**Title and Focus of Activity**: Case Application of Motor Learning Principles, Progression/Regression and Interventions for impairments in body structures and functions

*Intervention*

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**Course Information:** Interventions for Individuals with Neuromuscular Disorder; 3 units (2 hours lecture, 3 hours lab per week); Fall of year 2 (semester 5 out of 9 total). Students have already had Motor Control and Learning, Evaluation of the Individuals with Neuromuscular Disorders, Neuroanatomy, and Neuropathology.

**Learning Activity Description:**

Context: Students receive a 50 minute lecture on common impairments in body structures and functions in the neurologic population and a 50 minute lecture on Functional Progression. Students participate in a 3 hour lab that includes analysis of videos of patients with neurologic function and identification of activity limitations and possible impairments in body structures and function. Students are then asked to work in groups of 3 and complete a paper case-based assignment applying principles of progression, motor learning and identification of impairments related to documented activity limitations.

Student Assignment:

1. In groups of 3, you will be assigned a case.

2. Develop interventions that address the following areas:

**a.** **Limitations in body structures and functions (strength, ROM, aerobic capacity)**

1. One non-functional exercise with one progression and regression

2. One functional exercise with one progression and regression

**b. Activity limitations** (Bed mobility, transfers, gait, stairs, etc….)

1. Apply principles of motor learning with the goal of optimizing learning.

a. Practice condition (context)

b. Structure of practice: constant vs variable; blocked vs random

c. Feedback given: type and frequency

2. Develop one progression and regression for the activity chosen.

**c. Participation**

1. Develop a home program that addresses the impairments listed in “a”, the activity limitations in “b” and that is relevant to the patient’s goal and will begin to address the patient’s limitations at the participation level.

3. Be prepared to present your interventions and home program to the class and discuss how the interventions chosen will decrease the individual’s activity limitations and increase their level of participation.

**Case #1: 45 year old woman with Multiple Sclerosis** **Setting: Home care**

PT Problems: ***Right Hemiparesis***: 100 % selective movement in R UE/LE

Left UE/LE: 5/5 throughout

Right UE: 3/5 shoulder flexors/abductors; 4/5 elbow/wrist/hand

Right LE: 3+/5 hip flexors/extensors/abductors; 4/5 knee extensors, 3+/5 knee flexors; 3+/5 ankle DF: 2+/5 ankle PF

***PROM***: L UE/LE: WNL throughout; R hip extension: 0 degrees, R ankle DF: 0 degrees (knee extended).

***Spasticity:*** MAS: Right gastroc/soleus: 2.

***Endurance***: poor muscle endurance in the lower extremities limits distance with walking; 2Meter Walk: 50 feet (required 2 seated rest breaks) with FWW and SBA

***Cognition and Perception***: Intact

***Functional Reach***: 4 inches

***Bed Mobility***: modified Indep

***Transfers***: SBA with FWW

***Stairs***: Min A to ascend and descend 3 steps into home with unilateral railing and FWW

**Patient Goal**: “Improve strength in legs to walk further and be able walk and ascend stairs with just a cane and railing.

**Case #2: 42 year old man with Guillain Barré Syndrome (re-innervating)** **Setting: Acute care**

PT Problems: ***MMT***: Bilateral shoulders 4-/5, other UE muscles 2/5; trunk (abdominals): 2/5;hips 3/5, knees 3+/5, ankles 1/5

***PROM***: Dorsiflexion neutral only; bilateral hip extension: -10 degrees; bilateral SLR: 35 degrees

***Postural Control***: SBA to sit with UE support; unable to sit w/o UE support

***Sitting tolerance***: 20 minutes in cardiac chair in 30 degree recline; 5 minutes at edge of bed with therapist’s support.

***Bed Mobility***: moderate to maximum assist

***Transfers***: mod A (slide board)

***Standing***: Able to stand in parallel bars with maximum assist of 2 for 2 minutes

**Patient Goal**: “Be able to sit up on my own to brush my teeth and comb my hair. Be able to sit in a regular chair for a meal”.

**Case #3: 66 year old man with Parkinson’s Disease** **Setting: Outpatient PT**

PT Problems: ***Strength*** throughout is 4/5 except for hip extensors 3/5.

***PROM***: Dorsiflexion neutral only, Bilateral shoulder flexion: 110 degrees (increased thoracic kyphosis); bilateral hip extension: -10 degrees

***Functional Reach***: 6 inches

***Berg Balance Scale***: 32/56

***Bed Mobility***: min A

***Transfers***: min A sit to stand from surface height < 20 inches

***Gait***: Indep with FWW with moderate gait deviations (short stride, bilateral foot flat at Initial Contact; excessive hip and knee flexion throughout stance)

***6MWT***: 900 feet (3 rest breaks)

**Patient Goal**: “Be able to get out of bed in the night and get up from my sofa without help. Be able to walk in the home without my walker”.

**Case #4: 73 year old man with Right CVA** **Setting: Acute Care**

PT Problems: ***Hemiparesis***: L shoulder: 25% selective gravity eliminated; L elbow: 25% selective gravity eliminated; L wrist/hand: < 25% in synergy (flexion only; no extension); L hip: 25% selective against gravity; knee ext: 50% selective against gravity; ankle: < 25% ankle DF/PF in synergy

***PROM***: L ankle DF: -10 deg; L hip ext: 0 degrees

***Spasticity:*** MAS: L gastroc/soleus: 2

***Perception/Cognition***: Follows 2 step commands; Short Term Memory intact; L neglect (body and environment)

***Modified FRT***: anterior: 3 inches; R: 2 inches; L: 2.5 inches; posterior: 2 inches (fearful)

***Bed Mobility***: Moderate assist

***Transfers***: maximum assist (bed to chair – low squat pivot & sit to stand)

***Standing***: Max assist with support of hands on tall back chair x 30 seconds

**Patient Goal**: “Be able to stand up and begin walking”.

**Case #5 21 year old woman with Traumatic Brain Injury** **Setting: Acute Rehab**

PT Problems: ***Quadriparesis***: Both UE’s 3-/5 proximally, 4/5 distally. Both LE’s 3-/5 proximally, 3+ to

4-/5 distally with poor muscle endurance.

