to prevent pathologic fracture.)

**CELLULITIS**: Clinical manifestations: Fever with an abrupt onset of hot, stinging, and itchy skin and painful, red, thickened lesions that have firm, raised palpable borders in the affected areas.
REVIEW OF SYSTEMS: Infection

GASTROINTESTINAL (bacterial: cdiff, e-coli, salmonella; viral: rotavirus, noravirus): Clinical manifestations: crampy abdominal pain, nausea, vomiting, and diarrhea, all of which vary in severity and duration according to the type of infection.

SEPsis: Three progressive infectious conditions including: bacteremia, septicemia, and septic shock
- Bacteremia: normally asymptomatic; bacterial invasion of blood from contaminated needles, catheters, monitoring transducers, or perfusion fluids; could also come from a preexisting infection; can resolve spontaneously or progress to septicemia
- Septicemia: symptomatic progression, representative of the infective pathogen and the organ(s) involved
- Septic shock: critical condition of systemic tissue hypoperfusion, primary cause of this is bacterial damage of the peripheral vascular system

EXAMINATION: Systems Review

CARDIOVASCULAR- PULMONARY
- Blood Pressure
- Heart Rate/Rhythm
- Respiratory Rate/Rhythm
- Oxygen Saturation
- Edema

Red Flag: Cardiovascular System

Medical Emergency
- No BP or extremely low BP with lack of mentation
- Elevated BP > 200 mm Hg / 110 mm Hg

Terminate Activity
- ACSM
  - Resting Systolic > 200 mm Hg
  - or < 80 mm Hg
  - Resting Diastolic > 100 mm Hg
REVIEW OF SYSTEMS: Cardiac

HYPERTENSION
- Headache
- Dizziness
- Flushed face
- Spontaneous nose bleed
- Blurred vision
- Night urinary frequency

HYPOTENSION
- Light-headedness
- Syncope
- Visual disturbance
- Sense of weakness
- “Rubbery” legs

REVIEW OF SYSTEMS: Cardiac Labs

Hemoglobin

<table>
<thead>
<tr>
<th>Normal range</th>
<th>Men: 14-17.4 g/dL</th>
<th>Women: 12-16 g/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Values</td>
<td>&lt;5-7 g/dL or &gt;20 g/dL</td>
<td></td>
</tr>
</tbody>
</table>

Blood transfusions sometimes given between 7-8 g/dL

Causes for trend up: congenital heart disease, dehydration, CHF, severe burns, COPD

Presentation for increase: orthostasis, dizziness, arrhythmias, seizure, TIA symptoms, chest pain

Causes for trend down: anemia/blood loss, nutrition, symptoms, IBI, splenomegaly, sarcoidosis, kidney disease, sickle cell anemia, stress to bone marrow, RBC destruction

Symptoms-based approach when determining appropriateness for activity, monitor symptoms, collaborate with team

Hematocrit

<table>
<thead>
<tr>
<th>Normal range</th>
<th>Men: 42-52%</th>
<th>Women: 37-47%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Values</td>
<td>&lt;15-20% or &gt;60 g/dL</td>
<td></td>
</tr>
</tbody>
</table>

Blood transfusions sometimes given at <25%

Causes for trend up: COPD, burns, eclampsia, CHF, high altitude, dehydration

Presentation for increase: fever, headache, dizziness, weakness, fatigue, bruising/bleeding

Causes for trend down: leukemia, multiple myeloma, pregnancy, high altitude, hypothyroid, cirrhosis, RA, hemorrhage

Presentation for decrease: pallor, skin, headache, dizziness, chest pain, arrhythmia, dyspnea

Symptoms-based approach when determining appropriateness for activity, monitor symptoms, collaborate with team
REVIEW OF SYSTEMS:
Cardiac Labs

**Serum Viscosity**

<table>
<thead>
<tr>
<th>International Normalized Ratio (INR)</th>
<th>Activated Partial Thromboplastin Time (aPTT/Heparin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Range: 0.8 - 1.2</td>
<td>Normal Range: 21-35 seconds</td>
</tr>
<tr>
<td>VTE, PE, aVT</td>
<td>High Risk for Bleeding: &gt;70 seconds</td>
</tr>
<tr>
<td>Therapeutic Range: 2.0-3.0</td>
<td>Therapeutic for Effectiveness of anticoagulant:</td>
</tr>
<tr>
<td>Stroke prophylaxis</td>
<td>2-3 times normal range (60-109 seconds)</td>
</tr>
<tr>
<td>Higher Risk for Bleeding: &gt;3.6</td>
<td>Anti-Factor Xa Assay (Unfractionated</td>
</tr>
<tr>
<td></td>
<td>Heparin &amp; Low Molecular Weight Heparins)</td>
</tr>
<tr>
<td>Prothrombin Time: Coumadin</td>
<td>Therapeutic Range LMWH: 0.5-1.2 IU/mL</td>
</tr>
<tr>
<td>Normal Range: 11-13 seconds</td>
<td>Therapeutic Range UH: 0.3-0.7 IU/mL</td>
</tr>
<tr>
<td>High Risk for Bleeding: &gt;25 seconds</td>
<td></td>
</tr>
</tbody>
</table>

**Troponin**

Normal <0.03 ng/mL

The trend will be important in decision making for physical therapy

**Creatine Kinase**

Normal: 30-170 U/L

CK2-MB Cardiac Muscle
Commonly elevated in MI within 3-6 hours of cardiac injury then returns to normal within 2-3 days (peaks 18-24 hrs)

(sensitivity & specificity is lower than troponin levels)

**Arrhythmias**

- Changes in rhythm can be normal
- If normal rhythm and then suddenly irregular, Ask, "Do you have history of this?"
- Usually, > 6 abnormal bpm, requires medical attention
Any rhythm other than normal sinus rhythm is considered an arrhythmia.

