Presentation Details
Basic-introductory and Intermediate-experienced levels.

This interactive experience incorporates tricks-of-the-trade techniques in the fabrication of a wrist-hand immobilization orthosis and a serpentine orthosis. Participants will learn methods to enhance ergonomics, to improve client collaboration in the fabrication process and to use materials economically. The focus on orthosis fabrication offers opportunities for therapists with a wide range of experience and skill levels to participate.

2. Brief Description
The participant will:
State the optimal position for the orthosis of the upper extremity in a variety of diagnoses.
Make one pattern for one wrist-based orthosis.
Demonstrate or state the process to make one orthosis without a physical pattern.
Fabricate one wrist immobilization orthosis with one of three hand variation components or one wrist hand immobilization orthosis.
Fabricate one serpentine orthosis, either hand-based or forearm-based.
Demonstrate three techniques to increase efficiency in orthosis fabrication.
Demonstrate three methods of enhanced ergonomics in fabrication process.
State three techniques to encourage client collaboration during the fabrication process.
Determine essential components of home education to facilitate compliance with orthosis wear.
State nine uses for small material scraps.
Define five basic infection control standards.

Handouts include patterns and designs for wrist immobilization and wrist-hand immobilization orthoses, and bibliography.

PARTICIPANTS: Please bring a pair of SCISSORS for use in orthosis construction.

Presenters:
Toni Thompson, MA, OTR/L, C/NDT and Erica N. Goldin, MS, OTR /L

Toni Thompson, MA, OTR/L, C/NDT, fabricated, modified, or fit over 10,000 upper extremity orthoses during her 22 years at Shriners Hospitals for Children in Tampa. She developed and presented 10 two-day pediatric splinting workshops. As a senior instructor for TherapyEd, she has presented over 150 OT Exam Review Courses throughout the US, including Puerto Rico. Publications include over 40 articles in AOTA, OT Practice, ADVANCE for OTs, Journal of Pediatric Orthopaedics, and a variety of physical therapy and orthotic and prosthetic magazines. She authored a chapter in Culture in Rehabilitation: From Competency to Proficiency. Currently, she continues to teach OT Exam Review courses and provide volunteer service to projects in Tampa and in various Latin American countries.

Erica N. Goldin, Ms, OTR/L, is a 2011 graduate of the University of Florida Master’s program in Occupational Therapy and holder of the Alice C. Jantzen Fellowship for her class.
Practicum Outline
TERMINOLOGY
Volar = palmar
Dorsal
Wrist flexion, not volar flexion
Wrist extension, not dorsiflexion
CMC, MP, PIP, DIP, IP
Index, middle, ring, small fingers
Elbow ROM 0 ° to 125 ° - 140 °
Radial styloid
Ulnar styloid
Mechanical Properties
  ! Force
  ! influence that changes/directs motion.
  ! Parameters of force
    ! Nature: type, either push or pull.
    ! Magnitude: amount.
    ! line of angle of application: path.
    ! point of application: location where force acts.
Mechanical Properties
  ! Torque = moment of force
  ! The potential for a force to produce:
    ! rotation of lever around an axis (joint.)
  ! Torque
    ! unbalanced force.
    ! point of application NOT the center of the object.
    ! resulting in rotation of object around fixed axis.
Mechanical Properties
  ! Torque = moment of force
  ! Torque = Force X perpendicular distance from the axis of rotation to the point of application.
LEVERS
CLASSIFICATION SYSTEM
American Society of Hand Therapists (ASHT)
CLASSIFICATION SYSTEM
ARTICULAR = cross joint(s.)
NON-ARTICULAR = do not cross joint
  Support/protect bone/soft tissue.
CLASSIFICATION SYSTEM
LOCATION =
JOINT(S) WHERE orthosis ACTS
WRIST = functional orthosis.
WRIST/HAND = positional orthosis.
THUMB = hand-based thumb orthosis.
THUMB CMC/MP = forearm-based, IP free.
WRIST/THUMB = forearm-based thumb.
ELBOW = elbow orthosis.
CLASSIFICATION SYSTEM
DIRECTION = DESIRED POSITION
Flexion    Extension
Pronation    Supination
Radial    Ulnar
Palmar Abduction    Opposition
Static Orthosis
components are essentially immobile.
imobilize joint(s.)
block one joint for movement elsewhere.
facilitate dynamic function.
imobilize joint for function later.
position for function.
Serial Static Orthosis or cast
elongate tissue
maintain joints, soft tissue, muscle, tendon in lengthened fashion.
worn for lengthy periods of time to prevent rebounding.
modified periodically by therapist.
Static  Progressive Orthosis

