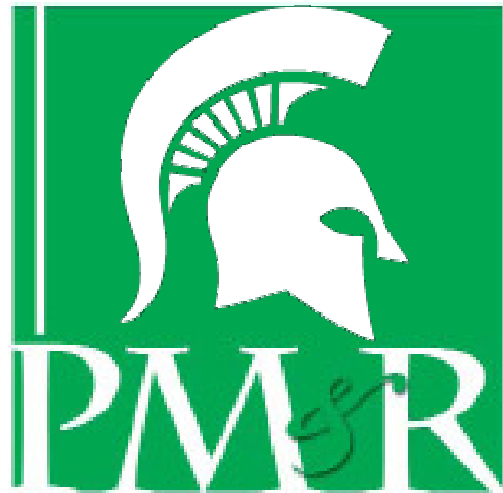


MSU PM&R Rotation Handout



**Physical Medicine
and Rehabilitation
Residency Program**

Physical Medicine & Rehabilitation Basics

Physical Medicine and Rehabilitation (PM&R) is the medical specialty dedicated to maximizing function and quality of life. Psychiatrists (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 fxs and pain syndromes – like radiculopathy are NOT included)
3. **Congenital Deformity**
4. **Major Multiple Trauma**
5. **Hip Fracture** (femur fxs below the lesser trochanter and pelvic fxs 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 arthritides are NOT included)
10. **Amputations** (Partical 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 wheel chair skills.
- 2) Teaches balance 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 wheel chairs and gait aides), 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 care givers.
- 4) Serves as a Liaison between patient, family and physicians

Neuro Psychologist

- 1) Determines areas and severity of cognitive impairment, psychological 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

Axonotmesis 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

Neurotmesis 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.

Anosignosia without knowledge of ones deficits. ie commonly in a Pt. with stroke of non dominant lobe (right side) MCA (parietal and coronal) 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

Grade	Description
0	No increase in muscle tone
1	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
1+	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (< 50%) of the ROM
2	More marked increase in muscle tone through most of ROM (> 50%), but affected part(s) easily moved
3	Considerable increase in muscle tone, passive movement difficult
4	Affected part(s) rigid in flexion and extension

Traumatic Brain Injury (TBI)

Best prognostic indicators are

- Glascow Coma Scale best score in 1st 24 hours
- Length of coma
- Duration of posttraumatic amnesia (PTA)

Glascow 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

Pt.	BEST EYE RESPONSE	Pt.	BEST VERBAL RESPONSE	Pt.	BEST MOTOR RESPONSE
1	No eye opening	1	No verbal response	1	No motor response
2	Eye open to noxious stimulation*	2	Incomprehensible (moan)	2	Decerebrate (extension) pose to pain
3	Eyes open to command	3	Inappropriate words	3	Decorticate (flexion) pose to pain
4	Eyes open spontaneously	4	Confused or disoriented	4	Withdraws to pain
		5	Oriented	5	Localizes to pain
	*noxious stim = sternal rub			6	Obeys commands

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

Level Description

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

Functional K Levels medicare guidelines

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.

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

Recomended by 4rth ACCP Consensus Conference on Antithrombotic Therapy

<u>INR</u>	<u>Symptoms</u>	<u>Reccomendation</u>
Super theraputic and <6	without bleed	Withhold Coumadin for next 2 days
6-10	without bleed	1-2 mg Vit. K, recheck in 24 hours, if still Super-therapeutic give 0.5 mg vit. K.
10-20	without bleed	3 mg. Vit. K, INR shoud be reduced in 6 hours and repeat Vit. K as needed.
Above 20	serious bleed	Give 10 mg. Vit.K and supplement with transfusion of fresh frozen plasma (FFP).
	Life threatening bleed	Transfuse factor concentrates, factor 7! Supplement with 10 mg vit. K, by IV.

Repeat as necessary.

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

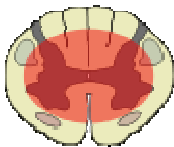
Sensory Level = Lowest level with intact (2/2) sensation for BOTH pinprick and light touch

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.

