How to Incorporate the Evidence-Based Practice of Modified Constraint-Induced Movement Therapy in an Inpatient Rehabilitation Facility

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Lauren Walker Bio

- **Introductory and Educational Background:** Lauren Walker currently serves as a CVA primary therapist within an inpatient rehabilitation setting in her second year of practice. OT Graduate Work completed at Shenandoah University in Winchester, Virginia before moving to Gainesville, Florida to join Shands Rehabilitation Hospital. Aside from occupational therapy, Lauren participates in achieving physical activity goals such as half-marathons, and sprint triathalons.

- **Presenter Professional Experience:** Graduate work included research on Hippotherapy and Special Olympic Athletes being accepted and presented at World OT Conference in Japan, 2014. In second year of clinical practice, serving the CVA adult population.

- **Presenter Publications:** Pending publication through OT Practice for this CIMT topic.
Kristen Haines Bio

- **Introductory and Educational Background:** Kristen Haines received her Bachelors of Health Science and Masters of Occupational Therapy at the University of Florida. She has since remained in her hometown of Gainesville, Florida where she is a working mom with two beautiful children.

- **Presenter Professional Experience:** Kristen has worked as an OT for the last 9 years. Kristen’s primary area of practice has been in the inpatient rehabilitation setting at Shands Rehab Hospital over the last 8 years where she began as the primary therapist on the Spinal Cord Injury team. She also has experience in the acute care, home health and outpatient settings.

- **Presenter Publications:** Pending publication through OT Practice for this topic.
What’s happening in the brain during a stroke

- The Penumbra
  - Neurons in a stunned state after infarction or hemorrhage
  - Lack of blood flow
  - Neurons are alive and salvageable for a time
  - Natural healing of the brain decreases penumbra
  - The brain is either establishing new connections or pruning dendritic connections

Figure 3 Core and penumbra after stroke.
Note: Reprinted from Journal of Radiology Nursing, 30(3), Summers D, Mulloy R, CT and MR imaging in the acute ischemic stroke patient: a nursing perspective,104-115, Copyright 2011, with permission from Elsevier.
Brain Derived Neurotrophic Factor

- A protein growth factor that brain emits
- Happens under neurological injury, also when babies are first born
- Allows humans to learn in stressful environments
Four Phases of Stroke

1. Hyper-Acute Phase: The first six hours (when TPA can be used)
2. Acute Phase: The first seven days
3. Subacute Phase: Between 7-days and 3 months
4. Chronic Phase: 3 months and over
Timing is Everything

- During the first 7 days s/p CVA, brain plasticity is **DECREASED**, therefore; high intensity is not recommended.
- Between 14-20 days s/p CVA, brain plasticity is **INCREASED**

Takeaway: No compensatory strategies in the first 10 days, instead focus on cardiovascular training to emit BDNF, and rehabilitative theories to avoid learned non-use.
Why avoid early compensation?

- Most residual deficits after stroke are not from the area of infarct, they are from learned non-use.
- Loss of function from the penumbra that will eventually come back online when stunned state is over.

Example: AFO’s immediately s/p CVA. The area of the brain that is controlling dorsiflexion and other musculatures that might cause a reason for an AFO later in life, can shrink up to half it’s size in just a few weeks, if not given a chance to get out of it’s stunned state.
How do we maximize recovery?

MAKE IT:

REPETITIVE

CHALLENGING

MEANINGFUL
1,200 is the magic number in multiple studies where the brain was able to light up on a CT scan, using a new part of the brain to take over the area of infarct.

On average, therapists are completing 32 repetitions per session (Lang et. Al, 2007) without the use of a modality or technology.
Three Principles of CIMT

- Constraining the unaffected limb
- Forced use of the affected limb
- Massed practice
Evidenced-Based Support of CIMT/mCIMT

- Research supports that 75% of subacute and chronic CVA patients benefit from CIMT due to the amount of cortical reorganization that happens with one-handed, repetitive tasks.
- This repetitive use increases the patient’s willingness to use their affected UE, as well as the mental flexibility to continue challenging themselves once a therapist is not present.
- Literature review completed by Fleet, et al. (2014), aimed to explore the LOE of mCIMT in promoting UE recovery post stroke:
  - 15/473 articles identified with results indicating that participants receiving mCIMT experienced clinically significant improvements in UE impairment
  - mCIMT protocol is an effective intervention for UE recovery post-stroke
  - Future research including large RCTs could increase the LOE for mCIMT
Why We Chose mCIMT

The Research:

The drawbacks to traditional CIMT were the required practice intensity and duration of restraint (90% of waking hours).

Modifications to the original procedures may create promising results, however; the optimal timing of treatment remains uncertain (programs range from 30 minutes-6 hours in different facilities).

Meta-review concludes that participants receiving mCIMT experienced clinically significant improvements in UE impairment and activity-level attributes. It is an effective intervention for UE recovery post-stroke.
Our Version of mCIMT

- Strive for a total of 2 hours of participation per day with the constraint involved, however; only 30 minutes Monday-Friday is scheduled with a therapist daily.

- Patients must be cognitively intact enough to follow one to two-step commands to complete repetitive movements.

- Must meet the 10-10-10 rule, 10 degrees of active wrist extension, 10 degrees of active abduction of the thumb at CMC joint, 10 degrees to two other digits.

- Must be able to pick up and drop a washcloth 3x within 1 minute.
Program Guidelines

- OT/TR Collaboration

- All disciplines try to screen patients to see who is appropriate, and sign them up accordingly.

- Use 9HPT, Box and Blocks, Grip Strength, and Pinch Strength as evaluation measurements.