! low-load force.
! on maximum ROM.
! non-elastic elements for stress.
! variable adjustment to increase ROM.
Dynamic Orthosis
static base
outrigger & elastic components.
controlled mobilizing force & elastic component. passive-assistive ROM or active-resistive ROM.
CLASSIFICATION SYSTEM
DESIGN DESCRIPTORS
Forearm-based Hand-based
Thumb-based Digit-based
Arm-based
Radial    Ulnar
Dorsal    Posterior
Volar    Anterior
CLASSIFICATION SYSTEM
Volar wrist/hand extension immobilization = positional orthosis.
Volar wrist extension immobilization =
functional volar orthosis.
Wrist thumb opposition immobilization =
long opponens orthosis.
TYPES OF ORTHOSES
Functional
Enhance current function.
Allow thumb/finger movement.
Wrist-finger dynamics.
TYPES OF ORTHOSES
Positional
Prevent current functional movement.
Continuous low load pressure.
Enhance/maintain position.
Increase function after orthosis removal.
Prevent deformity.
Positional or Functional
WRIST ORTHOSES????
Wrist-finger dynamics
ROM
Immobility VS. Mobility
Stability & Sleep position
Tenodesis, Tone
GOALS OF ORTHOSIS USE
Facilitate functional movement.
Enhance positions of function.
Immobilize joint(s) for function.
GOALS OF ORTHOSIS USE
  !  Enhance gains made in therapy.
  !  Substitute for therapy.
GOALS OF ORTHOSIS USE
  !  Inhibit tone/stiffness.
  !  Support joint laxity.
  !  Support low tone.
GOALS OF ORTHOSIS USE
  !  Position pre-operatively.
  !  Rest/position post-op site.
  !  Rest post-injury.
GOALS OF ORTHOSIS USE
  !  Prevent/decrease pain.
  !  Prevent/decrease contractures.
  !  Prevent/decrease deformities.
GOALS OF ORTHOSIS USE
  !  Decrease inflammation from injury.
  !  Decrease arthritic inflammation.
  !  Substitute for muscular weakness.
GOALS OF ORTHOSIS USE
  !  Substitute for motor impairment.
  !  Substitute for muscular imbalance.
  !  Substitute for muscular weakness.
CONTRAINDICATIONS
MOVEMENT IMPAIRMENTS
  !  Athetosis
  !  Ataxia
  !  Dystonia
SENSATION LIMITATIONS
CONTRAINDICATIONS
MEDICAL CONDITIONS
  !  Temperature regulation
CONTRAINDICATIONS

BEHAVIOR/COGNITIVE
- Self-injury
- Injures others
- Eat orthosis
- Cognitive level
- Caregiver situation

ORTHOSIS ASSESSMENT

INITIAL ELEMENTS
Prior to hands-on contact:
evaluate PAIN!

ORTHOSIS ASSESSMENT
INITIAL ELEMENTS
- Corporal posture

ORTHOSIS ASSESSMENT
INITIAL ELEMENTS
- Positioning equipment

ORTHOSIS ASSESSMENT
INITIAL ELEMENTS
- Positioning equipment

ORTHOSIS ASSESSMENT
INITIAL ELEMENTS
Positioning equipment

ORTHOSIS ASSESSMENT
INITIAL ELEMENTS
Prior to hands-on contact:
Medical conditions
Allergies
Nighttime sleeping position

ORTHOSIS ASSESSMENT
SECONDARY
Initial Hands-on Contact:
Skin condition
Edema
Vascularity
Bumps
Bony prominences