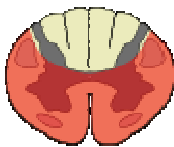
ASIA = American Spinal Injury Association

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



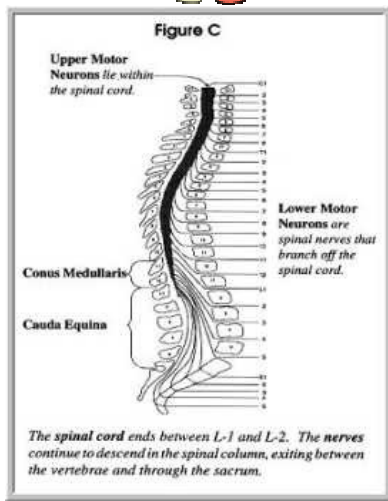
Central Cord: (arms more affected than legs, bladder dysfunction--usually retention)



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)

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

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 Spraying 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

Categorize 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

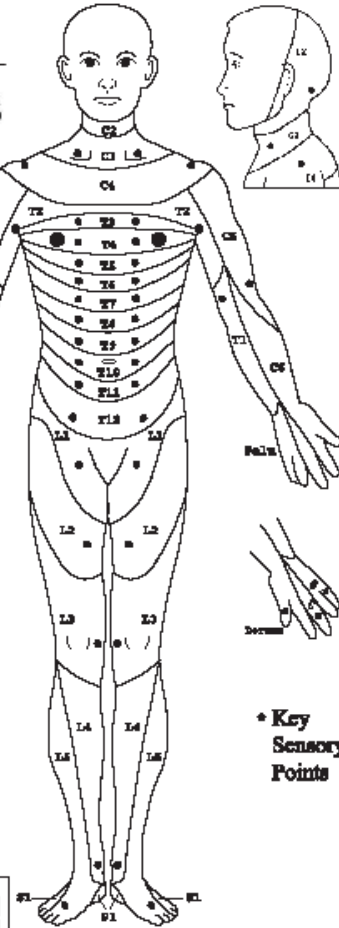
Determine Zone of partial Spraying (only used for complete injuries) = sensory or motor levels caudal to neurologic level of injury that remain partly intact

Patient Name _____

Examiner Name _____ Date/Time of Exam _____



STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY



MOTOR

KEY MUSCLES
(scoring on reverse side)

	R	L	
C5	<input type="checkbox"/>	<input type="checkbox"/>	Elbow flexors
C6	<input type="checkbox"/>	<input type="checkbox"/>	Wrist extensors
C7	<input type="checkbox"/>	<input type="checkbox"/>	Elbow extensors
C8	<input type="checkbox"/>	<input type="checkbox"/>	Finger flexors (distal phalanx of middle finger)
T1	<input type="checkbox"/>	<input type="checkbox"/>	Finger abductors (1st finger)
UPPER LIMB TOTAL			
	<input type="checkbox"/>	+	<input type="checkbox"/> = <input type="checkbox"/>
(ASUB)R (ASUB)L (ASUB)T			

Comments:

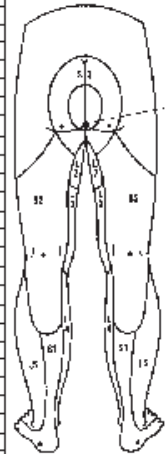
L2	<input type="checkbox"/>	<input type="checkbox"/>	Hip flexors
L3	<input type="checkbox"/>	<input type="checkbox"/>	Knee extensors
L4	<input type="checkbox"/>	<input type="checkbox"/>	Ankle dorsiflexors
L5	<input type="checkbox"/>	<input type="checkbox"/>	Long toe extensors
S1	<input type="checkbox"/>	<input type="checkbox"/>	Ankle plantar flexors

Ulnar and ventral (N6/N4)

LOWER LIMB TOTAL			
	<input type="checkbox"/>	+	<input type="checkbox"/> = <input type="checkbox"/>
(ASUB)R (ASUB)L (ASUB)T			

	LIGHT TOUCH		PIN PRICK	
	R	L	R	L
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				

0 = absent
1 = impaired
2 = normal
NT = not testable



<input type="checkbox"/>	Any anal sensation (N6/N4)
<input type="checkbox"/>	PIN PRICK SCORE (max: 716)
<input type="checkbox"/>	LIGHT TOUCH SCORE (max: 716)

