Online Supplementary Document

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Hand Therapy Assessments For Use With International Technicians (HTAIT)

Appendix S1

Background:
Rehabilitation professionals and hand therapists participating in international medical humanitarian efforts often do so with very little information regarding the capabilities of the local staff or organization. The HTAIT is a simple, easy to use needs assessment to help identify current knowledge as well as areas for growth by focusing training, demonstration, and learning opportunities to assist the visiting therapist in determining the level of competency in a host therapy technician or organization. Hand therapists and non-profit organizations preparing to travel internationally can administer this tool to international technicians, nurses, or healthcare staff at the host institution, improving the effectiveness of the experience for both visiting and host practitioners and increasing the likelihood of long term carryover.

Methods:
The HTAIT consists of four assessment modules, each focusing on a different element of upper extremity rehabilitation: *Basic Upper Extremity Anatomy, Wound Care & Scar Remodeling, Orthotic Principles, and Rehabilitation*. The modules are designed to be given individually or in combination with one another depending on the expressed needs or interest of the host facility. Although the assessment modules are not necessarily sequential, they do require knowledge that is hierarchical in nature with a certain degree of overlap. Therefore, it would be expected to administer assessment modules 1, 2 and 3 together, but unlikely that assessment modules 3 or 4 would be given without a high score in assessment module 1.

Findings:
To score the HTAIT, add the number of correct answers in each assessment module according to the instructor key. The total number of points in each assessment module corresponds to the student's Learning Level category on the scoring rubric and GRID. Practitioners can then use the Learning Level category as a guide to focus learning opportunities.

Conclusion:
Information gleaned from the HTAIT will improve the effectiveness of the learning experience for both the visiting and host practitioners, increasing the likelihood of long term carryover of rehabilitation principles and strategies.

Assessment Module 1: Basic Upper Extremity Anatomy

1. The flexor muscle tendon units are located on the palmar side of the forearm and hand.

YES NO

2. The extensor and flexor muscle tendon units begin above the elbow and extend to the fingertips.

YES NO

3. The thumb has muscles and tendons that begin both in the forearm as well as the hand.

YES NO

4. The bicep muscle can bend what two joints?

Answer: _____

5. The median nerve provides sensation to the dorsum of the hand.

YES NO

6. The scaphoid bone is located at the ulnar aspect of the wrist.

YES NO

7. The Flexor Digitorum Superficialis tendon splits into two slips to allow the Flexor Digitorum Profundus to attach at the distal phalanx joint?

Answer: _____

8. What three bones does the shoulder complex consists of?

Answer: _____

9. What nerve provides motor innervation to both parts of the thumb and small finger?

Answer: _____

10. What long forearm bone rotates around another bone to allow the forearm-hand complex to supinate?

Answer: _____

Instructor Key

Module 1: Basic Upper Extremity Anatomy

(4 low/4 med/2 high) total 26 points

1. The flexor muscle tendon units are located on the palmar side of the forearm and hand? (Yes: The FDP and FDS are located on the volar aspect of the forearm and hand) 1POINT

2. The extensor and flexor muscle tendon units extend from the upper arm to the fingertips? (Yes: The extrinsic flexors and extensors have origins at the proximal forearm and do not cross the elbow joint.) 1POINT

3. The thumb has muscles and tendons that begin both in the forearm as well as the hand? (Yes: the thumb has both intrinsic and extrinsic muscles-tendon units.) 1POINT

4. The bicep muscle can bend what two joints? (Answer: The bicep muscle crosses both the anterior shoulder and the anterior elbow joint, allowing for flexion at each joint.) 1POINT

5. The median nerve provides sensation to the dorsum of the hand? (No: The median nerve provides sensation to the anterior aspect of the forearm and the volar aspect of the thumb, IF, MF and the radial aspect of the RF.) 3POINTS

6. The scaphoid bone is located at the ulnar aspect of the wrist? (No: The scaphoid bone is located on the radial aspect of the wrist). 3POINTS

7. The Flexor Digitorum Superficialis tendon splits into two slips to allow the Flexor Digitorum Profundus to attach at the distal phalanx joint? (No: The FDP tendon splits into two slips to allow the FDS to attach at the distal phalanx joint.) 5 POINTS

8. What three bones does the shoulder complex consists of? (Answer: the scapula, clavicle and humerus). 3POINTS

9. What nerve provides motor innervation to both parts of the thumb and small finger? (Answer: the ulnar nerve). 3POINTS

10. What long forearm bone rotates around another bone to allow the forearm-hand complex to supinate? (Answer: the radius rotates around the ulna to allow supination motion). 5POINTS

Assessment Module 2: Wound Care & Scar Remodeling

1. There are three layers of skin.

YES NO

2. A hypertrophic scar is raised, red and can be tender or itchy.

YES NO

3. At the very least, sterile water should be used clean a wound by boiling for a minimum of 5 seconds and then storing it in a closed container.

