Physical Medicine & Rehabilitation Basics

Physical Medicine and Rehabilitation (PM&R) is the medical specialty dedicated to maximizing function and quality of life. Physiatrists (fizz ee AT trists or Fizz i oh trist), have advanced training and skill in the diagnosis, treatment, and prevention of functional disabilities of all types. They identify and deliver cost-effective care that can help people to live the most active, independent lives possible. A PM&R physician is trained to recognize and diagnose an impairment in any of the body's organ systems. The PM&R physician may initiate the most effective treatment of the impairment, often working with surgeons and medical specialists in other fields.

PM&R physician will lead an interdisciplinary team of healthcare professionals, including physical therapists, counselors, nurses and others, to help the patient regain optimal function and adjust to disability.

Functional goals may vary: from helping the patient regain self-sufficiency and mobility after a major disabling illness or injury, to reducing pain caused by neuromuscular disorders.

Impairment: Any loss of psychological, physiological or anatomical structure or function. (or any deficit on physical exam)
It represents a problem at the tissue and organ level.
IE: weakness, limited ROM, Pain, Confusion, amputations

Activity Limitation (old term = Disability): Any restriction resulting from an impairment of normal ability for a human being
IE: Inability to walk, run, or ski

Participation Restriction (old term = Handicap): a disadvantage for a given individual resulting from impairment or disability.
It limits the fulfillment of normal function of an individual of a given age, gender, society and culture. A problem at the societal level:
IE economic self-sufficiency, ability to negotiate barriers (wheel chair accessibility)

Interdisciplinary Approach distinguishes PM&R from other medical specialties.
Team works to evaluate functional ability and disability In order to:
1) Set therapeutic goals of physical, psychological, social, vocational, avocational educational, that are consistent with physiologic and anatomic impairment and environmental limitations
2) Determine the most appropriate therapeutic setting.
3) Monitors progress and makes recommendations to team members, patient, family members, care providers, or guardians regarding patients needs and requirements

The 13 Rehab Diagnoses (the 60% part of the 60:40 rule for inpatient rehab)

1. Stroke
2. Spinal Cord Injury (vertebral compression fxss and pain syndromes – like radiculopathy are NOT included)
3. Congenital Deformity
4. Major Multiple Trauma
5. Hip Fracture (femur fxss below the lesser trochanter and pelvic fxss other than of the acetabulum are NOT included)
6. Brain Injury (Alzheimer’s and senility are NOT included)
7. Neurological Disorders
8. Burns (MUST be 3rd degree)
9. Active, Polyarticular RA, Psoriatic Arthritis, or Seronegative Spondyloarthropathy (Infectious arthritis are NOT included)
10. Amputations (Partial and complete hand or foot amputations are NOT included)
11. Systemic Vasculitis WITH Joint Inflammation (Joint infections are NOT included)
12. Severe Advanced Osteoarthritis (MUST involve ≥ 2 major joints not including any joints with a prosthesis AND there MUST be evidence that the pt failed out-patient rehabilitation)
13. Lower Limb Total Joint Replacement WITH one of the following: B/L hip replacement, B/L knee replacement, Age > 85, or BMI > 50
Rehabilitation Team Duties

Rehab Nurse:
1) Provides Nursing to In Patient rehab patients (administration of medications, taking vital signs and neurologic signs, dressing change, assist with toileting)
2) Documentation of: Ins, Outs, voids, & BM
3) Monitor and document significant events; mental status changes, changes in vital signs, falls
4) Manages the nursing care team and educates non rehab nurses.
5) Instructs patients and families in functional skills
6) Reinforces skills learned in therapies

Physical Therapy:
1) Evaluates and Trains patient in mobility and gross motor skills such as gait and wheelchair skills.
2) Teaches and transfers skills
3) Trains the patient to perform exercises to increase ROM, Strengthening, Endurance, Coordination including H.E.P.
4) Provides symptom treatment Modalities including: heat (superficial and deep), cold, hydrotherapy, Electric Stimulation, and traction
5) Makes recommendation for orthotics, prosthetics, adaptive equipment especially wheelchairs and gait aids), and home modifications.
6) Documents patients progress with all of the above

Occupational Therapy:
1) Evaluates and trains patients in Activities of Daily Living (ADLS): dressing, hygiene, bathing, feeding
2) Training and or retraining of vocational skills
3) Teaches balance and transfer skills
4) Provides Exercises to increase ROM, strength, endurance, coordination, and fine motor skills primarily of the upper extremity and cervical area
5) Assesses driving skills
6) Makes recommendation for orthotics, prosthetics, and adaptive equipment especially modified utensils, reachers, and home modifications. (including wheelchairs)
7) Documents patients progress with all of the above

Speech Language Therapy:
1) Evaluates and Treats Pathology of Communication (aphasias)
2) Evaluates and Treats Pathology of Swallowing (dysphagia), makes dietary recommendations
3) Assists with Cognitive evaluation and Treatment (i.e. TBI, impulsivity, attention)
4) Documents patients progress with all of the above

Rehab Social Worker
1) Evaluates patients: living situation, level of supervision and assistance available from friends and family
2) Explores and assists patient in available options when changes in living situation are needed
3) Provides and coordinates support and resources to patients, their family members, and caregivers.
4) Serves as a Liaison between patient, family and physicians

Neuro Psychologist
1) Determines areas and severity of cognitive impairment, psychologic impairments, memory function, substance abuse, that effect participation in rehab and or home safety.
2) Determines level of supervision required for patient safety
3) Determines the ability or lack of ability to make informed medical decision: activation of DPOA or guardianship.

