

## C. Motor Recovery Post Stroke Educational Supplement

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## **C1. Assessment of Motor Function Post Stroke**

### **C1.1 Assessments of Motor Function Post Stroke**

#### ***Case Study***

*A 65 year old male suffers a left hemispheric stroke and presents with a right hemiplegia. At the time of his admission to rehabilitation 2 weeks later he still presents with weakness on his right side, he is a two person pivot transfer with returning tone.*

**Q1. Name some commonly used assessments of motor function post stroke.**

### **C1.2 The Berg Balance Score**

**Q2. Describe the Berg Balance Score including its strengths and limitations.**

**Q3. Describe the Benefits of the Berg Balance Score in Terms of Prognosis of Stroke?**

#### ***Case Study (continued)***

*The 65 year old male who suffered a left hemispheric stroke responds well to rehabilitation and after extensive rehabilitation he is up walking with a cane. His Berg Balance score is 42/56.*

**Q4. What are the Implications of a Berg Balance Score of 42/56 with Regard to Risk of Falling? What Level of Assistance Should He Require?**

### **C1.3 The Chedoke-McMaster Stages of Motor Impairment**

***Q5. Describe the Chedoke-McMaster Stages of Motor Impairment.***

***Q6. Describe the 7 Brunnstrom Stages of Motor Recovery.***

#### **C1.4 Clinical Outcomes Variables Scale (COVS)**

***Q7. Describe the COVS Assessment Tool Including Strengths and Weaknesses.***

### **C2. Prognosis for Motor Recovery**

***Q1. Describe the two most important factors which predict motor recovery and describe their role.***

### **C3. Strength Training Post Stroke**

***Q1. What is the evidence that strength training improves outcomes following stroke?***

### **C4. Balance Retraining Post Stroke**

***Q1. Is balance is a predictor of mobility post stroke?***

***Q2. What evidence is there to treat balance problems post stroke.***

## **C5. The Bobath Approach / Neurodevelopmental Technique of Motor Therapy**

### **C5.1 The Bobath Approach**

#### ***Case Study***

*A 70 year female suffered a large hemispheric stroke with a significant hemiplegia. On admission to rehabilitation 14 days following the onset of the stroke the patient has shown some improvement, with no recovery in the upper extremity and CMS of 3 in the leg and 2 in the foot. The therapists enter you into a discussion about the use of the Bobath technique and its use in this case.*

***Q1. Describe the Bobath Approach/Neurodevelopmental Technique for the therapy of stroke patients.***

### **C5.2 Neurodevelopmental Approaches to Motor Recovery Post Stroke**

***Q2. Describe the various Neurodevelopmental Approaches to Motor Recovery Post Stroke.***

### **C5.3 The Evidence Supporting Neurodevelopmental/Bobath Therapy**

***Q3. The physical and occupational therapists on the rehabilitation team have been trained in neurodevelopmental therapy (NDT), in particular the Bobath technique. What is the evidence with regard to using NDT in the treatment of the hemiparetic upper extremity following a stroke?***

## **C6. Task-Specific Therapy**

### **C6.1 Task-Specific Training for Mobility**

***Q1. Why is Task-Specific Training for Mobility Being Increasingly Recommended?***

## **C6.2 Motor Relearning Program**

***Q2. Describe the Motor Relearning Program (Carr and Kenney 1992, Carr et al. 1985).***

## **C7. Treadmill Training and Partial Weight Support**

### **C7.1 Treadmill Training**

***Q1. What Evidence is there for the Effectiveness of Treadmill Training in the Absence of Partial Body Weight Support?***

### **C7.2 Treadmill Training and Partial Body Weight Support**

***Q2. What evidence is there for the effectiveness of treadmill training and partial body weight support?***

## **C8. Functional Electrical Stimulation in the Lower Extremity**

***Q1. Describe the use of functional electrical stimulation (FES) in the lower extremity.***

## **C9. Rehabilitation of the Upper Extremity**

### **C9.1 Motor Recovery in Severe Stroke**

Nakayama et al. (1994) reported that of stroke patients with severe arm paresis, with little or no movement at hospital admission, 14% make a complete motor recovery while 30% make a partial recovery. The odds of recovery for this patient, with no recovery at 14 days post-stroke, are less than that reported by Nakayama.