Emergency arrhythmias vs non-emergent arrhythmias

How will you proceed?

Check vitals (manually preferred), check symptoms, call nurse for non-emergent concerns, 12-lead EKG may be needed, call emergency code for emergent concern

Do Not Treat:

- Supraventricular Tachycardia - regular rhythm with a rate of 160-250 bpm
- Atrial Fibrillation - irregular rhythm, atrial has no rate (quivers), hold PT for new-onset afib
- Ventricular Tachycardia - usually regular rhythm with a rate >100, no P wave
- Ventricular Fibrillation - chaotic rate & rhythm

Treat:

- Atrial Flutter - regular or irregular rhythm, atrial rate 250-350; treatment based on patients tolerance to rhythm
- Atrial Fibrillation - irregular rhythm, atrial has no rate (quivers), chronic afib that is medically managed can do treatment based on patients tolerance
- Premature Ventricular Contractions (PVCs) - irregular rhythm, couplet is 2 in a row, bigeminy is every other beat, trigeminy is every third beat; frequency will dictate treatment, stop treatment if >6 per minute
- Sinus Tachycardia & Sinus Bradycardia - regular rhythm; treatment based on symptoms & tolerance
Red Flag: Cardiovascular System

Cardiovascular
- Shortness of Breath
- Dizziness
- Pain / heaviness in chest
- Pulsating pain
- Discolored / painful feet
- Swelling

Stith, Sahrmann, Dixon, Norton. Curriculum to prepare diagnosticians in physical therapy. / Phys Ther Educ. 1995; 9 (3)

Cardiac Conditions Requiring Referral

- Angina at rest
- Angina not relieved in 20 minutes
- Requiring > 3 sublingual nitroglycerin tablets for pain relief
- Angina not relieved by nitroglycerin
- Angina not relieved by rest
- Cool, sweaty, and moist upper back region
- Angina increasing after stimulus has been eliminated
- Changes in angina characteristics
- Severe chest pain with /without nausea or vomiting
- Angina pain radiating to jaw or left arm
- Patient has doubts about condition

Lower Quarter Screening: DVT Clinical Prediction Rule

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (treatment ongoing, within 6 months, or palliative)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis or recent plaster immobilization of the lower extremities</td>
<td>1</td>
</tr>
<tr>
<td>History consistent for 2 days or more of major surgery within 12 weeks requiring general or regional anesthesia</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along the distribution of the deep venous system</td>
<td>1</td>
</tr>
<tr>
<td>Pitting swelling</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling at least 3 cm larger than asymptomatic side</td>
<td>1</td>
</tr>
<tr>
<td>Bilateral superficial vein pain or swelling</td>
<td>1</td>
</tr>
<tr>
<td>Previously documented DVT</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis at least as likely as DVT</td>
<td>-2</td>
</tr>
</tbody>
</table>

Clinical probability simplified score

| DVT “likely” | 2 points or more |
| DVT “unlikely” | 2 points |

Screening for Pulmonary Embolism

A proximal LE DVT (in or above the popliteal vein) is associated with a 50% risk of PE if not treated. Compared with 20-25% of LE DVTs below the knee.

Reduced mobility = increased risk of VTE

Surgery with anesthesia time of >90 min or if surgery involves pelvic or lower limb & anesthesia time is >60 min = increased risk of VTE

Early ambulation following LE DVT diagnosis has not been associated with an increased incidence of PE or progression of LE DVT when compared to bedrest (There was actually a lower incidence of new PE and lower mortality)

DVT/PE Protocols in Acute Care

- Wells Clinical Prediction Rule
  - As the score goes up, so does the likelihood of a LE DVT
  - This relationship has been shown to hold up across outpatient and inpatient settings
  - This should help guide selection of medical testing

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical signs and symptoms of DVT (e.g., swelling and pain with palpation in the deep vein region)</td>
<td>3.0</td>
</tr>
<tr>
<td>An alternative diagnosis is less likely than PE</td>
<td>3.0</td>
</tr>
<tr>
<td>Rest rate &gt;100 beats per minute</td>
<td>1.5</td>
</tr>
<tr>
<td>Immobilization or surgery in the previous four weeks</td>
<td>1.5</td>
</tr>
<tr>
<td>Previous DVT or PE</td>
<td>1.0</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1.0</td>
</tr>
<tr>
<td>Malignancy (no treatment, treated in the past six months, or palliative care)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Interpretation of Point Total**

<table>
<thead>
<tr>
<th>Score</th>
<th>Mean Probability</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2 points</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>2 to 8 points</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;8 points</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>