NEUROLOGICAL LEVEL <small>The most caudal segment with normal function</small>	<table border="0"> <tr><td>SENSORY</td><td>R</td><td>L</td></tr> <tr><td>MOTOR</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	SENSORY	R	L	MOTOR	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETE OR INCOMPLETE? <small>Incomplete - Any sensory or motor function in S4-S5</small>	ZONE OF PARTIAL PRESERVATION <small>Could occur at possibly sacral level</small>	<table border="0"> <tr><td>SENSORY</td><td>R</td><td>L</td></tr> <tr><td>MOTOR</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr> </table>	SENSORY	R	L	MOTOR	<input type="checkbox"/>	<input type="checkbox"/>
	SENSORY	R	L													
MOTOR	<input type="checkbox"/>	<input type="checkbox"/>														
SENSORY	R	L														
MOTOR	<input type="checkbox"/>	<input type="checkbox"/>														
ASIA IMPAIRMENT SCALE		<input type="checkbox"/>														

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MUSCLE GRADING

- 0 total paralysis
- 1 palpable or visible contraction
- 2 active movement, full range of motion, gravity eliminated
- 3 active movement, full range of motion, against gravity
- 4 active movement, full range of motion, against gravity and provides some resistance
- 5 active movement, full range of motion, against gravity and provides normal resistance
- 5* muscle able to exert, in examiner's judgement, sufficient resistance to be considered normal if identifiable inhibiting factors were not present

NT not testable. Patient unable to reliably exert effort or muscle unavailable for testing due to factors such as immobilization, pain on effort or contracture.

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-Sequard
- Anterior Cord
- Conus 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.
Note: in regions where there is no myotome to test, the motor level is presumed to be the same as the sensory level.
3. Determine the single neurological level.
This is the lowest segment where motor and sensory function is normal on both sides, and is the most cephalad of the sensory and motor levels determined in steps 1 and 2.
4. Determine whether the injury is Complete or Incomplete (sacral sparing).
If voluntary anal contraction = No AND all S4-5 sensory scores = 0 AND any anal sensation = No, then injury is COMPLETE. Otherwise injury is incomplete.

5. Determine ASIA Impairment Scale (AIS) Grade:

Is injury Complete? If YES, AIS=A Record ZPP (For ZPP record lowest dermatome or myotome on each side with some (non-zero score) preservation)

NO ↓

Is injury motor incomplete? If NO, AIS=B (Yes=voluntary anal contraction OR motor function more than three levels below the motor level on a given side.)