Rehab Unit Coordinator/Administrator
1) Determines if an inpatient meets criteria for admission to an acute inpatient rehab unit by current interpretation of the interqual criteria
2) Determine of bed availability, staffing, and patients insurance coverage.
3) Will act as a liaison between the doctor and the insurance companies to assist in determining rehab candidacy and insurance coverage.
Stages of Nerve Compression Injury

**Physiologic or Metabolic Conduction Block**
Local deprivation of O2 based on circulatory arrest, inhibiting impulse transmission in intact nerves. Generally via compression. Conduction is restored once compression is relieved

**Neuropraxia** (Seddon) Local conduction block with axon preservation due to compression which causes acute myelin damage at the nodes of Ranvier. With decompression conduction returns in weeks to months with local remyelination. Large fibers are more vulnerable and presents as a mixed lesion.  
*May be Painful*

**Axonotomesis** Loss of continuity of axons with endoneurial sheath intact. Function recovery reflects time for nerves to regrow (approx one mm per week), unless regrowth is complicated by intraneural scarring or some other process.  
*Painful*

**Neurotomesis** Loss of continuity of axon as well as elements of nerve trunk including endoneurial tubes, perineurium and epineurium. Complete severation or complete disorganized by scar tissue. Requires Surgery for functional recovery.  
*Not Painful*

Conduction Block is the Electrodiagnostic finding associated with Neuropraxia,

**Important Definitions**

**Pain:** An unpleasant or uncomfortable sensation or perception associated with noxious stimuli, tissue damage, or nerve damage (…in either CNS or PNS.)

**Parasthesias:** abnormal sensations, typically tingling sensation

**Dysathesias:** uncomfortable abnormal sensations

**Allodynia:** perception of pain from non-noxious stimuli

**Hyperalgesia:** increased sensitivity to pain from noxious stimuli

**Anesthesia:** Lack of sensation, numbness.

**Nociception:** neurologic transmission of painful stimuli, normally the CNS will interpret this as pain. Can be due to pressure, heat, chemical stimulation (as with inflammation).

**Neuropathic Pain:** Pain caused by damaged nerve cells rather than by nociception, in either CNS (ie Thalamus Damage in CVA which causes “thalamic Pain” typified by intense burning quality.) or in the PNS (ie As with peripheral neuropathy which also is often described as either burning or freezing in quality.)

**Aphasia:** literally the inability to speak, generally it is used in place of dysphasia (see below) to avoid confusion with dysphagia.

**Dysphasia:** impairment of ability to speak, don’t use this word, it is confused with dysphagia.

**Dysphagia:** impairment of ability to swallow

**Apraxia** unable to perform skilled or purposeful movements (…that were previously learned…) despite retention of requisite strength, motor skills, and comprehension. Commonly from CVA/CNS damage to temporal region.

**Anosognosia** without knowledge of ones deficits. ie commonly in a Pt. with stroke of non dominant lobe (right side) MCA (parietal and corical) who is unaware of their deficits. Often accompanied by Left hemiparesis.

**Prosopagnosia** unable to recognize faces (But patient IS still able to tell when people’s faces are ugly like Casey Chamberlain’s)
Important Grading Systems

Muscle Stretch Reflexes (MSR) NINDS Grading (AKA: Deep Tendon Reflexes (DTR’s) a misnomer)

0  No response
1+ Requires distraction or Gendraisic maneuver to illicit
2+ Lower half of normal
3+ Upper half of normal
4+ Hyper reflexic very brisk (this does *not* denote the presence of clonus)

Clonus is noted separately, when noting clonus note the number of beats

2-3 beats may be physiologic but greater than 3 beats are pathologic

Manual Muscle Testing (MMT) Grading
Note: does not indicate bulk or tone, these must also be noted on PE

Grade 5: Full range of motion against full resistance
Grade 4: Full range of motion against some resistance (but less than full resistance)
Grade 3: Full range of motion against gravity (perpendicular to the plane of the floor)
Grade 2: Full or partial range of motion with gravity-eliminated (parallel to the plane of the floor)
Grade 1: The muscle/muscles contraction can be palpated without joint movement while the patient is performing the action in the gravity-eliminated position.
Grade 0: No contractile activity can be felt in the gravity eliminated position

Spasticity

Spasticity: velocity dependant increase in tonic stretch reflex. Hyper-excitibility may be due to decreased activation of antagonistic alpha motor neurons by means of Upper motor neuron damage, revealing primitive reflexes and spasticity. Normally muscle stretch reflexes are inhibited by activation of antagonist muscles. This is modified by descending pathways leading to inhibitory interneurons. If UMN disease, like a CVA, impairs these this inhibition the result is spasticity

Modified Ashworth Scale for Grading Spasticity

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No increase in muscle tone</td>
</tr>
<tr>
<td>1</td>
<td>Slight increase in muscle tone, manifested by a catch and release, or by minimal resistance at the end of the range of motion when the affected part(s) is moved in flexion or extension</td>
</tr>
<tr>
<td>1+</td>
<td>Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (&lt; 50%) of the ROM</td>
</tr>
<tr>
<td>2</td>
<td>More marked increase in muscle tone through most of ROM (&gt; 50%), but affected part(s) easily moved</td>
</tr>
<tr>
<td>3</td>
<td>Considerable increase in muscle tone, passive movement difficult</td>
</tr>
<tr>
<td>4</td>
<td>Affected part(s) rigid in flexion and extension</td>
</tr>
</tbody>
</table>
Traumatic Brain Injury (TBI)
Best prognostic indicators are:
- Glasgow Coma Scale best score in 1st 24 hours
- Length of coma
- Duration of posttraumatic amnesia (PTA)

Glasgow Coma Scale (Use this for any pt with suspected head trauma, accident, MVA, or fall)
Patients are scored on: eye responses, verbal response, and motor response to stimuli. Scored 3-15 points
Used to determine level of consciousness and also as a means of rating severity of a traumatic brain injury (TBI)
Additionally it has prognostic utility