YES NO

4. Body parts with fresh burns should not be allowed to move until the wound has fully healed.

YES NO

5. Household products such as butter or cooking oil are safe to apply to fresh burns and wounds.

YES NO

6. The same piece of gauze or cloth should be reapplied to a wound after it is cleaned.

YES NO

7. How long does it take for a severe burn scar to remodel?

Answer: _____

8. What two forces are required for optimal scar remodeling?

Answer: _____

9. What position should be avoided during burn and wound healing to provide maximum tissue length?

Answer: _____

10. What position should the fingers be positioned in to avoid clawing during burn wound healing?

Answer: _____

Instructor Key

Module 2: Wound Care & Scar Remodeling

(4 low/4 med/2 high) total 26 points

1. There are three layers of skin? (Yes: The epidermis, the dermis and the hypodermis) 1POINT

2. A hypertrophic scar is raised, red and can be tender or itchy. (Yes: a hypertrophic scar is all of the above but does not extend beyond the border of the scar) 3POINTS

3. At the very least, sterile water should be used clean a wound by boiling for a minimum of 5 seconds and then storing it in a closed container. (No: Water should be boiled for a minimum of 60 seconds in order to render it safe for basic wound cleansing) 1POINT

4. Body parts with fresh burns should not be allowed to move until the wound has fully healed. (No: Limbs with burn wounds must be moved to the limits of the joint regularly in order to maintain joint range of motion and encourage tissue length to prevent contractures.) 3POINTS

5. Household products such as butter or cooking oil are safe to apply to fresh burns and wounds. (Answer: Products such as these are not safe to apply to wounds or burns and can cause infection or delay in healing.) 1POINT

6. The same piece of gauze or cloth should be reapplied to a wound after it is cleaned. (No: a clean, fresh dressing should be applied each time the wound is cleansed to prevent infection) 1POINT

7. How long does it take for a severe burn scar to remodel? (Answer: 2 years or longer) 3POINTS

8. What two forces are required for optimal scar remodeling? (Answer: Compression and tissue tension) 3POINTS

9. What position should be avoided during burn and wound healing to provide maximum tissue length? (Answer: Flexion is the position of comfort and also the position that is most likely to lead to contracture) 5POINTS

10. What position should the fingers be positioned in to avoid clawing during burn wound healing? (Answer: Clawing of fingers can be avoided by positioning the MP joints in flexion, IP joints in extension, thumb mid palmar radial abduction) 5POINTS

Assessment Module 3: Orthotic Principles

1. A fracture should be immobilized for at least 4-6 weeks.

YES NO

2. As many joints as possible should be included in the orthotic immobilization in order to protect the healing structure.

YES NO

3. A severed tendon can be repaired by immobilizing in an orthotic for at least 4-6 weeks.

YES NO

4. A barrier such as a thin cloth or gauze should be applied between the skin and the orthotic for protection.

YES NO

5. A distal radius fracture should be positioned in an orthotic with a neutral wrist.

YES NO

6. What are some of the contraindications of orthotic application of an injured structure?

Answer: _____

7. Why should the digits not be immobilized in a resting flexed position if the hand and digits are very swollen?

Answer: _____

8. What might be the consequence of applying a too-tightly fitting orthotic?

Answer: _____

9. What position should a shoulder be positioned in during the healing phases of a burn?

Answer: _____

10. What position should the hand/digits be positioned in during the healing phase of a burn?

Answer: _____

Instructor Key

Module 3: Orthotic Principles

(4 low/4 med/2 high) total 26 points

1. A fracture should be immobilized for at least 4-6 weeks? (Yes: A typical fracture is consolidated enough for gentle, interval motion at 4-6 weeks) 1POINT

2. As many joints as possible should be included in the orthotic immobilization in order to protect the healing structure. (No: Only the joints essential to protection of the injured structure should be immobilized to prevent stiffness). 1POINT

3. A severed tendon can be repaired by immobilization in an orthotic for at least 4-6 weeks. (No: The ends of a severed tendon cannot consolidate without surgical repair). 1POINT

4. A barrier such as a thin cloth or gauze should be applied between the skin and the orthotic for protection. (Yes: A thin barrier allows for perspiration absorption and reduces friction in order to protect against mace ration and skin breakdown) 1POINT