Signs and Symptoms of a LE DVT
- Pitting edema
- Tenderness and pain in leg
- Erythema
- Warmth
- Swelling of the leg
- Prominent superficial veins
DVT/PE Protocols in Acute Care

**Anticoagulation**
- Decreased risk of PE in those properly anti-coagulated
- Review medications prior to mobility
- Options include: unfractionated heparin, low molecular weight heparin, coumadin, fondaparinux, and oral thrombin or Xa-Inhibitors

INR between 4.0-5.0 resistive exercises should be avoided (maintain RPE 11 or less), hold ambulation if gait is too unsteady and patient has high fall risk

INR >5, speak with physician regarding patient safety

INR >6, medical team should consider bedrest

**Current Anticoagulation Options In Use**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Peak Therapeutic levels achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfractionated Heparin (Heparin)</td>
<td>24-48 hours</td>
</tr>
<tr>
<td>Low Molecular Weight Heparins</td>
<td>3-5 hours</td>
</tr>
<tr>
<td>Fondaparinux (synthetic drug)</td>
<td>2-3 hours</td>
</tr>
<tr>
<td>Vitamin K antagonists (Coumadin)</td>
<td>used with WP heparin or UFH INR 2-3.2</td>
</tr>
<tr>
<td>Oral direct thrombin inhibitors (Pradaxa)</td>
<td>peak achieved in 2 hours</td>
</tr>
<tr>
<td>Oral direct Xa inhibitors (apixaban, Eliquis)</td>
<td>2-3 hours</td>
</tr>
</tbody>
</table>

Early ambulation is possible as soon as anticoagulation has been initiated and therapeutic levels have been reached

**REVIEW OF SYSTEMS: Pulmonary**

**OBSERVATION**
- General appearance & alertness
- Ease of talking
- Skin Color
- Posture & chest shape
- Ventilatory/breathing pattern
- Digital clubbing
- Presence of supplemental O2 & other medical equipment
- Presence and location of surgical incisions

**Breathing Pattern**

<table>
<thead>
<tr>
<th>Breathing Pattern</th>
<th>Description</th>
<th>Associated Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apnea</td>
<td>Lack of airflow to the lungs for &gt;15 seconds</td>
<td>Anxiety, respiratory distress, acute respiratory failure</td>
</tr>
<tr>
<td>Gastho respirations</td>
<td>Central increased rate and depth of respiration followed by periods of apnea or stopping &gt;15 seconds</td>
<td>Elevated intracranial pressure, meningitis</td>
</tr>
<tr>
<td>Bradypnea</td>
<td>Ventilatory rate of breathing per minute</td>
<td>Use of sedatives, narcotics, or alcohol; neurologic or metabolic disorders; excessive fatigue</td>
</tr>
<tr>
<td>Cheyne-Stokes respirations</td>
<td>Increasing depth of ventilation followed by a period of apnea</td>
<td>Elevated intracranial pressure, CHF, narcotic overdose</td>
</tr>
<tr>
<td>Hypoventilation</td>
<td>Decreased rate and depth of ventilation resulting in increased fluid</td>
<td>Sedation or insufficiency, neurologic depression of respiratory centers, overmedication, metabolic alkalosis</td>
</tr>
<tr>
<td>Hyperventilation</td>
<td>Increased rate and depth of ventilation resulting in decreased fluid</td>
<td>Activity, pulmonary infections, CHF</td>
</tr>
<tr>
<td>Kussmaul respirations</td>
<td>Increased regular rate and depth of ventilation</td>
<td>Diabetic ketoacidosis, renal failure</td>
</tr>
<tr>
<td>Orthopnea</td>
<td>Diaphragm that occurs in a flat supine position, relief occurs with more upright walking or standing</td>
<td>Diaphragm paralysis, ventilator malfunctions, respiratory muscle fatigue</td>
</tr>
<tr>
<td>Paradoxic ventilation</td>
<td>Inward abdominal or chest wall movement with inspiration and outward movement with expiration</td>
<td>Diaphragm paralysis, ventilator malfunctions, ventricular wall trauma</td>
</tr>
<tr>
<td>Sight respirations</td>
<td>The presence of a sigh ≥2-3 times per minute</td>
<td>Angina, anxiety, dyspnea</td>
</tr>
<tr>
<td>Tachypnea</td>
<td>Ventilatory rate of breathing per minute</td>
<td>Acute respiratory distress, fever, pain, anxiety, infection</td>
</tr>
<tr>
<td>Hoover’s sign</td>
<td>The inward motion of the lower rib cage during inspiration</td>
<td>Flattened diaphragm often related to decompensated or incompensated hyperventilation of the lungs</td>
</tr>
</tbody>
</table>
REVIEW OF SYSTEMS: PULMONARY

Continuous Sounds
- WHEEZE: occur with airway obstruction from bronchoconstriction or retained secretions; commonly heard on expiration; may be high or low pitched
- RHONCHI: low pitched sounds; associated with large airway obstruction
- STRIDOR*: an extremely high pitched wheeze that occurs with significant upper airway obstruction; present during inspiration and expiration
  *MEDICAL EMERGENCY - notify nursing/medical staff if this occurs during a treatment