<table>
<thead>
<tr>
<th>Pt.</th>
<th>BEST EYE RESPONSE</th>
<th>Pt.</th>
<th>BEST VERBAL RESPONSE</th>
<th>Pt.</th>
<th>BEST MOTOR RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No eye opening</td>
<td>1</td>
<td>No verbal response</td>
<td>1</td>
<td>No motor response</td>
</tr>
<tr>
<td>2</td>
<td>Eye open to noxious stimulation*</td>
<td>2</td>
<td>Incomprehensible (moan)</td>
<td>2</td>
<td>Decerebrate (extension) pose to pain</td>
</tr>
<tr>
<td>3</td>
<td>Eyes open to command</td>
<td>3</td>
<td>Inappropriate words</td>
<td>3</td>
<td>D e c o r t i c a t e (f lex i o n) pose to pain</td>
</tr>
<tr>
<td>4</td>
<td>Eyes open spontaneously</td>
<td>4</td>
<td>Confused or disoriented</td>
<td>4</td>
<td>Withdraws to pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Oriented</td>
<td>5</td>
<td>Localizes to pain</td>
</tr>
<tr>
<td></td>
<td>*noxious stim = sternal rub</td>
<td>6</td>
<td>Obey commands</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Traumatic Brain Injury Severity by GCS Score

- ≤ 8  = Severe TBI also defines a Coma.  5-7 = 53% death or Vegetative State
- 9-12 = Moderate TBI.  8-10 = mod - good recovery in 68%
- ≥ 13 = Mild TBI  11 = mod – good recovery in 87%

Mild complicated evidence of brain injury on CT scan
Mild uncomplicated no evidence of brain injury on Ct scan

Rancho Los Amigos Cognitive Scale describes level of function in TBI patients

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No response to pain touch sound or sight, Total A.</td>
</tr>
<tr>
<td>2</td>
<td>Generalized reflex to pain, Total A.</td>
</tr>
<tr>
<td>3</td>
<td>Localized response, Total A. Blinks to light, turns to or away from sounds, responds to discomfort, Inconsistent</td>
</tr>
<tr>
<td>4</td>
<td>Confused &amp; Agitated, Max A. Alert and active, may be aggressive or have bizarre or non purposeful behavior</td>
</tr>
<tr>
<td>5</td>
<td>Confused &amp; Non Agitated, Max A. Pays gross attention to environment, but distractible &amp; requires redirection, a. Becomes agitated with over stimulation, b. May be conversational with inappropriate speech</td>
</tr>
<tr>
<td>6</td>
<td>Confused &amp; Appropriate, Mod A. Inconsistent orientation to time and place, a. Recent memory impaired, b. Begins to recall the past</td>
</tr>
<tr>
<td>7</td>
<td>Automatic/ Appropriate, Min A for ADLs. Performs daily routine in familiar environment in non-confused but automatonic fashion, skills deteriorate in unfamiliar environment, lacks realistic planning for the future</td>
</tr>
<tr>
<td>8</td>
<td>Purposeful and Appropriate SBA</td>
</tr>
<tr>
<td>9</td>
<td>Purposeful &amp; Appropriate requiring only SBA on request</td>
</tr>
<tr>
<td>10</td>
<td>Purposeful &amp; Appropriate with Mod I</td>
</tr>
</tbody>
</table>
**Functional K Levels medicare guidlines**

**K0 = no ability or potential** to ambulate or transfer, a prosthesis will not enhance QOL

**K1 = Household Ambulator**
potential or ability to transfer or ambulate on level surface at *fixed cadence*

**K2 = Limited Community Ambulator:**
potential / ability to transfer or ambulate on low level barriers (curbs, stairs, uneven surface)

**K3 = Community Ambulator**
potential / ability to transfer or ambulate with *variable cadence* Can traverse most enviromental Barriers. May have vocational barrier

**K4 = Active Adult/ Athlete/ Child:** potential / ability for ambulation that exceeds basic skills. Including high impact, stress, or energy levels.

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**DVT 40-50% of CVA pt. 10% get PE!!**
Cause: Virchow Triad venous stasis, hypercoagulable state, (endothelial injury – added by Nathan since it is hard to have a triad with only two causes)
Clinical typically unilateral, hot, swollen, or tender extremities
Clinical Test Homan’s sign (not very sensitive or specific)
Diagnosis: Venous Doppler or arteriogram
Management: Anti coagulation typically with Heparin, LMWH, or Coumadin
Functional Implication can lead to PE and death

**DVT Prophylaxis**
In general ASA, Ted Hose, Pneumatic Compression Dressings or Sequential Compression Dressings are beneficial though inadequate for DVT prophylaxis

Prophylaxis & Treatments are per American Heart Association and the journal CHEST supplement, which is updated periodically; consult this for the most up to date recommendations.

**Heparin 5000 units SC BID** monitor with PTT goal _reverse with protamine sulfate_
**LMWH 75 mg Lovenox SQ daily or 30mg SQ q 12 hours**
**Coumadin** with INR goal 2-3 unless otherwise noted by specialist.
Note: Coumadin prophylaxis may require concomitant Heparin to bridge prophylaxis until therapeutic INR is reached (typically in 3-4 days). Reverse with Vitamin K and or FFP and or Factor 7

**Management of Elevated INR**
Recommended by 4rth ACCP Consensus Conference on Antithrombotic Therapy

<table>
<thead>
<tr>
<th>INR</th>
<th>Symptoms</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super therapeutically &lt;6 without bleed</td>
<td>Withhold Coumadin for next 2 days</td>
<td></td>
</tr>
<tr>
<td>6-10 without bleed</td>
<td>1-2 mg Vit. K, recheck in 24 hours, if still Super-therapeutic give 0.5 mg vit. K.</td>
<td></td>
</tr>
<tr>
<td>10-20 without bleed</td>
<td>3 mg. Vit. K, INR should be reduced in 6 hours and repeat Vit. K as needed.</td>
<td></td>
</tr>
<tr>
<td>Above 20 serious bleed</td>
<td>Give 10 mg. Vit.K and supplement with transfusion of fresh frozen plasma (FFP).</td>
<td></td>
</tr>
<tr>
<td>Life threatening bleed</td>
<td>Transfuse factor concentrates, factor 7! Supplement with 10 mg vit. K, by IV.</td>
<td></td>
</tr>
</tbody>
</table>
**Spinal Cord Injury (SCI):** Injury resulting in disruption of the spinal cord or in the case of Cauda Equina of the nerve roots. Often reserved for injury from trauma, but may be from non-traumatic diseases of the spinal cord such as tumors, MS, and Transverse Myelitis.