5. A distal radius fracture should be positioned in an orthotic with a neutral wrist. (No: A DR fracture is typically positioned in short arm, volar resting orthotic in 20-30 degrees of wrist extension) 3POINTS

6. What are some of the contraindications of orthotic application of an injured structure? (Answer: Edema fluctuations, skin maceration, tissue/wound integrity, sensation deficits, ect) 3POINTS

7. Why should the digits not be immobilized in a resting flexed position if the hand and digits are very swollen? (Answer: The PIP and DIP should be in extension with the MPs in slight flexion to preserve digital extension and maintain tissue length of intrinsic muscles of the hand) 3POINTS

8. What might be the consequence of applying a too-tightly fitting orthotic? (Answer: a too-tightly fitting orthotic could create pooling edema, compress nerve, and impede healing but disrupting blood supply). 3POINTS

9. What position should a shoulder be positioned in during the healing phases of a burn? (Answer: slight shoulder abduction) 5POINTS

10. What position should a hand/digits be positioned in during the healing phase of a burn? (Answer: MP joints should be positioned in slight flexion, IP joints in extension and thumb in mid palmar radial abduction) 5POINTS

Assessment Module 4: Rehabilitation Principles for the Upper Extremity

1. Therapy can be a specific exercise or familiar activity in which the goal is increasing independence.

YES NO

2. Needing to engage in a task and wanting to engage in a task are both important aspects of a person.

YES NO

3. Safety is an important consideration in exploring an adaptive approach to completing a task.

YES NO

4. An activity's level of difficultly cannot be altered by changing the patient's body position.

YES NO

5. A stiff joint should be repeatedly pushed past the point of pain but not held in place.

YES NO

6. In what way might you grade an activity to make it more or less challenging based on the needs of the patient?

Answer: _____

7. In general, what tissue quality is needed before strengthening can be introduced?

Answer: _____

8. When should range of motion begin following a burn injury?

Answer: _____

9. What precautions should be taken when caring for a limb with no sensation or poor sensation?

Answer: _____

10. What is an important question to ask a patient when setting an outcome goal for therapy?

Answer: _____

Instructor Key

Module 4: Rehabilitation Principles for the Upper Extremity

(4 low/4 med/2 high) total 26 points

1. Therapy can be a specific exercise or familiar activity in which the goal is increasing independence? (Yes: Therapeutic exercise and therapeutic tasks both provide opportunities to improve quality of movement for greater independence in everyday situations). 1POINT

2. Needing to engage in a task and wanting to engage in a task are both important aspects of a person. (Yes) 1POINT

3. Safety is an important consideration in exploring an adaptive approach to completing a task. (Yes) 1POINT

4. An activity's level of difficultly cannot be altered by changing the patient's body position? (No: Environment and the patient's relationship within the therapeutic environment plays a vital role in the kinds of challenges the activity might pose.) 3POINTS

5. A stiff joint should be repeatedly pushed past the point of pain but not held in place. (No: As appropriate, a stiff joint should be ranged to the point of firm end feel as tolerated and held in place for a minimum of 30 seconds before being slowly released at tissue speed. This will maximize tissue growth for increased length while avoiding joint and soft tissue damage and increased edema.) 3POINTS

6. What sorts of ways might you grade an activity to make it more or less challenging based on the needs of the patient? (Answer: Time constraints, duration/endurance tolerated, speed of the task/exercise, level of resistance or weight tolerated, number of steps, visual or verbal cues required, quality of movement or compensatory movements) 5POINTS

7. In general, what tissue quality is needed before strengthening can be introduced? (Answer: Adequate tissue length should be achieved prior to initiation of strengthening through range of motion exercise). 5POINTS

8. When should range of motion begin following a burn injury? (Answer: Range of motion should be introduced as is safely allowed to minimize joint contractures and encourage tissue length.) 1POINT

9. What precautions should be taken when caring for a limb with no sensation or poor sensation? (Answer: Extreme hot or cold temperature, pressure points, friction, skin integrity, ect.) 3POINTS

10. What is an important question to ask a patient when setting an outcome goal for therapy? (Answer: The patient should be consulted as to what their goal is for the therapeutic intervention as well as what sorts of activities they would like to be able to accomplish more easily. Patient volition is vital to any successful therapeutic interaction). 3POINTS

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Assessment Module(s) Scoring Rubric

Module 1: Basic Upper Extremity Anatomy: total 26 points

Level 1 (score of 0-6 points)
Orientation- Focus on the names of UE large muscle groups and their general location; names for the direction of motion for each joint structure such as flexion vs extension; names of the three major nerves; introduce concept if anterior/posterior and volar/dorsal