ORTHOSIS ASSESSMENT
SENSORY-MOTOR
Isolated AROM
AROM in patterns
PROM
Joint alignment and position
Tone/stiffness
Static & dynamic contractures
Sensation
ORTHOSIS ASSESSMENT
FUNCTIONAL SKILLS
Fine motor skills
Self-care skills
School activities
Leisure activities
Chores
ORTHOSIS ASSESSMENT
COGNITIVE SKILLS
Patient cognition
Caregiver cognition
Ability to carry out PRECAUTIONS
don the orthosis
maintain time schedule
assess for potential injuries
HAND/WRIST POSITION
Functional
Wrist 20°- 30°
MPs 35°- 45°
PIP/DIPs flexed
45 ° palmar
abduction to opposition
Safe, Intrinsic-plus, or Anti-deformity
Wrist 30°- 40°
MPs70 °- 90°
PIP/DIPs extended
40°- 45° palmar abduction to opposition
The best position and function I can get!
Volar orthosis
evenly distribute
pressure on volar
forearm and wrist/hand
immobilize wrist
free digits for function
WRIST EXTENSION IMMOBILIZATION ORTHOSIS
options
Thumb free
! allow thumb CMC, MP, and IP function
Short thumb support
! immobilize thumb CMC and MP
! allow active IP function
Long thumb support
immobilize thumb CMC, MP, and IP
RADIAL or ULNAR
IMMOBILIZATION ORTHOSIS “GUTTER ORTHOSIS”
Functional with elbow free
fingers & thumb free for function
short thumb post to stabilize MP
long thumb post to stabilize MP & IP
Positional with elbow included
WRIST/HAND IMMOBILIZATION ORTHOSIS
Prevent/decrease contractures
Enhance function after orthosis removal
CUSTOM THERMOPLASTIC WRIST HAND IMMOBILIZATION ORTHOSIS
Long thumb post
support webspace
immobilize CMC, MP, & IP
prevent IP hyperextension
CUSTOM THERMOPLASTIC ORTHOSIS Fabrication LAB
ERGONOMICS
Posture.
Cutting.
Smoothing edges:
  Use table edge,
  Use heel of hand,
  Use leg.

THERMOPLASTIC WRIST EXTENSION IMMOBILIZATION ORTHOSIS
Key Fabrication Tips
distal palmar crease free
attention to bony prominences
therapy putty
bevel padding
THERMOPLASTIC WRIST EXTENSION IMMOBILIZATION ORTHOSIS
Key Fabrication Tips
place damp paper towel on skin
use damp paper towel over dressing
fit on my wrist first
fit on my finger first
THERMOPLASTIC WRIST EXTENSION IMMOBILIZATION ORTHOSIS
Key Fabrication Tips
trough 2/3 length of forearm
trough 2/3 width of forearm
adequate thenar eminence clearance
CUSTOM THERMOPLASTIC WRIST/ HAND IMMOBILIZATION ORTHOSIS
Key Fabrication Tips
trough 2/3 length of forearm
trough 2/3 width of forearm
CUSTOM THERMOPLASTIC WRIST/ HAND IMMOBILIZATION ORTHOSIS
Key Fabrication Tips
fit to wrist first
adequate thenar eminence space
CUSTOM THERMOPLASTIC WRIST HAND IMMOBILIZATION ORTHOSIS

Key Fabrication Tips
next, fit to forearm
stretch webspaces and thumb area
appropriate thumb position
finger pan 1/2 height of fingers

CUSTOM THERMOPLASTIC WRIST HAND IMMOBILIZATION ORTHOSIS

pan angle
MP angle
MP bend
STRAPS
Contour
Feather
PADDING STRAPS
Self-adhesive pads
Removable pads
Back-to-back adhesive hook Velcro

WRIST EXTENSION IMMOBILIZATION ORTHOSIS

Thumb & Webspacer options
  ! Theratube
  ! Foam Roll

Velcro Options
Imbed Hook Velcro
Imbed Loop Velcro
Thermoplastic rivet

RED MARKS
DO NOT USE PADS OR MOLESKIN TO PAD TIGHT ORTHOSIS OPENING!