**Skeletal level of injury versus Neurologic Level of Injury**

Skeletal level = Level of greatest vertebral damage by radiography

Neurologic Level = Level of injury determined by ASIA – lowest intact motor and sensory level

Motor Level = Lowest level with 5/5 strength OR with 3-4/5 strength with 5/5 strength one level above

Sensory Level = Lowest level with intact (2/2) sensation for BOTH pinprick and light touch

**Neurologic Assessment** made by precise neurologic examination of motor and sensory function by rules determined by ASIA; International Standards for neurological and functional Classification of Spinal Cord Injury.

**ASIA = American Spinal Injury Association**

ASIA Impairment Scale is based on 3 criteria:

1) Neurologic level of motor and or sensory injury
   Named after the most caudal level **without** motor or sensory injury.

2) **Complete** (= no sensory in sacral segment), or **Incomplete** (Sacral sensation spared) impairment of the spinal cord below that level graded: (A-complete), (B, C, D – incomplete) or (E-normal).

3) Notation of Clinical syndromes if applicable

   - **Central Cord:** (arms more affected than legs, bladder dysfunction--usually retention)
   
   - **Anterior Cord:** (preservation of dorsal columns – proprioception and light touch intact, other 2/3’s of cord is affected in variable degrees)

   - **Brown Sequard:** (hemisection of cord – Ipsilateral motor & proprioception deficits and Contralateral pain and temperature sensation deficits)

   - **Conus Medularis:** (L1–L2 vertebral level injury – usually normal motor function, may have absent BCR, usually symmetric findings, saddle anesthesia, areflexic bowel and/or bladder)

   - **Cauda Equina:** (L2–sacrum vertebral level injury– flaccid paralysis of involved roots, absent BCR, usually asymmetric findings, sensory loss in root distribution, may have loss of bowel and/or bladder)
Neurologic level of motor and or sensory injury Assessment

**Patient Supine**

**Muscle Strength** Graded Bilaterally to 10 key muscle groups (0-5 scale)

<table>
<thead>
<tr>
<th>Level</th>
<th>Action</th>
<th>Muscle → Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>Elbow Flexors</td>
<td>Biceps Brachii → Musculocutaneous</td>
</tr>
<tr>
<td>C6</td>
<td>Wrist Extensors</td>
<td>Extensor Carpi Radialis → Radial</td>
</tr>
<tr>
<td>C7</td>
<td>Elbow Extensors</td>
<td>Triceps → Radial</td>
</tr>
<tr>
<td>C8</td>
<td>Finger Flexors (distal phalanx of middle finger)</td>
<td>Flexor Digitorum Profundus → Median &amp; Ulnar</td>
</tr>
<tr>
<td>T1</td>
<td>Finger Abductors</td>
<td>Abductor Digiti Minimi (Quinti) → Ulnar</td>
</tr>
<tr>
<td>L2</td>
<td>Hip Flexors</td>
<td>Iliopsoas → L2-3 ventral rami &amp; Femoral</td>
</tr>
<tr>
<td>L3</td>
<td>Knee Extensors</td>
<td>Quadriceps → Femoral</td>
</tr>
<tr>
<td>L4</td>
<td>Ankle Dorsiflexors</td>
<td>Tibialis Anterior → Deep Peroneal</td>
</tr>
<tr>
<td>L5</td>
<td>Great Toe Extensor</td>
<td>Extensor Hallucis Longus → Deep Peroneal</td>
</tr>
<tr>
<td>S1</td>
<td>Ankle Plantar Flexors</td>
<td>Gastrocnemius &amp; Soleus → Tibial</td>
</tr>
</tbody>
</table>

**Sensation** graded bilaterally along dermatomes by light touch & pinprick compared to face.

**Grading**

0 = Sensation Absent (for light touch; and unable to feel “sharp” for pinprick)
1 = Diminished sensation (can discern sharp from dull but it’s a different “sharpness” than face)
2 = Intact Sensation (normal: equivocal to face and)

**Determine Sacral Sparing of S4, S5** dermatome and myotome: voluntary anal contraction, and or sensation intact. If EITHER is intact indicate incomplete injury and potential for recovery and return of bowel & bladder function.

**Determine Left and Right Motor and Sensory Levels and Assign Levels**

Catagorize injury as Complete or incomplete by impairment Scale:

A= Complete No motor or sensory preservation in sacral segments

B= Sensory Incomplete Sensory preserved below neurological level (at least in sacral segments or preserved deep anal sensation) No motor ≥ 4 levels below neuro level

C= Motor Incomplete Motor function is spared ≥ 4 levels below neurologic level

More than ½ of KEY muscles below level have a grade ≤ 2/5

D= Motor Incomplete Motor function is spared below neurologic level

At least ½ of KEY muscles below the level are ≥ 3/5

E= Normal Pt that has fully recovered from a prior SCI

*NOTE: Considered “C or D” if 1) BOTH anal sensation and anal tone is preserved or
if 2) there is any motor function ≥ 4 levels below MOTOR level

Calculate Score for motor and sensory

**Determine Zone of partial Sparing** (only used for complete injuries) = sensory or motor levels caudal to neurologic level of injury that remain partly intact
**ASIA IMPAIRMENT SCALE**

- **A** - Complete: No motor or sensory function is preserved in the sacral segments S4-S5.
- **B** - Incomplete: Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.
- **C** - Incomplete: Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.
- **D** - Incomplete: Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.
- **E** - Normal: Motor and sensory function are normal.