Level 2 (score of 5-13 points)
Refinement- Focus on names and location of the bones of the shoulder, forearm, hand, and digits with possible introduction of proximal row of carpal bones; introduce names and location of FDP/FDS and EDC; focus on pattern of cutaneous innervation of median, ulnar and radial nerves;

Level 3 (score of 12-26)
In Depth- Names of all carpal bones and their relation to one another; sensory vs motor innervation patterns in the UE; names, origin and insertion and action of intrinsic vs extrinsic wrist flexors and extensors; names, location and action of muscles of the shoulder and elbow

Module 2: Wound Care & Scar Remodeling

Level 1 (score of 0-6 points)
Orientation- Basic structure and function of skin and connective tissues; basic stages of normal wound healing; indications of infection or healing complication; principles of infection control and cleansing of wounds

Level 2 (score of 5-13 points)
Refinement- Principles of scar remodeling; Impact of positioning on healing burns/wounds; importance of interval movement in creation of tissue length to preserve function

Level 3 (score of 12-26)
In Depth- Specific positioning for burns/wounds of digits, hand, wrist, elbow, shoulder/axilla; physiological factors that may delay healing

Module 3: Orthotic Principles

Level 1 (score of 0-6 points)
Orientation- Purpose of orthotics for fractures, tendon injuries, nerve injuries; principles of soft tissue and joint protection in orthotic application; introduction to materials and basic static orthotic design such as volar resting, thumb spica, ulnar gutter

Level 2 (score of 5-13 points)
Refinement- Principles of assessing soft tissue for orthotic application such as edema, bony prominences, external hardware; refinement of static orthotic design including safe position, dorsal blocking, oval eight

Level 3 (score of 12-26)
In Depth- Introduction of dynamic orthotics; detailed orthotic modifications for specific joints

Module 4: Rehabilitation

Level 1 (score of 0-6 points)
Orientation- Principles of patient volition and self-actualization; concepts of grading a familiar activity for therapeutic purposes; concepts of ADLs/IADLs and or recreation/play as therapeutic activities

Level 2 (score of 5-13 points)
Refinement- Activity gradation; strategies for increased active range of motion, passive range of motion, place and hold for increased tissue length/growth in stiff joint; impact of altered sensation on function/safety; desensitization strategies; low tech adaptation and environmental modifications for increased function

Level 3 (score of 12-26)
In Depth- principles of adequate range of motion and tissue length; strengthening strategies

	Module 1 Basic Upper Extremity Anatomy	Module 2 Wound Care & Scar Remodeling	Module 3 Orthotic Principles	Module 4 Rehabilitation
Level 3 *In Depth* *(score of* *12-26* *points)*	Names of all carpal bones and their relation to one another; sensory vs motor innervation patterns in the UE; names, origin, insertion and action of intrinsic vs extrinsic wrist flexors and extensors; names, location and action of muscles of the shoulder and elbow	Specific positioning for burns/wounds of digits, hand, wrist, elbow, shoulder/axilla; physiological factors that may delay healing	Introduction of dynamic orthotics; detailed orthotic modifications for specific joints	Principles of adequate range of motion and tissue length; strengthening strategies
Level 2 *Refinement* *(score of* *5-13 points)*	Focus on names and location of the bones of the shoulder, forearm, hand, and digits with possible introduction of proximal row of carpal bones; introduce names and location of FDP/FDS and EDC; focus on pattern of cutaneous innervation of median, ulnar and radial nerves	Principles of scar remodeling; impact of positioning on healing burns/wounds; importance of interval movement in creation of tissue length to preserve function	Principles of assessing soft tissue for orthotic application such as edema, bony prominences, external hardware; refinement of static orthotic design including safe position, dorsal blocking, oval eight	Activity gradation; strategies for increased A/AA/PROM and place and hold for increased tissue length/growth in stiff joint; impact of altered sensation on function/safety; desensitization strategies; low tech adaptation and environmental modifications for increased function
Level 1 *Orientation* *(score of 0-6 points)*	Focus on the names of UE large muscle groups and their general location; names for the direction of motion for each joint structure such as flexion vs extension; names of the three major nerves; introduce concept of anterior/posterior and volar/dorsal	Basic structure and function of skin and connective tissues; basic stages of normal wound healing; indications of infection or healing complication; principles of infection control and cleansing of wounds	Purpose of orthotics for fractures, tendon injuries, nerve injuries; principles of soft tissue and joint protection in orthotic application; introduction to materials and basic static orthotic design such as volar resting, thumb spica, ulnar gutter	Principles of patient volition and self-actualization; concepts of grading a familiar activity for therapeutic purposes; concepts of ADLs/IADLs and or recreation/play as therapeutic activities