Discontinuous Sounds
- CRACKLES: bubbling or popping sounds; presence of fluid (pulmonary edema) or secretions (pneumonia); described as "wet" or "crackling" sudden opening of closed airways (atelectasis); described as "dry"

REVIEW OF SYSTEMS: Pulmonary

Accessory Muscle Use
- Changes in tissue and mechanical properties in the pulmonary system can result in accessory muscle use being used earlier in activity or even at rest
- Those with advanced conditions may automatically assume positions to optimize accessory muscle use (forward leaning on forearms)

REVIEW OF SYSTEMS: PULMONARY

Hemoptysis: The expectoration of blood during cough
- dark red/brown
- bright red

New blood in sputum? notify nurse

Oximetry: Measures the saturation of peripheral oxygen (SpO2)
- What can affect readings? poor circulation, movement of sensor cord, cleanliness of sensors, nail polish, intense light, increased levels of carboxyhemoglobin, jaundice, skin pigmentation, shock states, cardiac dysrhythmias, and severe hypoxia
  (Check for proper waveform or pulsations to ensure accurate readings)
REVIEW OF SYSTEMS: Pulmonary Labs

Arterial Blood Gases (ABG’s)

- Examines acid-base balance (pH), ventilation (CO2 levels), and Oxygenation (O2 levels)
- Normally sampled from an indwelling arterial line

**Normal:**
- pH: 7.35-7.45
- PaO2: 80-95 mmHg
- PaCO2: 37-43 mmHg
- HCO3: 20-30 mmol/L

**Implications for acid-base disorders:**
- May need to coordinate treatments around ventilation
- May need to coordinate mobility around dialysis (metabolic acidosis)
- Consider risk of arrhythmias with mobility (metabolic acidosis)

<table>
<thead>
<tr>
<th>Acidosis</th>
<th>Respiratory</th>
<th>Metabolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH &lt;7.35</td>
<td>PaCO2 &gt;45mmHg</td>
<td>HCO3 &lt;24mmol/L</td>
</tr>
<tr>
<td>Causes:</td>
<td>COPD, Neumoclastic disease (ALS, MS, PD), asthma, drug overdose, decreased lung compliance, pulmonary edema, sleep apnea</td>
<td>Causes: Increased acid production, decreased renal acid excretion, laxative abuse, thiazide diuretics, massive diuretics</td>
</tr>
<tr>
<td>Symptoms:</td>
<td>confusion, fatigue, lethargy, SOB, oliguria</td>
<td>Symptoms: lactic acidosis, ketoacidosis, kidney disease, cardiac arrhythmia, diabetes, anxiety</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alkalosis</th>
<th>Respiratory</th>
<th>Metabolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH &gt;7.45</td>
<td>PaCO2 &lt;35mmHg</td>
<td>HCO3 &gt;30mmol/L</td>
</tr>
<tr>
<td>Causes:</td>
<td>COPD, pain, anxiety, fever, CIV, CVA, PE, meningitis, psychosis Pulmonary embolism</td>
<td>Causes: vomiting, diarrhea, diuretics, decreasing ventilation causing increasing hypercapnia, CF</td>
</tr>
<tr>
<td>Symptoms:</td>
<td>dyspnea, paresthesia, chest pain, confusion, nausea</td>
<td>Symptoms: CO2 retention, decreasing ventilation</td>
</tr>
</tbody>
</table>

American Thoracic Society Dyspnea Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>Slight</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
</tr>
<tr>
<td>3</td>
<td>Severe</td>
</tr>
<tr>
<td>4</td>
<td>Very severe</td>
</tr>
</tbody>
</table>

- Not troubled with breathlessness except with strenuous exercise
- Troubled by shortness of breath when hurrying or walking up a slight hill
- Walks slower than people of the same age on the level because of breathlessness, or has to stop for breath when walking at own pace on the level
- Stops for breath after walking about 100 yards or after a few minutes on the level
- Too breathless to leave the house or breathe when dressing or undressing

Pulmonary Conditions Requiring Referral

- Shoulder pain aggravated in supine position
- Shoulder or thoracic pain lessening with lying on painful side
- Abnormal breath, or lung sounds
- Worsening shortness of breath
- Exercise induced asthma or bronchial activity
- Angina at Rest

EXAMINATION: Systems Review

INTEGUMENTARY
- Pliability (texture)
- Presence of scar formation
- Skin color
- Skin Integrity
- Wound healing
- Temperature
- Dry / moist
- Masses, lumps
- Rash
- Hair
- Nails

REVIEW OF SYSTEMS: Integumentary

Checking the Skin
- Asymmetry
- Border
- Color
- Diameter
- Elevation
REVIEW OF SYSTEMS: Integumentary

Normal mole

NonMelanomas

Risk Factors
- Basal/Squamous Cell
- Family History
- Immunosuppression
- Prolonged sun exposure**
- Highest Risk
- Pre-malignant skin lesions
- Radiation therapy
- Local exposure to tar and oil
- Fair Skin

Squamous Cell Carcinoma
- Melanoma


REVIEW OF SYSTEMS: Integumentary

Observation
- Skin color
- Edema
- Atrophy
- Warmth
- Shiny
- Skin lesions
- Digital clubbing
- Gait abnormalities
- Pulse abnormalities
- Odor
- Drainage