- We use OVEN MITTS 😊
Role of OT in CIMT

- Recognizing and assigning appropriate patients.
- Determining “just right challenge”
- Task breakdown through activity analysis of patient’s occupational goal
- Use of CIMT to carryover independence as remedial therapeutic intervention of affected UE/hand in ADLs/IADLs.
- Educating patient/family on best ways to implement at home post discharge.
Implementing into Rehab Setting

Consistency is key!
- Same Time (M-F 1:30-2:00)
- Same Place (dinning hall), all at one table
- Same Therapist
- Same Patients (assigned to everyday, Cap at 4 persons unless 2nd therapist available)

Supplies
- 1 large Tupperware bin
- Oven Mitts
- Purell
- Activity options
- 9HPT
- Dycem

Communication
- Therapy staff education – OT/PT/SLP
- RN education on mitts

Patient carryover
- Purple Mitts
- Signed “contract”
Case Study: Bennie

- **Occupational Profile**
  - 58 year old male
  - Bilateral ACA/MCA watershed acute infarcts due to embolism
  - Admitted 3/29 and evaluated for case study on 3/31
  - Retired Army, married to supportive wife
  - Enjoys cooking, spending time with wife, playing video games

- **GOALS:**
  1. “Open a can of soda and bring it to my mouth without spillage”
  2. “Dress myself again”
  3. “Be stronger, better and faster”
  4. “Be able to touch my wife again”
CIMT Intervention for Bennie

Water cups: Starting R→ L and back again as many times as tolerated, transfer ½ cup water from cup to cup
2. Clothes pins with different levels of resistance
3. Scooping ONLY 2 beads at a time with spoon from one bowl to the other
CIMT Interventions for Bennie Continued

4. Dressing Vest: to promote in-hand manipulation, lateral pinch and pincer grasp

5. Open/Pour/ bring to mouth a full cup of soda without spillage
CIMT Intervention for Bennie Continued

- 6. Basketball toss to encourage grasp/release patterns and active elbow extension
CIMT Intervention for Bennie Continued

- 7. Handwriting
- 8. Velcro exercise board
- 9. Disc manipulation using OT tool to promote coordination and controlled pronation/supination
- 10. Whiteboard wash using washcloth to promote AROM
Case Study Outcomes
4/5/16-4/11/16 Only 6 Days!
Continued Case Study Outcomes
3/31 -> 4/11

Roll putty from ball form into log shape form

String 9 beads onto string: 82 seconds faster (187-105)
Continued Case Study Outcomes

### Quantitative Data

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#### GRIP
- R Grip Strength: 67 lbs
- L Grip Strength: 110 lbs
- R Grip Strength: 53 lbs
- L Grip Strength: 95 lbs
- R Grip Strength: 96 lbs
- L Grip Strength: 124 lbs

#### PINCH
- R Pinch (tip): 10 lbs
- L Pinch (tip): 20 lbs
- R Pinch (tip): 10 lbs
- L Pinch (tip): 20 lbs
- R Pinch (tip): 9 lbs
- L Pinch (tip): 10 lbs
- R Pinch (lateral): 13 lbs
- L Pinch (lateral): 29 lbs
- R Pinch (lateral): 18 lbs
- L Pinch (lateral): 29 lbs
- R Pinch (lateral): 16 lbs
- L Pinch (lateral): 24 lbs
- R Pinch (3 jaw): 11 lbs
- L Pinch (3 jaw): 22 lbs
- R Pinch (3 jaw): 14 lbs
- L Pinch (3 jaw): 22 lbs
- R Pinch (3 jaw): 14 lbs
- L Pinch (3 jaw): 23 lbs

**Box and Blocks**
- To assess unilateral gross manual dexterity and number of cubes transferred in one minute.
- Mean: 75.2
- 20 blocks: 35 blocks
- 28 blocks

**9HPT**
- To assess finger dexterity
- R: 72 sec (mean=20.90)
- L: 37 sec (mean=21.64)
- R: 45 sec
- L: 37 sec
- R: 44 sec
- L: 31 sec

### Goniometric Measures

<table>
<thead>
<tr>
<th>Date</th>
<th>Ulnar Deviation</th>
<th>Radial Deviation</th>
<th>Wrist Extension</th>
<th>Wrist Flexion</th>
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*Means listed based on healthy sample norms with corresponding age range. Improvements noted in RUE.*

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**From 3/31 ➔ 4/11 confirmed**
- 8/12 days CIMT participation
- 5/12 days documented use of mitt during therapy
Continued Case Study Outcomes

• Patient-rated outcome measure
• Uses 11 items to measure physical function and symptoms in persons with any or multiple musculoskeletal disorders of the upper limb
• Scoring: based on 0-100 scale, with *higher* score indicating *greater* disability
• Used to measure patient’s sense of self, ability, and function pre and post CIMT participation

• Initial score: **56.81**
• Post-CIMT score: **38.6**
### Plan of Care Goals

<table>
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<tr>
<th>Problem area</th>
<th>Initial LOF</th>
<th>Current LOF</th>
<th>Estimated LTG</th>
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<tbody>
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<tr>
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<td>5</td>
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<td>Shower Transfer</td>
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<td>5</td>
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<tr>
<td>Impaired FMC</td>
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Overall Patient feedback

- Enjoy the group setting, allows for encouragement and motivation from other participants
- Recognize own improvements more
- Patients can compare/contrast when discussing the similar activities they have done at different stages of recovery
Other primary therapists that have signed their patients up for the CIMT group, notice a definite change in ADL performance in regards to upper extremity use in functional environment.

Patients understand the concept more when they have an isolated time to be educated on it.

It is an opportunity to educate family and caregivers on ways to carry over this method at home.

Keeping it simple leads to increased carryover.
How can YOU implement this in your setting?

Let’s Discuss 😊
References