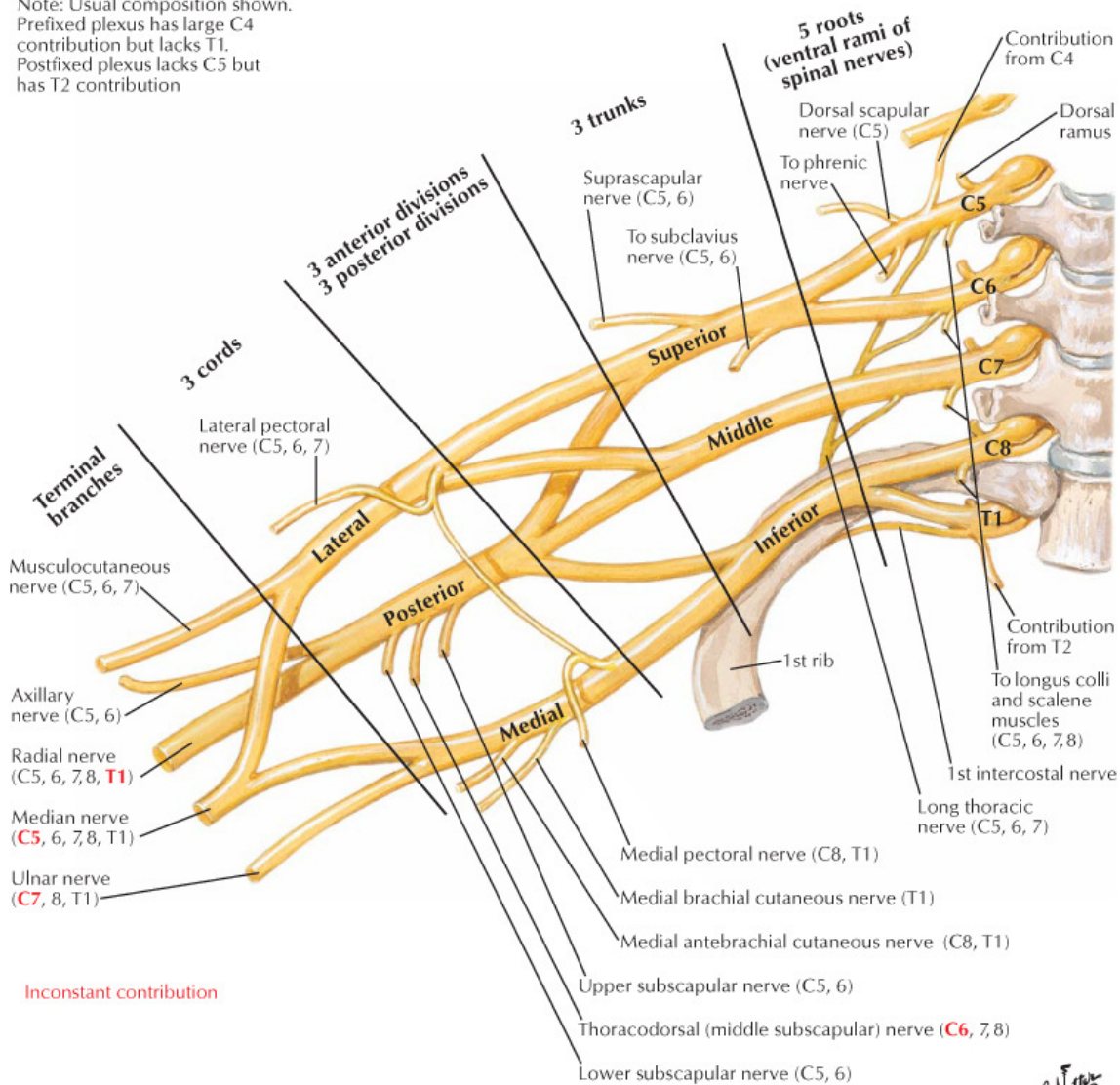
YES ↓

Are at least half of the key muscles below the (single) neurological level graded 3 or better?

NO ↓ YES ↓
AIS=C 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.

Note: Usual composition shown.
 Prefixed plexus has large C4 contribution but lacks T1.
 Postfixed plexus lacks C5 but has T2 contribution



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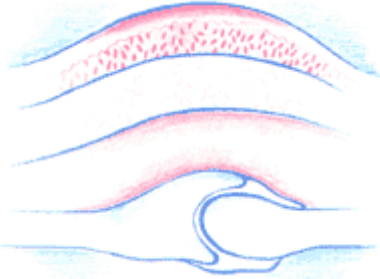
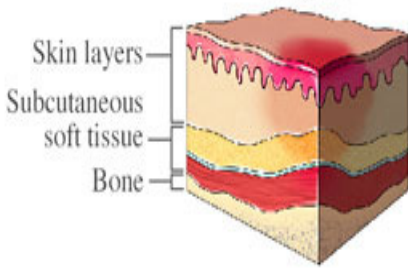
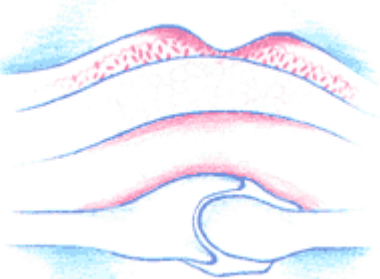
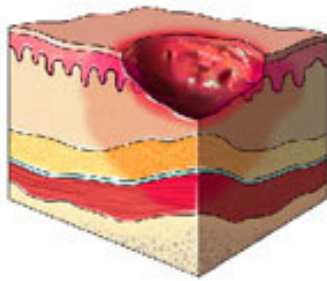
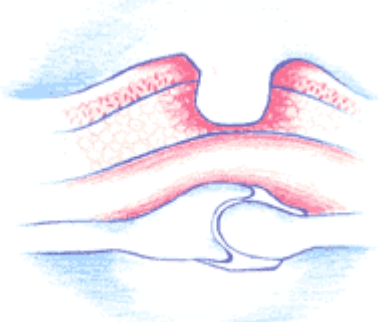
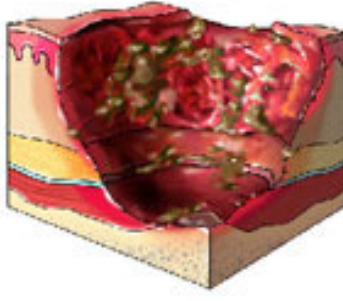
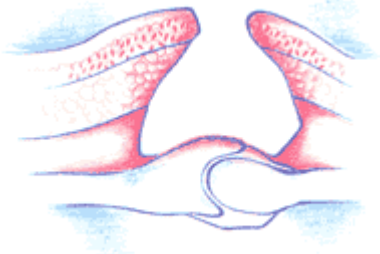
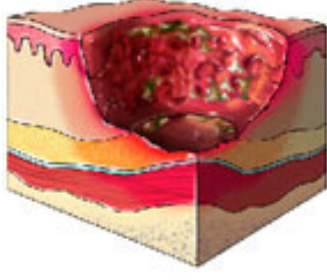
- If you are able to draw the brachial plexus it will greatly help you out in the EMG lab
- Also I would STRONGLY recommend memorizing the nerves/nerve root that innervate each of the muscles listed in the EMG screening exam (see below) prior to going to the EMG lab
- NOTE – The root levels noted below are for Dr. Andary’s lab and other sources may vary