Compartment Syndrome: circulation in a closed compartment is compromised by increased pressure causing necrosis of muscles and nerves
- Normally seen after traumatic injuries or from a chronic condition that develops from overuse such as strenuous exercise
- Permanent muscle damage after 4-12 hrs, nerve damage after 8 hrs
- Treatment: preventing external compression, limb elevation/proper positioning, fasciotomy (physical therapy ROM/weightbearing precautions)

Lymphedema: chronic disorder with an abnormal collection of lymph fluid in the tissues, most common cause is mechanical insufficiency of the system
- Primary: congenital or hereditary
- Secondary: injury to the lymphatic system
REVIEW OF SYSTEMS: Integumentary Burns

Observation
- Level of consciousness
- Presence of agitation, pain, and stress
- Location of the burn or graft, including proximity of the burn to a joint
- Presence and location of dressings, splints, or pressure garments
- Presence of lines, tubes, or other equipment
- Presence and location of edema
- Posture
- Position of head, trunk, and extremities
- HR and BP, respiratory rate and pattern, and oxygen saturation

When treating a patient with burn injuries:
- Avoid popping any blisters on the skin during palpation or with manual contacts.
- Do not place a blood pressure cuff over a burn or graft site or an area of edema.
- Be cautious with gait belt placement where trunk burns are present. Nylon belts are preferable for easier cleaning and infection management.

REVIEW OF SYSTEMS: Integumentary Wounds

Observation
- sensation
- pain
- ROM
- strength
- functional mobility
- edema & circulation
- wound color/drainage
REVIEW OF SYSTEMS: Integumentary

Wounds

- Pain Management...coordinate around medication, work on positioning, relaxation, deep breathing, exercise or modalities

- ROM/Strength/Mobility...necessary for proper positioning and minimizing risk of pressure ulcers, be careful with fragile skin and dressings during exercise, strength necessary for weight shifting and following any precautions

REVIEW OF SYSTEMS: Integumentary

Acute Care Equipment

Presence of certain equipment in a patient’s room can give you an idea of the patient’s general medical condition and the appropriateness of physical therapy interventions

As long as a patient is appropriate for therapy, equipment should not limit us

- Make sure you check for lines, tubes, drains on your patient.
- Make sure they are still intact & working
- Make sure the IV is intact, working, & not infiltrating into the patient
- How much output does the patient have out of their drains?
- Does any output look cloudy? Bloody? Off color?
- Do you notice any odor at any surgical sites, wounds, or drains?
- Do all the signs & symptoms make sense or are there concerns for new infection?

EXAMINATION: Systems Review

MUSCULOSKELETAL

- Gross ROM
- Gross Strength
- Gross Symmetry
- Height
- Weight
  * Body Mass index
REVIEW OF SYSTEMS: Musculoskeletal

- Insidious onset
- Atypical pain pattern
- Night pain
- Inadequate relief from rest / Rehab
- Inability to change symptoms during exam

REVIEW OF SYSTEMS: Musculoskeletal Labs

Creatine Kinase
Normal: 30-170 U/L

CK3-MM Skeletal Muscle
>15-20k following strenuous exercise but not considered rhabdomyolysis

Review of Systems: Musculoskeletal Acute Care

- Common orthopedic diagnoses seen by physical therapists in the acute care setting include degenerative joint disease, spinal disorders, and fractures associated with trauma.
- Because many patients with these conditions have undergone surgical interventions, physical therapists must be familiar with physician-dICTed precautions such as weight-bearing limitations and range-of-motion (ROM) restrictions.
- Be aware of equipment needs such as braces, orthotics, and assistive devices
**Review of Systems: Musculoskeletal Acute Care**

What affects does medication have on the patient?
- residual effects of general anesthesia (woozy, confused, delirious, weak)
- local anesthetic effects from epidural or spinal block (diminished sensation or motor function)
- opioid analgesics commonly used, be aware of their side effects

Talk to the nurse before you go in
- how has their pain been? when did they get their pain medicine?
- anything you should know before you see the patient?

**Observation**
- equipment
- extremity position
- skin/incision check

---

**RED FLAG: Hip Dislocation**

- Patient-specific risk factors for displacement of a hip endoprosthesis include advanced age, accompanying neurologic disease, and impaired compliance.
- Operation-specific risk factors include suboptimal implant position, insufficient soft-tissue tension, and inadequate experience of the surgeon.
- The risk of dislocation after primary total hip arthroplasty is ~2%
- Dislocation rates of up to 26% are found after revision and implant exchange surgeries
- Reduced rates of dislocation with anterior surgical approach when compared to posterior approach

Dargel J et al. Dislocation Following Total Hip Replacement. Dtsch Arztebl Int. 2014 Dec; 111(51-52)

---

**RED FLAG: Hip Dislocation**

Internally rotated, shortened leg
RED FLAG: Pelvic Fracture

- Plain radiographs may miss the presence of pelvic fractures
- Increased mortality in the elderly
- Closed (more common) vs Open (low rates, especially in elderly)
- Pubic rami is the most frequent location for pelvic fracture
- The most common mechanisms of injury include MVA, low energy falls, high energy falls
- Urinary complications have been associated with pelvic fractures