Make opening larger
  ! Cut down orthosis around prominences
  ! Heat & expand orthosis over bony areas

Mold with therapy putty on bony areas
Cut hole and bevel pad at risk areas

SERPENTINE ORTHOSES

HAND-BASED SERPENTINE
Inhibits thumb-in-palm position
Supports MP
Long thumb post
stabilizes MP
stabilizes IP
Short thumb post
stabilizes MP
allows IP function

FOREARM-BASED SERPENTINE
Rigid webspaces support
Minimal wrist support
Short thumb post
stabilizes thumb MP
allows IP function
SERPENTINE ORTHOSIS Fabrication LAB
ORTHOSIS EDUCATION
Educate
Demonstration/Documentation
Understanding
Contact information
Activity checkout
Time schedule
Issues
Other priorities
Notice RED FLAGS
EDUCATION
Educate
! donning
! care
! precautions
! follow-up
Demonstrate
! donning & doffing
! return demonstration
Document
! strategies
EDUCATION
Understanding
! printed materials
! demonstration/return demo
! document verbal agreement
Contact information
! name, phone
Activity Checkout
Time wearing schedule
EDUCATION
Issues & team priorities
Other therapists & disciplines: Goals
EDUCATION
Notice RED FLAGS
! pain -red marks
! rash, irritation -blisters
! limb color -digit color
! hot or cold limb
! written contact information
LEFTOVER MATERIALS?
Finger splints
Finger dividers
Thumb/finger troughs
Built-up handles for spoons/combs
Makeshift rivets & hinges
Repair toys/toilets/blinds
Splints for stuffed animals and toys
COST CUTTING TIPS
DON'T RECYCLE SPLINTS between clients.
Modify child’s own splints only.
Keep scissors sharp and clean.
Use separate scissors for velcro.
Sew only regular velcro--not adhesive back--on sewing machine.
COST CUTTING TIPS
Recycle new knee immobilizer pads.
Use a fry pan or microwave.
Use pure water.
Clean splint pans well.
Use a high-wattage hair dryer.
Have caregivers make cloth splints.
Try feasible low-tech options first.
INFANT FITTING HINTS
Engage the child.
Have caregiver hold, cuddle child.
Allow child to have a bottle.
Sing.
Make baby noises.
Breathe softly and slowly.
Assure caregiver that behavior is normal.
TODDLER FITTING HINTS
Engage the child.
Sing. Dance. Be silly.
Make funny faces.
“Help me, please!”
“Pick the color you want!”
Explain each step in simple words.
Give positive feedback. OR.....
School Age & Adolescent Tips
Use team or school colors for straps.
Decorate with fabric paint.
Add thermoplastic sun, heart, or other design.
Apply stickers.
Imbed stones or jewels.
Decorate with permanent markers.
INFECTION CONTROL
Determine strategies and policies:
Cleaning pans.
Changing water.
Wearing gloves.
Re-dipping thermoplastic splints.
Fitting prefab splints.

BIBLIOGRAPHY
Cannon, N.M. (January 1991). Diagnosis and treatment manual for physicians and therapists (3rd Ed.) Indianapolis: The Hand Rehabilitation Center of Indiana, P.C.


(With pass code to online website.)


http://commons.pacificu.edu/cgi/viewcontent.cgi?article=1005&context=otpf


**Web links:**


VOLAR or DORSAL WRIST
IMMOBILIZATION SPLINT
Small webspacer

VOLAR or DORSAL WRIST
IMMOBILIZATION SPLINT
Three webspacer options
VOLAR or DORSAL WRIST IMMOBILIZATION SPLINT
Long webspacer

VOLAR or DORSAL WRIST IMMOBILIZATION SPLINT
Velcro webspacer
VOLAR WRIST IMMOBILIZATION SPLINT
Thenar opening

VOLAR WRIST IMMOBILIZATION SPLINT
Two options:
MP IMMOBILIZATION &
MP IP IMMOBILIZATION
WRIST/HAND IMMOBILIZATION SPLINT
VOLAR PAN & DORSAL FOREARM
Thumb free

WRIST/HAND IMMOBILIZATION SPLINT
VOLAR PAN & DORSAL FOREARM
Two options:
MP IMMOBILIZATION &
MP IP IMMOBILIZATION