**CLINICAL SYNDROMES (OPTIONAL)**

- Central Cord
- Brown-Squard
- Anterior Cord
- Coma Medullaris
- Cauda Equina

**STEPS IN CLASSIFICATION**

The following order is recommended in determining the classification of individuals with SCI:

1. Determine sensory levels for right and left sides.
2. Determine motor levels for right and left sides.
3. Determine the single neurological level. This is the lowest site where motor and sensory function is normal on both sides, and is the most cephalad of the sacral and motor levels determined in steps 1 and 2.
4. Determine whether the injury is Complete or Incomplete (motor sparing).
   - If voluntary and sensation = No AND all S4-5 sensory scores = 0 AND any and sensation = No, then injury is COMPLETE.
   - Otherwise injury is incomplete.
5. Determine ASIA Impairment Scale (AIS) Grade:
   - If injury Complete?
     - NO
       - If YES, AIS=A, Record ZIP
       - If NO, AIS=Incomplete
   - If injury Incomplete?
     - YES
       - (Loss of voluntary and contraction OR motor function more than three levels below the motor level on a given side)
   - Are at least half of the key muscles below the (single) neurological level graded 3 or better?
     - NO
       - AIS=C
     - YES
       - AIS=D

   If sensation and motor function is normal in all segments, AIS=E

Note: AIS E is used in follow-up testing when an individual with a documented SCI has recovered normal function. If at initial testing no deficits are found, the individual is neurologically intact; the ASIA Impairment Scale does not apply.
If you are able to draw the brachial plexus it will greatly help you out in the EMG lab
Also I would STRONGLY recommend memorizing the nerves/nerve root that innervate each of the muscles listed in the EMG screening exam (see below) prior to going to the EMG lab
NOTE – The root levels noted below are for Dr. Andary’s lab and other sources may vary

<table>
<thead>
<tr>
<th>Upper Extr Muscle</th>
<th>Root</th>
<th>Nerve</th>
<th>Lower Extr Muscle</th>
<th>Root</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>C5-C6</td>
<td>Axillary</td>
<td>Adductor Longus</td>
<td>L3</td>
<td>Obturator</td>
</tr>
<tr>
<td>Biceps</td>
<td>C5-C6</td>
<td>Musculocutaneous</td>
<td>Vastus Medialis</td>
<td>L3</td>
<td>Femoral</td>
</tr>
<tr>
<td>Pronator Teres</td>
<td>C6-7</td>
<td>Median</td>
<td>Rectus Femoris</td>
<td>L3</td>
<td>Femoral</td>
</tr>
<tr>
<td>Ext. Dig. Comm.</td>
<td>C7</td>
<td>Radial → PIN</td>
<td>Anterior Tibialis</td>
<td>L4-5</td>
<td>Deep Fibular</td>
</tr>
<tr>
<td>Triceps</td>
<td>C7</td>
<td>Radial</td>
<td>Posterior Tibialis</td>
<td>L5-S1</td>
<td>Tibial</td>
</tr>
<tr>
<td>Flexor Carpi Ulnaris</td>
<td>C8</td>
<td>Ulnar</td>
<td>Biceps Fem (Short)</td>
<td>L5-S1</td>
<td>Fibular part of Sciatic</td>
</tr>
<tr>
<td>Flexor Carpi Radialis</td>
<td>C7</td>
<td>Median</td>
<td>Tensor Fascia Lata</td>
<td>L5</td>
<td>Superior Gluteal</td>
</tr>
<tr>
<td>Abd. Poll. Brevis</td>
<td>C8-T1</td>
<td>Median</td>
<td>Med Gastroc/Soleus</td>
<td>S1</td>
<td>Tibial</td>
</tr>
<tr>
<td>First Dorsal Interos.</td>
<td>C8-T1</td>
<td>Ulnar</td>
<td>Lat Gastroc/Soleus</td>
<td>S1</td>
<td>Tibial</td>
</tr>
<tr>
<td>Infraspinatus</td>
<td>C5-C6</td>
<td>Suprascapular</td>
<td>Extensor Hallucis</td>
<td>L5</td>
<td>Deep Fibular</td>
</tr>
<tr>
<td>Extensor Indicus</td>
<td>C7-8</td>
<td>Radial → PIN</td>
<td>Peroneus Longus</td>
<td>L5-S1</td>
<td>Superficial Fibular</td>
</tr>
<tr>
<td>Abd Dig. Minimii</td>
<td>C8-T1</td>
<td>Ulnar</td>
<td>First Dorsal Int Plant</td>
<td>S1-S2</td>
<td>Lateral Plantar, Tibial</td>
</tr>
</tbody>
</table>
Decubitus Ulcer Classification

National Pressure Ulcer Advisory Panel (NPUAP) - For pressure ulcers
The stage of the ulcer is indicated by noting the deepest layer of exposed tissue.

