Occupational Therapy in the Physical Rehabilitation of Stroke Patients

Judy Yang, MS, OTR/L
Occupational Therapist
What is Occupational Therapy (O.T.)?

• Occupation = meaningful activity

• Occupational therapists treat people across the lifespan (from premature infant to older adult) to promote development, recover skills impacted by injury, and increase independence and ability to participate and return to meaningful activities.

• Remediation of underlying deficit performance skills: strength, range of motion (ROM), motor control, cognition

• Compensation: Adaptation of task or environment

• OTs work with Physical Therapists, Speech Therapists, and other rehabilitative specialists in a physical rehab setting.
OT Improves Functional Independence

- **ADLs: Activities of Daily Living**
  - Basic self-care, bed mobility, transfers

- **IADLs: Instrumental Activities of Daily Living**
  - Home management, community mobility, medication management, driving
  - Work, hobbies, life roles

- Effectiveness of OT is well-documented
What Medical Conditions do Occupational Therapists Treat?

- Neurological
- Orthopedic
- Sports Medicine
- Burns/Plastics
- Cancer
- Rheumatology
- Cardiac
Contexts of Care

- Acute
- Inpatient Rehab
- Sub-acute Rehab/Skilled Nursing Facility
- Home Health
- Outpatient
- School
- Specialty Clinics
What is Stroke?

- Stroke or Cerebral Vascular Accident (CVA) is a sudden onset of weakness or other neurological symptoms as a result of injury to a blood vessel in the brain.

- Interruption in blood flow so that adequate supplies of oxygen and other nutrients fail to reach portions of the brain.

- Symptoms:
  - Sudden blurred or decreased vision
  - Numbness or weakness in the face, arm, or leg on one side of the body
  - Difficulty with speech (receptive, expressive)
  - Severe headache of sudden onset
Types of Stroke

- **Hemorrhage**: rupture of a cerebral blood vessel
  - Causes 10-20% of strokes
  - Most fatal

- **Ischemia**: blockage of a cerebral blood vessel. 80-90% of strokes.
  1. **Thrombosis**: Most common; stenosis or occlusion of vessel usually from atherosclerosis.
  2. **Embolism**: Dislodged platelets
Stroke Statistics

- Stroke is the 3rd leading cause of death in the U.S.
- 3 million stroke survivors in the U.S. 70% with significant functional disability. (Churchill, 1998)
- Most common cause of chronic disability
- Most common medical diagnosis treated by OTs
Risk Factors

- Hypertension
- Cardiac Disease
- Diabetes
- Smoking
- Alcohol abuse
- High Cholesterol
- TIAs – transient ischemic attacks
- Cocaine use
- Age
- Gender – M>F
- Race (African American, Hispanic)
- Family History
Prognosis

- Type of stroke
- Size
- Location
- Age
- Pre-existing conditions

Time Frame for Recovery:
1 year: most rapid recovery
1-5 years: slower improvement
5 years +: continued improvement
2/3 achieve independence in basic ADL (Jorgensen et al., 1995)
International Classification of Functioning, Disability, & Health

Health Condition (disorder/disease)

Body functions & structures (Impairment)

Activities (Limitation)

Participation (Restriction)

Environmental Factors

Personal Factors

Source: WHO 2001:18
OT Initial Evaluation

- OT Referral & Chart Review
- Hemodynamics: BP, HR, RR, SaO2 in 2 positions (supine, sit/stand) and after activity. Activity tolerance.
- Cognition
  - Orientation
  - Attention
  - Initiation
  - Memory
  - Organization
- Problem Solving
- Safety Awareness
- Insight
- Vision/Perception
- Ocular Motor
- Visual Fields
- Double Simultaneous Stimulation
- Spatial Awareness
- Praxis
## Lobe Specific Functions of the Brain

The brain is composed of three parts: the brainstem, cerebellum, and cerebrum. The cerebrum is divided into four lobes: frontal, parietal, temporal, and occipital.

The table lists the lobes of the brain and their normal functions as well as problems that may occur when injured. While an injury may occur in a specific area, it is important to understand that the brain functions as a whole by interrelating its component parts.