**Q1. For the severely affected hemiplegic upper extremity should the therapists continue to treat the upper extremity with a goal of maximizing recovery or palliate the upper extremity, minimizing contractures and pain?**

## **C10. Constraint-Induced Movement Therapy**

### **Case Study**

A 44-year-old man suffered a significant intracerebral hemorrhage with a right hemiplegia and right sensory loss to the point of the right arm having no sensation. He experienced a significant motor recovery in his right upper extremity including the hand but failed to use his right hand (he was right hand dominant) because of the significant and nearly complete sensory loss. Six weeks following the onset of his stroke, the uninvolved arm was subsequently restrained, initially for 4 hours in the mornings and progressing over the next week to 8-10 hours per day. Upon restraining the uninvolved arm and continuing with rehabilitation therapies he exhibited a dramatic recovery in the use of his right arm and hand. The upper extremity function test improved from 31/99 to 70/99 over 3.5 weeks. The 9-hole modified peg test improved from 210.3 seconds to 38.6 seconds over 3 weeks. Grip strength improved from 11 to 19 kg while lateral pinch strength improved from 4.0 to 6.0 kg over 2 weeks. Chedoke-McMaster Stroke Assessment Score for Motor Recovery did not improve over the course of treatment (6/7).



**Q1. Describe CIMT and the criteria necessary for him to be considered for CIMT.**

**Q2. What is the evidence for CIMT post-stroke for the upper extremity?**

## **C11. Mental Practice**

**Q1. What is mental practice and what is the evidence that it is useful in post-stroke recovery?**

## **C12. Spasticity Post Stroke**

### **C12.1 Spasticity of the Hemiplegic/Hemiparetic Limbs Post Stroke**

**Q1. Describe spasticity post-stroke.**

**Q2. Describe one positive aspect of spasticity on a stroke patient.**

**Q3. Describe a number of potential treatments for spasticity in a patient with upper motor neuron syndrome.**

### **C12.2 Spasticity in the Hemiplegic Lower Extremity**

#### **Case Study**

*A 38 year old male was admitted to hospital with a large left MCA infarct. CT scan showed a dense left MCA infarct, which was felt to be cardioembolic in etiology. 3 weeks after admission to acute care and following the onset of his stroke he was admitted to the rehabilitation unit. He required set-up assistance with his meals and tolerated a minced, honey-fluid diet. He required one person to assist him with dressing, grooming and bathing. He required in-and-out catheterizations for urinary retention. He was able to complete a 2 person pivot transfer despite problems with his dynamic balance. The patient could stand only in the parallel bars and used a manual wheelchair with a laptray for mobility. He was unable to communicate verbally but was able to gesture to make his needs known. Premorbidly he was quite active and was fully employed.*

*This gentleman was eventually able to ambulate independently with a cane. However, he had problems with a spastic hemiplegic gait. He tended to walk on his toes with his ankle/foot in plantar inversion which was only partially compensated for by an ankle-foot*

*orthosis. This would make his gait more inefficient, causing him to circumduct to clear the foot and sometimes throwing him off balance.*

**Q4. When Should One Treat Spasticity of Hemiplegic Lower Extremity?**

**Q5. What treatment options are available for spasticity in the lower extremity?**

**Case Study (continued)**

*The patient has heard about botulinum toxin as a "cure" for spasticity and wants to know if it will help with the spasticity in his lower leg.*

**Q6. Explain to the patient the mechanism and goals of Botulinum toxin treatment (BT) in the lower extremity.**

**Q7. Describe the impact of botulinum toxin in the spastic lower extremity.**

**Q8. What are some of the common indications for use of botulinum toxin in the spastic lower extremity, which muscles are commonly involved and what is the functional impact of these spastic muscles?**

**C12.3 Spasticity in the Hemiplegic Upper Extremity**

**Case Study (continued)**

*The patient notes that when he walks his arm goes up into forward flexed posture, with prominent spastic flexion of the elbow and wrist. He finds this posture bothersome, it*