<table>
<thead>
<tr>
<th>Stage I</th>
<th>Nonblanchable erythema of intact skin heralding lesion of skin ulceration. In individuals with darker skin, discoloration of the skin, warmth, edema, induration or hardness may be indicators.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Stage II</th>
<th>Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow center.</th>
</tr>
</thead>
</table>

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<thead>
<tr>
<th>Stage III</th>
<th>Full thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through underlying fascia. The ulcer presents clinically as deep crater with or without undermining of adjacent tissue.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Stage IV</th>
<th>Full thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g., tendon, joint capsule). Undermining and sinus tracts also may be associated with Stage IV pressure ulcers.</th>
</tr>
</thead>
</table>

Reverse Staging
Clinical studies indicate that as deep ulcers heal, the lost muscle, fat and dermis is NOT replaced. Instead, granulation tissue fills the defect before re-epithelialization. Given this information, it is not appropriate to reverse stage a healing ulcer. For example, a pressure ulcer stage 3 does not become a stage 2 or a stage 1 in your documentation during healing. You must chart the progress by noting an improvement in the characteristics (size, depth, amount of necrotic tissue, amount of exudate, etc.). [Taken from the NPUAP Report Vol.4, No.2, September 1995]
**Inpatient Sparrow Note Format**

Please make sure you address each of the following (when applicable) for each consult/admission/ and progress note that you do while on your inpatient time. Also make sure that you comment on if the problem is stable, improving, worsening, etc.

**Plan**

1. **Admitting Diagnosis** (i.e. CVA, TBI, multi-trauma, etc.)
2. **Impairments** (i.e. contractures, weakness, cognition, ulcers, etc.) – Anything you can find on PE
3. **Other Rehab Related Issues** (prior CVA deficits, MS, Peripheral Neuropathy, Cerebral Palsy)
4. **Pain** (Identify where the pain is and what type i.e neuropathic, chronic, incisional, etc.)
5. **Sleep** (How well they are sleeping, any complaints, ? sleeping pill, why is there sleep poor, etc.)
6. **GI** (Last BM, diarrhea, constipation, what meds/supplements they are taking, etc.)
7. **GU** (How well they are voiding, what method – Foley/self cath/on own, and PVR’s)
8. **Skin** (Decub ulcers or incisions, where, what stage, what meds/bed/turning, is wound care on board)
9. **Cognitive/Behavioral** (Continue with Speech therapy, any meds, etc.)
10. **DVT Prophylaxis** (i.e. Fragmin, Heparin, Coumadin, PAS, etc)
11. **Length of IV Abx** (how long will they have a PICC line – will they need it at home)
12. **Seizure Prophylaxis** (Often used with TBI patients)
13. **Nutrition** (Are they eating well, ? wt loss, do they need to be on a daily calorie count, etc.)
14. **Other Medical issues** (HTN, CHF, DM2, etc and state “managed by IM service”)
15. **Disposition** (Home vs ECF vs assisted living, who do they live with, need outpt PT/OT/ST, etc.)

ALSO address the following for Admission Notes

16. **Estimated Length of Stay** (ELOS) on the rehab unit
17. **Goals** (ambulate 200 ft Mod I, T/F’s Supervision, W/C propel Independent, LE dress min A, etc.)

**Suggested Reading List**

During Sparrow Inpatient

- Cucurullo – Stroke Chapter, Spinal Cord Injury Chapter, and Traumatic Brain Injury Chapter

EMG Lab

- Easy EMG or EMG Basics – only if interested in EMG’s, otherwise the info in this packet is sufficient
Common Rehab Abbreviations

Rehabilitation & Post Acute Hospitalization Facilities

IPR  Inpatient Rehabilitation A separate hospital admission from the acute hospital where patients work intensely (3 hours/day) with a rehabilitation team including physicians and therapists for a short duration (days to weeks) in order achieve specific functional goals that will allow the patient to safely return home. May include training with DME/AE and care giver training. Admission requirements generally include:
--Need for medical observation
--Ability to participate in & progress with 3 hours of therapy a day in 2 or more disciplines (PT/OT/ST)
--Have a viable discharge plan (patient should be able to return home safely after rehabilitation with whatever supervision/assistance is available.) – helps to have 24/7 help ALWAYS ask about this!

SAR  Sub Acute Rehabilitation Facility; unit within a nursing home, it is design for patients to work with therapists less intensely than IPR (60-90 minutes/day) for potentially longer periods (weeks to months) before returning home. Home is the goal.

LTACH  Long Term Acute Care Hospital/Facility. For patients that need long term medical care, such as ventilation, wound care, or IV antibiotics. Rehabilitation services such as PT, OT, & Speech Therapy is available, though participation and progression is not required.

ECF  Extended Care Facility a nursing home facility that provides supervision and assistance, but little rehabilitation services. Patient may or may not return home.

AFC  Adult Foster Care residents are medically stable and generally don’t require therapies. They require supervision but minimal to no assistance.

OP  Out Patient Therapies: Pt goes to Physical/Occupational/ Speech Therapy facility on an out patient basis. Does not include physician or physiatrist supervision, but generally requires a prescription from a physician that includes specific goals, instructions, frequency, duration, and intensity.

FIM  Functional Independence Measure; scoring system to evaluate level of ability of ADLs and AIDLs. Scale is 1-7, 7 being highest level of function and 1 denoting dependance.

FIM Score
7  I  Idependant: Pt. able to perform task safely independent of any assistance.
6  Mod I  Modified Independance: pt. able to safely perform task with use of an assistive device(AD) or home modification or modified technique or training.
5  SBA  Stand By Assist :caregiver had no contact with Pt. but available if needed
4  CGA  Contact Guard Assist: hands on, but no effort needed of care giver.

NOTE: Some interpret CGA as equivocal to Min A, However CGA indicates that patient may not require rehabilitation and disqualify them from Acute Inpatient Rehabilitation candidacy.