***PROM***: Dorsiflexion neutral only (Knees extended), with increased plantar flexion tone bilaterally

***Coordination***: Mild dysmetria and dysdiadochokinesia bilateral UEs.

***Cognition***: Follows simple 1-2 step commands; highly distractible; poor sustained attention; alert; oriented to name and place but not to current situation or date.

***Balance***: modified FRT: 6” in all directions. Berg 40/56

***Bed Mobility***: Independent

***Transfers***: minimum assist to stand up from low surface (< 18 inch height)

***Gait***: min assist x 100 feet with no assistive device; frequent loss of balance and assist to recover.

***Stairs***: min assist for 3 steps (4 inch height) with railing.

**Patient Goal**: “Go home to his parents’ apartment. Be able to climb full flight of stairs and walk without help”.

**Case #6: 63 year old man with cerebellar hemorrhage**  **Setting: Outpatient**

PT Problems: ***Quadriparesis***: Both UE’s is 2+/5 proximally, 3+ to 4-/5 distally. Both LE’s 3-/5 proximally, 3+ to 4-/5 distally. Trunk: 3/5.

***PROM***: WNL throughout bilat UE and LE.

***Coordination***: Moderate dysmetria and dysdiadochokinesia bilat UE and LE.

***Balance***: modified Functional Reach: anterior: 4 inches; lateral R/L: 3 inches; posterior: 3 inches with loss of balance.

***Bed Mobility***: Min assist

***Transfers***: Moderate assist (sit to stand)

***Gait***: Min assist with FWW x 25 feet.

**Patient Goal**: Be able to get out of bed on my own and stand up with my walker to walk into the bathroom without wife’s assistance”.

Case Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Group Members: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| 1.BSF impairments - ***List all impairments and then*** ***circle or highlight the 2 impairments most related to the patient’s goal that you will target in your intervention.*** |  |
| 2.For the 2 impairments chosen, **describe one non-functional exercise** and **one functional exercise** to target the impairment. Also describe **one progression** and **one regression** for each exercise (I do not want sets/reps for any of these). | Impairment 1:  ***Non-functional exercise***:  -regression:  -progression:  ***Functional exercise***:  -regression:  -progression: |
| Impairment 2:  ***Non-functional exercise***:  -regression:  -progression:  ***Functional exercise***:  -regression:  -progression: |
| 3.List all activity limitations and circle or highlight the MOST relevant one you will address in your intervention. |  |
| 4.For the activity chosen, describe the practice condition (context), structure of practice and feedback you will utilize to optimize motor learning. | Activity:  Practice condition:  Structure or practice:  Feedback: |
| 5. Describe one way that you could either change the practice condition or structure of practice for both a progression and a regression. | Progression:  Regression: |
| 6. Design a home program (that is not more than 3 activities) that the patient can perform that is realistic for their current level and setting and will address impairments, activity limitations and improve participation. |  |
| 7. Explain how your home program will lead to increased participation. |  |

Time for student to complete the activity: Approximately 2-3 hours to read the articles below, followed by a 3 hour lab

Readings/other preparatory materials:

1. Billinger S. et al. Physical activity and exercise recommendations for stroke survivors. *Stroke*. 2014; 45: 2532-2553.
2. Fell, D. Progressing Therapeutic Intervention in Patients with Neuromuscular Disorders: A Framework to Assist Clinical Decision Making. *J Neurol Phys Ther*. 2004; 225-236.
3. Shumway-Cook A, Woollacott, MH. Motor Learning and Recovery of Function. In: Motor Control: Translating Research into Clinical Practice. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2012: 21-43., L.A.

Learning Objectives:

1. Develop functional and non-functional therapeutic interventions that addresses body structure and function impairments that are relevant to key activity limitations
2. Apply principles of progression and regression in the design of a therapeutic intervention
3. Develop a home program that addresses a patient’s limitations at all levels of the ICF model.

Methods of evaluation of student learning:

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| --- | --- | --- | --- |
| Criteria | Possible points | Points received | Comments |
| 1.BSF impairments  -Lists all impairments for case given  -Highlights/circles the 2 impairments most related to the patient’s goal that you will target in your intervention. | 2 points |  |  |
| 2.Non-functional exercise  -appropriate for impairment chosen  -includes appropriate progression  -includes appropriate regression | Impairment 1:  3 points |  |  |
| 3. Functional Exercise  -relevant to impairment chosen  -includes appropriate progression  -includes appropriate regression | Impairment 2:  3 points |  |  |
| 3. Activity limitations  -Lists all activity limitations for case  - Highlights/circles MOST relevant activity limitation (related to patient goal) | 2 points |  |  |
| 4. Application of motor learning principles:  - Describes the practice condition (context)  - Describes structure of practice  - Describes feedback given  - Chooses variables that most optimize motor learning. | 4 points |  |  |
| 5. Motor Learning principles:  - Describes one progression that is appropriate for patient case  - Describes one regression that is appropriate for patient case | 2 points |  |  |
| 6. Home program  - Addresses impairments  - Addresses activity limitation  - Addresses participation  - Realistic considering patient’s current level of function and setting. | 4 points |  |  |
| 7. Accurately explains how home program will lead to increased participation. | 1 point |  |  |
| Total points: | 21 |  |  |