Multiple authors. Survivorship and severe complications are worse for octogenarians and elderly patients with pelvic fractures as compared to adults. Data from the National Trauma Data Bank. Journal of Osteoporosis. Vol 2012


Red Flag Screening: Low Back Pain

- Aortic Abdominal Aneurysm
- Vertebral fracture
- Cancer
- Infection
- Cauda Equina

Red Flag Screening: Low Back Pain

Vertebral Fracture

Clinical Prediction Rule (CPR)
1. Female
2. Age >70
3. Prolong use of steroids
4. Significant fall > 5 ft

≥3 +’s Sp=0.834 refer out

Sizer, F et al 2007; Bansal et al 2009
Red Flag Screening: Low Back Pain

**Abdominal Aortic Aneurysm**

1. Throbbing, pulsating in lumbar region at rest or recumbent **
2. Pulsating abdominal mass**
3. Hx of PVD, CAD
4. Age > 60

**Refer out

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Mechelli F et al 2008 JOSPT (10 cm aneurysm)

Abdominal Palpation

**Abdominal Aorta Artery**

- Between xiphoid and umbilicus
- Assess width of pulse by placing index fingers
- Slowly move fingers apart
- If width > 2 cm, or if have back pain, should auscultate over the blood vessel, and if pain present or bruit heard, contact physician

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Red Flag Screening: Low Back Pain

**Cancer**

1. Hx of Cancer
2. Night pain (waking up from pain)
3. Unexplained wt loss >10 lbs **
4. Age >50 or <20
5. Failure to improve after > 1 month of rx.

**Refer out if yes in isolation

Recommend Hx of Cancer +1, refer out
Red Flag Screening: Low Back Pain

**Infection**
1.) Hx of recent infection
2.) Systemically unwell
3.) Hx of recent IV drug abuse **
4.) Constant, progressive pain (not improving)

** Refer out if yes in isolation with non-mechanical presentation.**

 Recommend if Hx of recent infection and not improving with constant, progressive pain, then refer out.

---

Red Flag Screening: Low Back Pain

**Cauda Equina Syndrome**
1. Saddle anesthesia **
2. Urinary retention-unexplained **
3. Fecal incontinence **
4. Non-dermatomal loss of sensation
5. Non-myotomal weakness

** Recommend refer out if yes in isolation

---

Time Sensitive Red Flags

**AAA**

**Cauda Equina**

**ER visit advisable**
Cervical Fracture Screen

Extremity Fracture Clinical Decision Rules

Ottawa Ankle Rule
- Unable to weight bear or take 4-steps
- Malleolar or midfoot pain
- Tenderness to touch posterior tibia
- Tenderness to touch medial malleoli
- Tenderness to touch navicular bone

Radiograph if 1st 2 (+) and tenderness over any of above

➢ Study found a 27% reduction in radiography rates
➢ Patients spent ~ 36 minutes less time in ED without radiography


Extremity Fracture Clinical Decision Rules

Ottawa Knee Rule
- Age > 55 years
- Unable to weight bear and walk 4-steps
- Tender to touch over patella
- Tender to touch over fibular head
- Unable to flex knee > 90 deg

➢ Study found a reduction in radiography rates of 26%
➢ Patients spent an average of 33 minutes less in ED than those that had radiographs

Patellar Pubic Percussion Test

- Normal bone has clear “crisp” sound
- Bony disruption:
  - Dull, muffled, or diminished
- Legs positioned symmetrically
- “Grab” patella and hold

Sensitivity of 0.96 and Specificity of 0.86 (95% CI 0.49-0.98) with a positive predictive value of 6.73 and a negative predictive value of 0.75.


Sensitivity 0.96, Specificity 0.76
- Positive tests warrant a bone scan or MRI


Olecranon-Manubrium Percussion Test

- Specificity 99%
- +LR 84.0
- Used to detect a fracture between the olecranon and manubrium

EXAMINATION: Systems Review

NEUROLOGICAL
- Gross coordinated movements
  - Balance
  - Locomotion
  - Transfers
  - Transitions
- Motor Function
  - Motor Control and Learning

REVIEW OF SYSTEMS: Neurological
- Numbness / paresthesias
- Weakness
- Abnormal reflexes
- Clonus / spasticity
- Syncope
- Tremors

RED FLAGS: Neurological
- Changes in hearing
- Frequent /severe HA, without trauma
- Problems with swallowing or speech
- Changes in vision
- Fainting spells (Drop attacks)
- Sudden Weakness
REVIEW OF SYSTEMS: Neurological

Observation: What info can we gather from observing?

- alertness?
- body position?
- active movement?
- interaction with others?
- involuntary movements?
- eye movements?

neglect?
- muscle atrophy?
- respiratory rate/pattern?
- facial expression and symmetry?
- how easy/hard ADLs are?