4  Min A  Minimum Assistance: care giver provides 0-25% of effort
3  Mod A  Moderate Assistance: care giver provides 25-50% of effort
2  Max A  Maximum Assistance: care giver provides 50-75% of effort
1  Tot A  Total Assistance: care giver provides 75-100% of effort
1  D  Dependant: care giver provides 75-100% of effort
S  Supervision
A  Assistance

Acronym  Definition
LOB  Loss of Balance
LOC  Loss of Consciousness
HOB  Head of Bed
EOB  Edge of Bed
LOS  Length of Stay
ELOS  Estimated Length of Stay
ADL  Activity of Daily Living
IADL  Instrumental Activities of Daily Living
### Consult/Admit Sheet

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DME</td>
<td>Durable Medical Equipment (i.e. tub bench, grab bars, ramp, etc.)</td>
</tr>
<tr>
<td>AD</td>
<td>Assistive Device (Walker, W/C – wheelchair, cane, etc.)</td>
</tr>
<tr>
<td>STE</td>
<td>Steps to Enter</td>
</tr>
<tr>
<td>DSS</td>
<td>Dual Simultaneous Stimulation: sensory deficit seen with neglect (AKA: extinction)</td>
</tr>
<tr>
<td>FTN</td>
<td>Finger to Nose</td>
</tr>
<tr>
<td>HTS</td>
<td>Heel to Shin</td>
</tr>
<tr>
<td>RAM</td>
<td>Rapid Alternating Movements</td>
</tr>
<tr>
<td>WN/WD</td>
<td>Well Nourished / Well Dressed</td>
</tr>
<tr>
<td>NAD</td>
<td>No Acute Distress</td>
</tr>
<tr>
<td>ROM</td>
<td>Range of Motion</td>
</tr>
<tr>
<td>UE</td>
<td>Upper Extremity</td>
</tr>
<tr>
<td>LE</td>
<td>Lower Extremity</td>
</tr>
<tr>
<td>TTP</td>
<td>Tenderness to Palpation</td>
</tr>
<tr>
<td>SF</td>
<td>Shoulder Flexion</td>
</tr>
<tr>
<td>EF</td>
<td>Elbow Flexion</td>
</tr>
<tr>
<td>EE</td>
<td>Elbow Extension</td>
</tr>
<tr>
<td>WE</td>
<td>Wrist Extension</td>
</tr>
<tr>
<td>FDI</td>
<td>First Dorsal Interosseous</td>
</tr>
<tr>
<td>HF</td>
<td>Hip Flexors</td>
</tr>
<tr>
<td>KE</td>
<td>Knee Extensors</td>
</tr>
<tr>
<td>DF</td>
<td>Dorsiflexors</td>
</tr>
<tr>
<td>EHL</td>
<td>Extensor Hallucis Longus</td>
</tr>
</tbody>
</table>

### Electrodiagnostic

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>EDX</td>
<td>Electrodiagnostic Studies; the combination of EMG and NCS</td>
</tr>
<tr>
<td>EMG</td>
<td>Electromyography needles in muscles to determine if there has been denervation (chronically or acutely) or myopathy</td>
</tr>
<tr>
<td>NCS</td>
<td>Nerve Conduction Studies zaps of electricity to nerve function, axon loss and or demyelination</td>
</tr>
<tr>
<td>PSW</td>
<td>Positive Sharp Waves</td>
</tr>
<tr>
<td>Fibs</td>
<td>Fibrillations</td>
</tr>
</tbody>
</table>

### Physical Exam

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMT</td>
<td>Manual Muscle Testing</td>
</tr>
<tr>
<td>DTR</td>
<td>Deep Tendon Reflexes antiquated but common used term, preferred term is Muscle stretch reflex (MSR)</td>
</tr>
<tr>
<td>MSR</td>
<td>Muscle Stretch Reflex, previously Deep Tendon Reflexes (DTR)</td>
</tr>
<tr>
<td>PNS</td>
<td>Peripheral Nervous System</td>
</tr>
<tr>
<td>CNS</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>MAS</td>
<td>Modified Ashworth Scale of spasticity</td>
</tr>
<tr>
<td>UMN</td>
<td>Upper Motor Neuron, refers to lesions of the CNS (Spinal cord or brain) ie CVA, TBI, SCI or Conus Medullaris Syndrome. Signs include up going plantar reflex’ (Babinski Sign), Positive Hoffman’s Sign, Spasticity, and clonus (&gt;3beats)</td>
</tr>
<tr>
<td>LMN</td>
<td>Lower Motor Neuron refers to lesions of the PNS ie: Peripheral Neuropathy, radiculopathy, mononeuropathy (compression neuropathies) and Cauda Equina Syndrome. Signs include Weakness, Numbness, Paresthesias/Dysthaesthias</td>
</tr>
<tr>
<td>VOR</td>
<td>Vestibular Ocular Reflex AKA “doll’s eyes reflex” test of brainstem function</td>
</tr>
<tr>
<td>INO</td>
<td>Intra Nuclear Ophthalmoplegia</td>
</tr>
<tr>
<td>ATNR</td>
<td>Asymmetric Tonic Neck Reflex AKA “Fencer reflex” Primitive reflex that is extinguished in early childhood development and becomes un-masked with TBI or CVA. Shoulder abduction causes head to turn to ipsilateral side and contralateral shoulder is abducted and contralateral elbow is flexed.</td>
</tr>
<tr>
<td>GCS</td>
<td>Glasgow Coma Scale</td>
</tr>
<tr>
<td>BCR</td>
<td>Bulbocavernous Reflex: The most caudal reflex therefore it is normally the first reflex to return when a patient comes out of spinal shock</td>
</tr>
</tbody>
</table>

### Assistive devices/Adaptive Equipment/Durable Medical Equipment

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSC</td>
<td>Bed-Side Commode</td>
</tr>
<tr>
<td>ETB</td>
<td>Extended Tub Bench</td>
</tr>
<tr>
<td>HR</td>
<td>Hand Rails</td>
</tr>
<tr>
<td>GB</td>
<td>Grab Bars</td>
</tr>
<tr>
<td>WC</td>
<td>Wheel Chair</td>
</tr>
<tr>
<td>AD</td>
<td>Assistive Device</td>
</tr>
<tr>
<td>AE</td>
<td>Adaptive Equipment</td>
</tr>
<tr>
<td>DME</td>
<td>Durable Medical Equipment</td>
</tr>
</tbody>
</table>
Walkers
- RW: Rolling walker
- FWW: Front wheel walker
- SW: Standard walker
- 4WW: Four wheeled walker