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

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.

<p>Stage I</p> <p>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.</p>	 
<p>Stage II</p> <p>Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.</p>	 
<p>Stage III</p> <p>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.</p>	 
<p>Stage IV</p> <p>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.</p>	 

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

Cuccurullo – 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 <i>viable discharge plan</i> (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 rehabiliataion 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	Independant: Pt. able to perform task safely independent of any assistance.
6	Mod I	Modified Independence: 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 <i>no effort needed of care giver.</i> <i>NOTE:</i> 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 Consciocness
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

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

Electrodiagnostic

EDX	Electrodiagnostic Studies ; the combination of EMG and NCS
EMG	Electromyography needles in muscles to determine if there has been denervation (chronically or acutely) or myopathy
NCS	Nerve Conduction Studies zaps of electricity to nerve function, axon loss and or demyelination
PSW	Positive Sharp Waves
Fibs	Fibrillations

Physical Exam

MMT	Manual Muscle Testing
DTR	Deep Tendon Reflexes antiquated but common used term, preferred term is Muscle stretch reflex (MSR)
MSR	Muscle Stretch Reflex, previously Deep Tendon Reflexes (DTR)
PNS	Peripheral Nervous System
CNS	Central Nervous System
MAS	Modified Ashworth Scale of spasticity
UMN	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's (Babinski Sign), Positive Hoffman's Sign, Spasticity, and clonus (> 3beats)
LMN	Lower Motor Neuron refers to lesions of the PNS ie: Peripheral Neuropathy, radiculopathy, mononeuropathy (compression neuropathies) and Cauda Equina Syndrome. Signs include Weakness, Numbness, Paresthasias/ Dysthasesthesias
VOR	Vestibular Ocular Reflex AKA "dolls eyes reflex" test of brainstem function
INO	Intra Nuclear Ophthalmoplegia
ATNR	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.
GCS	Glascow Coma Scale
BCR	Bulbocavernous Reflex: The most caudal reflex therefore it is normally the first reflex to return when a patient comes out of spinal shock

Assistive devices/ Adaptive Equipment / Durable Medical Equipment

BSC	Bed-Side Commode
ETB	Extended Tub Bench
HR	Hand Rails
GB	Grab Bars
WC	Wheel Chair
AD	Assistive Device
AE	Adaptive Equipment
DME	Durable Medical Equipment

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, <i>syn TTA (preferred)</i>
TTA	Trans Tibial Amputation <i>syn; BKA (less preferred)</i>
AKA	Above the knee amputation <i>syn TFA (preferred)</i>
TFA	Trans Femoral Amputation <i>syn; AKA (less preferred)</i>
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 <i>syn.</i> ; Total Contact Socket
ISNY	Icelandic Scandanavian 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 <i>opening</i> split hook TD
VC	Voluntary Closing; body powered <i>closing</i> 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 Immobilizer
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	Occulomotor 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 polyradiculopathy)
CDIP	Chronic Inflammatory Demyelinating Polyneuropathy (or polyradiculopathy)
CRPS	Complex Regional Pain Syndrome <i>syn RSD</i>
RSD	Reflex Sympathetic Dystrophy <i>syn CRPS</i>
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 Myesthesia 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	Diabete Melitis type 1
DM2	Diabetes Mellitis type 2
IDDM	Insulin Dependant Diabetes Melitis
NIDDM	Non Insulin Dependant Diabetes Mellitis
SIADH	Syndrome of Inapropriate Anti Diuretic Hormone
DI	Diabetes Insipidis