---

REVIEW OF SYSTEMS: Neurological

- Transient Ischemic Attack (TIA): brief episode of neurologic dysfunction, symptoms typically last <1 hr, infarction evidence is lacking, 10-15% of patients with a TIA will have a stroke within 90 days, 5% will have a stroke within 2 days
- Cerebrovascular Accident (CVA): neurologic deficits lasting >24 hrs, can be ischemic or hemorrhagic

RISK FACTORS: HTN, CAD, HLD, afib, hypercoagulability, DM, obesity, smoking, ETOH abuse, physical inactivity

---

REVIEW OF SYSTEMS: Neurological

Patients with hemorrhagic CVA have a poorer prognosis than those with an ischemic CVA with a 30 day mortality rate of 35-50%

tPA (Tissue Plasminogen Activator):
- protein involved in breaking down clots
- needs to be given within 4.5 hrs of symptom onset
- strict BP control for 24 hrs, typically on bedrest and therapy is held for this time*

---
REVIEW OF SYSTEMS: Neurological

Many procedures/surgeries involved with neurological diagnoses.
- Know what lines & tubes are hooked up, what they do, and what precautions they have
- Understand post-operative therapy management and precautions

Screening Level of Consciousness

- Hyperalert: heightened arousal with increased sensitivity to immediate surroundings, they can be verbally and physically threatening, restless, and/or aggressive.
- Confused: disoriented, bewildered, and having difficulty following commands.
- Somnolent: sleepy, responding to stimuli only with incoherent mumbles or disorganized movements.
- Lethargic: reduced level of alertness with decreased interest in the surrounding environment.
- Obtunded: the patient has a lessened interest in the environment, has slowed responses to stimulation, and tends to sleep more than normal, with drowsiness in between sleep states.
- Stuporous: profoundly reduced alertness and requiring continuous noxious stimuli for arousal.
- Comatose: state of deep, unarousable, sustained unconsciousness.

Is there a change since a prior therapy session? Better? Worse?
Does the level of consciousness make sense with the patient’s physiological status?

What do you do if your patient’s mental status changes?

- Loss of Consciousness (LOC): check for presyncopal signs (diaphoresis, pallor, decreased responsiveness, knee buckling), lower patient to bed or chair, alert RN, check vitals. DO NOT leave patient unattended until they regain consciousness or other health care professionals arrive.
# REVIEW OF SYSTEMS: Neurological Tools for Screening Level of Consciousness

## Richmond Agitation & Sedation Scale (RASS)

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
<th>CAM-ICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Comatose</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Flaccid</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Very agitated</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Agitated</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Light sedation</td>
<td>Yes</td>
</tr>
<tr>
<td>1</td>
<td>Moderate sedation</td>
<td>Yes</td>
</tr>
<tr>
<td>0</td>
<td>Bored</td>
<td>No</td>
</tr>
<tr>
<td>-1</td>
<td>Not fully alert but aware, able to follow simple commands</td>
<td>Yes</td>
</tr>
<tr>
<td>-2</td>
<td>Talkative</td>
<td>Yes</td>
</tr>
<tr>
<td>-3</td>
<td>Stressed</td>
<td>Yes</td>
</tr>
<tr>
<td>-4</td>
<td>Active but not continually aware, sees or hears</td>
<td>Yes</td>
</tr>
<tr>
<td>-5</td>
<td>Drowsy</td>
<td>Yes</td>
</tr>
<tr>
<td>-6</td>
<td>Comatose</td>
<td>Yes</td>
</tr>
</tbody>
</table>

## CAM-ICU (Confusion Assessment Method for the Intensive Care Unit)

1. Acute Change or Progressing Course of Known Illness:
   - Have any acute changes occurred during the past 24 hours?
   - CAM-ICU marker: YES/NO DELIRIUM

2. Inattention:
   - 1. “Where am I?” or, “What’s this?”
   - 2. “What is your name?” and “What’s the date?”
   - 3. “What’s the time of day?”
   - CAM-ICU marker: YES/NO DELIRIUM

3. Current RASS score:
   - RASS score of zero
   - CAM-ICU marker: DELIRIUM

4. Disorganized Thinking:
   - 1. “What is your address?”
   - 2. “Do you know what day it is?”
   - 3. “Do you know what season it is?”
   - CAM-ICU marker: DELIRIUM
REVIEW OF SYSTEMS: Neurological
Falls
• Common causes: hypoglycemia, orthostatic hypotension, knee buckling, LOC, low SpO2, poor vision, poor balance
• If you begin to transfer patient and you are unable to complete you may have to lower patient to the ground
  • Use proper body mechanics
  • Hovermatt

REVIEW OF SYSTEMS: NEUROLOGICAL
Alarms & Restraints
• Bed and chair alarms: for impulsive patients with decreased safety awareness who may hurt themselves when trying to get OOB
• Restraints: soft wrist restraints, mittens, vest, raising all 4 bed rails

REVIEW OF SYSTEMS: NEUROLOGICAL
Aspiration precautions
Due to poor muscle control/weakness and decreased coordination of facial muscles
  • Speech therapy swallow eval
  • Special diets
  • NPO, PEG/Dobhoff for alternative nutrition
  • HOB elevated greater than 30 degrees regularly, at 90 degrees during meals and 30 minutes after
  • Place feeding tube on hold if lowering head less than 30 degrees
REVIEW OF SYSTEMS: Gastrointestinal