Canes
- SC: Standard Cane
- QC: Quad Cane
- SBQC: Small Base Quad Cane
- WBQC: Wide Based Quad Cane

Orthopedics
- WB: Weight Bearing
- PWB: Partial Weight Bearing; sometimes expressed as a % of body weight
- WBAT: Weight Bearing As Tolerated
- TKA: Total Knee Arthroplasty
- THA: Total Hip Arthroplasty
- BKA: Below the knee amputation, syn TTA (preferred)
- TTA: Trans Tibial Amputation syn; BKA (less preferred)
- AKA: Above the knee amputation syn TFA (preferred)
- TFA: Trans Femoral Amputation syn; AKA (less preferred)
- CTR: Carpal Tunnel Release
- I & D: Incision and Drainage

Prosthetics
- RRD: Removable Rigid Dressing
- I-POP: Immediate Post Operative Prosthetics
- TT: TransTibial prosthetics:
- PTB: Patella Tibial Bearing TT prosthetic syn.; Total Contact Socket
- ISNY: Icelandic Scandinavian New York TT prosthetic
- TF: Trans Femoral prosthetics
- TR: Trans Radial prosthetics
- TH: Trans Humeral prosthetics
- TD: Terminal Device: a prosthetic hand or hook
- VO: Voluntary Opening; body powered opening split hook TD
- VC: Voluntary Closing; body powered closing split hook TD
- SACH: Solid Ankle Cushioned Heel; a prosthetic foot
- DER: Dynamic Elastic Response prosthetic foot; aka “energy storing foot”

Orthotics
- AFO: Ankle Foot Orthosis
- KO: Knee Orthosis
- KAFO: Knee Ankle Foot Orthosis esp. CSO
- CSO: Craig Scott Orthosis, a specific type of KAFO
- HKAFO: Hip Knee Ankle Foot Orthosis
- SOMI: Sternal Ocipital Mandibular Imobilizer
- PRAFO: Pressure Relief Ankle Foot Orthosis
- RHO: Resting Hand Orthosis
- LSO: LumboSacral Orthosis
- TLSO: Thoraco Lumbo Sacal Othosis

Cranial Nerves
- CN1: Olfactory Nerve
- CN2: Optic Nerve
- CN3: Oculomotor Nerve
- CN4: Trochlear
- CN5: Trigeminal
- CN6: Abducent Nerve
- CN7: Facial Nerve
- CN8: Vestibulocochlear Nerve
- CN9: Glossopharyngeal Nerve
- CN10: Vagus Nerve
- CN11: Accessory Nerve
- CN12: Hypoglossal Nerve
Pathologic Processes and Disease States (a incomplete list of common processes seen in PM&R patients)

- **TBI**: Traumatic Brain Injury
- **SCI**: Spinal Cord Injury
- **GBS**: Guillain-Barré Syndrome, most common form of AIDP
- **AIDP**: Acute Inflammatory Demyelinating Polyneuropathy (or polyneuropathy)
- **CDP**: Chronic Inflammatory Demyelinating Polyneuropathy (or polyneuropathy)
- **CRPS**: Complex Regional Pain Syndrome syn RSD
- **RSD**: Reflex Sympathetic Dystrophy syn CRPS
- **SD**: Somatic Dysfunction
- **MSD**: Multiple Somatic Dysfunctions
- **TOS**: Thoracic Outlet Syndrome
- **CTS**: Carpal Tunnel Syndrome
- **ALS**: Anterolateral Sclerosis aka Lou Gerhig’s Disease
- **MS**: Multiple Sclerosis
- **LEMS**: Lambert Eaton Myasthenia Gravis Syndrome presynaptic NMJ syndrome
- **MG**: Myasthenia Gravis post synaptic NMJ disease
- **CP**: Cerebral Palsy
- **PSS**: Paget Schrotter Syndrome or Effort Thrombosis of Upper Extremity
- **HO**: Heterotopic Ossification
- **DISH**: Diffuse Idiopathic Skeletal Hyperostosis
- **MD**: Muscular Dystrophy
- **DMD**: Duchenne Muscular Dystrophy
- **NF**: Neurofibromatosis
- **NF-1**: Neurofibromatosis type 1
- **NF-2**: Neurofibromatosis type 2
- **SMA**: Spinal Muscular Atrophy
- **HNPP**: Hereditary Neuropathy with liability to Pressure Palsies
- **CMT**: Charcot Marie Tooth type 1 and type 2
- **CIM**: Critical Illness Myopathy
- **CVA**: Cerebral Vascular Accident aka Stroke Syndromes
  - **ACA**: Anterior Cerebral Artery
  - **MCA**: Middle Cerebral Artery
  - **PCA**: Posterior Cerebral Artery
  - **ACA**: Anterior Cerebral Artery
  - **BA**: Basilar Artery
  - **ICA**: Internal Carotid Artery
  - **ECA**: External Carotid Artery
- **TIA**: Transient Ischemic Attack
- **PN**: Peripheral Neuropathy
- **VTE**: Venous Thrombo Embolism
- **CVD**: Cardiovascular Disease
- **CAD**: Coronary Artery Disease
- **PD**: Parkinson’s Disease
- **COPD**: Chronic Obstructive Pulmonary Disease
- **PVD**: Peripheral Vascular Disease
- **DM1**: Diabetes Mellitus type 1
- **DM2**: Diabetes Mellitus type 2
- **IDDM**: Insulin Dependant Diabetes Mellitus
- **NIDDM**: Non Insulin Dependant Diabetes Mellitus
- **SIADH**: Syndrome of Inapropriate Anti Diuretic Hormone
- **DI**: Diabetes Insipidus