*gets in the way of his dressing, it makes him appear more disabled and can be bothersome by the end of the day.*

**Q9. Describe the benefits of botulinum toxin in improving function in the spastic upper extremity.**

**Q10. What are some of the common indications for use of botulinum toxin in the spastic upper extremity, which muscles are commonly involved and what is the functional impact of these spastic muscles?**

**Case Study (continued)**

*In particular, this patient notes that when he walks his arm goes up into forward flexed posture, with prominent spastic flexion of the elbow.*

**Q11. The patient specifically asks if botulinum toxin will improve the appearance of his spastic elbow flexion which becomes more prominent when he ambulates. Which of the muscles would you inject?**

## **C13. Hemiplegic Shoulder Pain**

### **C13.1 The Early Flaccid Upper Extremity**

**Case Study**

*A 75-year old gentleman suffers a moderately severe left middle cerebral artery territory stroke and is admitted to an acute stroke unit. As a rehabilitation clinician you are asked to assess him two days following admission. You notice that he has a flaccid left upper extremity.*

**Q1. You are asked to immediately provide a management plan for the upper extremity designed to protect the affected shoulder.**

### **C13.2 The Later Spastic Upper Extremity**

#### **Case Study (continued)**

*The same patient is admitted to the rehabilitation unit within 10 days of suffering their moderate-sized left middle cerebral artery infarct. On examining his shoulder he has no motor movement involving the upper extremity apart from being able to shrug his shoulder. Passively you are able to forward flex his shoulder to 90 degrees, externally rotate it to a full 90 degrees with mild discomfort. He has reasonably good internal rotation and abduction is restricted to 100 degrees. Clinical examination of this gentleman's shoulder also reveals mild subluxation of the shoulder joint.*

*Three weeks later the physiotherapist comments that this gentleman is suffering from quite significant shoulder pain. You examine him and his physical examination has changed. He has made some mild motor recovery in that he now has a Chedoke McMaster Outcome Score of 3 in the arm, and 2 in the hand. His tone has increased significantly involving the upper extremity. He is now able to only obtain 70 degrees of abduction, 40 degrees of external rotation with significant pain at end range, particularly when it is held in the end range adducted position (70 degrees) and he still had reasonably good internal rotation. The patient himself does not express himself well but when you ask him if it hurts he points to his right anterior shoulder. Treatment with anti-inflammatory drugs and Tylenol #3's do not appear to be assisting him and the nurses report that pain is beginning to keep him up at night and that they find him quite restless.*

**Q2. What are the possible pathophysiological causes of this gentleman's pain?**

**Q3. Assuming he has had no pain pre-morbidly and little pain at time of admission, what is the most likely cause of this gentleman's pain?**

**Q4. Describe a management plan for this gentleman's pain.**

**Case Study (continued)**

*The therapist asks if it would be appropriate to try functional electrical stimulation.*

**Q5. What would you advise regarding the use of functional electrical stimulation?**

**Case Study (continued)**

*The patient tells you that the shoulder pain is increasing and the therapist has been particularly aggressive, trying to get him to stretch out his tight shoulder even though it is very painful at the time.*

**Q6. What would you advise with the overaggressive therapist and the progressively increasing shoulder pain?**

**Q7. What is the evidence for using botulinum toxin to treat this gentleman's painful hemiplegic shoulder?**

## **C14. Case Study: Post-Stroke Motor Recovery**

**Case Study**

*63 year old female was admitted with a right middle cerebral infarct, involving the frontal lobe, as a consequence of a cardiac emboli. As a consequence she is suffering from a right hemiparesis. At the time of admission to the stroke rehabilitation unit, 14 days after the onset of her stroke, she was admitted with a Berg Balance score of only 8/56; the patient*

*is still experiencing a largely flaccid hemiplegia with Chedoke McMaster Staging scores on the right side of 1/7 in the hand and arm, 1/7 in the leg and 1/7 in the foot, and 1/7 for posture. There were no sensory problems noted.*