- Difficulty with swallowing
- Heartburn, indigestion
- Specific food intolerance
- Nausea
- Vomiting
- Change in appetite
- Excessive belching, flatulence
- Bowel habits
- History of liver, gallbladder, stomach problems

REVIEW OF SYSTEMS: Genitourinary

- Urinary frequency, including nocturia
- Dysuria
- Hematuria
- Reduced caliber or force of urine stream
- Incontinence
- History of urinary, kidney infections

REVIEW OF SYSTEMS: GI/GU Labs

**Sodium**

Normal range: 134-142 mEq/L

**Causes for trend up:** increased sodium intake, severe vomiting, CHF, renal insuff, Cushing's, DM

**Causes for trend down:** diuretic use, GI loss, burns/wounds, cirrhosis

**Presentation for increase:** irritability, agitation, seizure, coma, hypotension, tachy, decreased urinary output

**Presentation for decrease:** headache, lethargy, decreased reflexes, tachycardia, seizures, coma, orthostatic hypotension, pitting edema

**Clinical Implications:**
- Impaired cognitive skills
- Seizure precautions for those with a hx
- Monitor vitals for hypotension
### REVIEW OF SYSTEMS: GI/GU Labs

#### Potassium

**Normal range:** 3.7-5.1 mEq/L.

**Causes for trend up:** renal failure, metabolic acidosis, DKA, Addison's disease

**Causes for trend down:** malnutrition, restrictive diet, ETOH abuse, diuretics/vomiting, diarrhea, Cushings

**Presentation for increase:** paresthesia, muscle weakness/paralysis, bradycardia, heart block, v-fib, cardiac arrest

**Presentation for decrease:** extremity weakness, decreased reflexes, paresthesia, leg cramps, EKG changes, cardiac arrest, hypotension

**Clinical Implications:**
- Symptoms-based approach when determining appropriateness for activity
- With higher levels patient may exhibit muscle weakness
- With severe hypokalemia speak with medical team

#### Blood Urea Nitrogen (BUN)

**Normal range:** 6-25 mg/dL.

**Causes for trend up:** high protein diet, renal failure, CHF, GI bleed, fever

**Causes for trend down:** hepatic disease, malnutrition

**Presentation for increase:** HTN, fluid retention, fatigue, poor appetite, nausea/vomiting, itchy/dry skin, decreasing cognition, dyspnea

**Presentation for decrease:** uncommon

**Clinical Implications:**
- Decreased tolerance to activity
- Symptoms based approach when determining appropriate activities

#### Serum Creatinine

**Normal range:**
- Male 0.7-1.3 mg/dL
- Female 0.4-1.1 mg/dL

**Causes for trend up:** renal disease, muscular dystrophy, rhabdomyolysis, dehydration

**Causes for trend down:** age, low muscle mass, liver disease, low protein diet, pregnancy

**Presentation for increase:** decreased urine output, dark urine, edema, back pain, dyspnea, fatigue, low fever, headache, confusion

**Presentation for decrease:** fatigue, can be a precursor to autoimmune disease

**Clinical Implications:**
- Decreased tolerance to activity
- Symptoms based approach when determining appropriate activities
RED FLAGS: Gastrointestinal/Genitourinary

- Frequent abdominal pain
- Frequent heartburn / indigestion
- Change /problems with bladder function
- Unusual menstrual irregularities

REVIEW OF SYSTEMS: Psychiatric

- Nervousness
- Tension
- Depression
- Psychological disorders
- Dementia
- History of physical/mental abuse
- History of alcohol or drug addiction

Depression Screen

Two-question instrument

“During the past month have you often been bothered by feeling down, depressed, or hopeless?”
“During the past month have you often been bothered by having little interest or pleasure in doing things?”

- If Yes to either or both questions: 96% sensitivity, 57% specificity

Third-question?

“Is this something in which you would like help?”

- Decreases Sensitivity (59.4%) Increases specificity (88.2)
Cognitive Screening Tools

**Mini-Cog**: 3 minute instrument used to detect cognitive impairment in older adults

Recommended scoring for dementia screen:
- 0-2 = positive for dementia screening
- 3-4 = negative for dementia screening

(Not a good tool at detecting mild cognitive impairments)

Refer to appropriate medical professionals for further dementia workup

---

**Montreal Cognitive Assessment (MoCA)**: a 10 minute screening tool for mild cognitive dysfunction. It assesses attention & concentration, executive functions, memory, language, visuospatial skills, conceptual thinking, calculations, and orientation.

There is a worksheet to go through with the patient as well as an instructional worksheet.

Total possible score = 30

Normal = 26-30

Free use of the tool after registering on the website: www.mocatest.org
Withdrawal Screening Tool

Clinical Institute Withdrawal Assessment For Alcohol (CIWA): A 10-item screening tool to assess and manage alcohol withdrawal

Max Score: 67
Mild alcohol withdrawal: 0-15
Moderate alcohol withdrawal: 16-20
Severe alcohol withdrawal: >20
Free download and use of the tool

Case Scenarios
CONCLUSION

Medical Screening is important for both Out-patient and Acute Care

Is one more important?

It is not only for Direct Access

Thank you

OPTA Conference Committee
OPTA Staff

Ohio Physical Therapy Association