**Q1. The patient asks you what the potential for recovery of the upper extremity is. What is your response?**

**Q2. The occupational therapist asks you how they should manage the hemiplegic upper extremity. Should they continue to treat the upper extremity with a goal of maximizing recovery or palliate the upper extremity, minimizing contractures and pain?**

**Case Study (continued)**

*The patient improves with rehabilitation. Although there is only limited recovery in her upper extremity she improves in her lower extremity to a CMS of 3 in her leg and 2 in her foot. She is able to ambulate, albeit with a spastic gait, a cane, and supervision. Unfortunately, because her ankle/foot keeps going into plantarflexion she has trouble clearing her foot or getting her heel down on the ground. The outpatient physiotherapist thinks that she would be a good candidate for botulinum toxin injections.*

**Q3. Explain to the patient the mechanism and goals of Botulinum toxin treatment (BT) in the lower extremity.**

**Q4. Describe the benefits of botulinum toxin in improving function in the spastic upper extremity.**

**C15. Case Study: Lower Extremity and Mobility**

### **Case Study**

A 38 year old male was admitted to hospital with a large left MCA infarct. CT scan showed a dense left MCA infarct, which was felt to be cardioembolic in etiology. 3 weeks after admission to acute care and following the onset of his stroke he was admitted to the rehabilitation unit. He required set-up assistance with his meals and tolerated a minced, honey-fluid diet. He required one person to assist him with dressing, grooming and bathing. He required in-and-out catheterizations for urinary retention. He was able to complete a 2 person pivot transfer despite problems with his dynamic balance. The patient could stand only in the parallel bars and used a manual wheelchair with a laptray for mobility. He was unable to communicate verbally but was able to gesture to make his needs known. Premorbidly he was quite active and fully employed.

### **Case Study (continued)**

Initial assessment on the stroke rehabilitation unit reveals the following:

	<b>Admission 3 weeks post-stroke</b>
2 Minute Walk Test	Not walking
Berg Balance Scale	5/56
COVS	30/91
CMS Right Leg	1/7
CMS Right Foot	1/7
Postural Control	4/7
CMS Arm	1/7
CMS Hand	1/7
Sensation Right Side	Decreased

**Q1. Try to predict this gentleman's clinical course. Presuming no medical complications will he walk again and if so how much assistance is he likely to require.**

**Q2. The Question of whether this patient would benefit from partial body-weight support and treadmill training early on arises. Discuss the evidence for benefits of this treatment approach and any potential drawbacks.**

**Case Study (continued)**

*This patient remained on the rehabilitation unit for almost 3 months. He was discharged to home with the help of his spouse.*

	<b>Admission</b>	<b>Discharge</b>
2 Minute Walk Test	Not walking	60 meters
Greatest Distance Walked Before Requiring a Rest	-	525 meters
Time to Walk Greatest Distance	-	22 min, 42 sec
Assistance Required	-	Supervision for walking
Walking Device Used	-	Single point cane
Berg Balance Scale	5/56	51/56
COVS	30/91	75/91
CMS Right Leg	1/7	4/7
CMS Right Foot	1/7	2/7
Postural Control	4/7	5/7
CMS Arm	1/7	2/7
CMS Hand	1/7	2/7
Sensation Right Side	Decreased	Decreased

**Q3. What is the risk of this gentleman falling based on the Berg Balance Score?**

**Q4. This gentleman showed a marked improvement in terms of ambulation and mobility despite only modest improvements in his Chedoke McMaster or Brunnstrom recovery stages. What factors would account for this improvement?**

## **C16. Case Study: Upper Extremity Post-Stroke**

### **Case Study**

*A 67 year old male suffered a small subcortical left hemispheric stroke, with subsequent right hemiparesis. He was admitted to rehabilitation 14 days following the onset of his stroke. The Chedoke McMaster Score of the lower extremity was 5 in the leg, 3 in the foot, 5 in the arm, and 2 in the hand.*

***Q1. The occupational therapist is new and has not done much in the way of stroke rehabilitation in the past. She asks you how they should manage the hemiplegic upper extremity. How aggressively should she treat the upper extremity?***

***Q2. Your patient tells you that he knows he is going to improve because he frequently imagines moving his arm. What can you tell him about mental practice?***

## References

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