### Table: Lobe Specific Functions

<table>
<thead>
<tr>
<th>Lobe</th>
<th>Healthy Brain</th>
<th>Injured Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frontal lobe</strong></td>
<td>Personality / emotions, Intelligence, Attention / concentration, Judgment, Body movement, Problem solving, Speech (speak &amp; write)</td>
<td>Loss of movement (paralysis), Repetition of a single thought, Unable to focus on a task, Mood swings, irritability, impulsiveness, Changes in social behavior and personality, Difficulty with problem solving, Difficulty with language; can’t get the words out (aphasia)</td>
</tr>
<tr>
<td><strong>Parietal lobe</strong></td>
<td>Sense of touch, pain and temperature, Distinguishing size, shape and color, Spatial perception, Visual perception</td>
<td>Difficulty distinguishing left from right, Lack of awareness or neglect of certain body parts, Difficulties with eye-hand coordination, Problems with reading, writing, naming, Difficulty with mathematics</td>
</tr>
<tr>
<td><strong>Occipital lobe</strong></td>
<td>Vision</td>
<td>Defects in vision or blind spots, Blurred vision, Visual illusions / hallucinations, Difficulty reading and writing</td>
</tr>
<tr>
<td><strong>Temporal lobe</strong></td>
<td>Speech (understanding language), Memory, Hearing, Sequencing, Organization</td>
<td>Difficulty understanding language and speaking (aphasia), Difficulty recognizing faces, Difficulty identifying / naming objects, Problems with short- and long-term memory, Changes in sexual behavior, Increased aggressive behavior</td>
</tr>
<tr>
<td><strong>Cerebellum</strong></td>
<td>Balance, Coordination</td>
<td>Difficulty coordinating fine movements, Difficulty walking, Tremors, Dizziness (vertigo), Slurred speech</td>
</tr>
<tr>
<td><strong>Brainstem</strong></td>
<td>Breathing, Heart rate, Alertness / consciousness</td>
<td>Changes in breathing, Difficulty swallowing food and water, Problems with balance and movement, Dizziness and nausea (vertigo)</td>
</tr>
</tbody>
</table>

OT Evaluation & Treatment: Functional Independence Measure (FIM)

- Swallowing
- Self-feeding
- Bathing
- Dressing
- Grooming
- Toileting
- Bladder/bowel management
- Toilet, Tub, Bed to chair, Wheelchair transfers
- Cognitive: comprehension, expression, social interaction, problem solving, memory
• Sit/Stand Balance (with or without UE support)

• Tone Assessment

• Bed Mobility
  • Rolling
  • Scoot Laterally
  • Scoot Up/down
  • Supine to sit
  • Bed to chair
  • Sit to stand
• Edema
• Coordination
• Pain
• Postural appearance
• Sensation for the UE
  • Light touch, Sharp/dull, proprioception (Joint and position sense), Kinesthesia
• Upper Extremity Control: Active/passive ROM, Strength
  • Manual Muscle Test or Functional Muscle Test throughout UE
  • Hand testing, dominance
Instrumental Activities of Daily Living: Assessment of Living Skills and Resources (ALSAR)

- Telephone use
- Reading
- Leisure
- Medication Management
- Money Management
- Transportation
- Shopping
- Meal prep
- Laundering
- Cleaning
- Home maintenance
• Orthotics/Prosthetics
• Adaptive Equipment
• OT Problems
• OT Assessment
• OT Plan
• OT Goals
  • Long term: to be met by discharge
  • Short term: one week
• Discharge Recommendation
Neurological Impairments of Stroke & Effects on Occupational Function

- Hemiplegia or hemiparesis: Paralysis or weakness contralateral to the side of the brain affected.
- Impaired trunk control and postural adaptation, decreased upper extremity function and hand use, decreased independence in ADL & IADLs.

http://assets.bizjournals.com/story_image/112502-0-0-2.jpg
Neurological Impairments: Spasticity

- **Tone**: Amount of tension a muscle has at rest.

- **Spasticity**: Increased, involuntary, velocity-dependent resistance to passive stretch.

- **Ashworth Scale/Modified Ashworth**: from 0-4 (normal to rigid)

- **Affects 20-50% of stroke survivors**

- **Treatment for the upper extremity (UE) MUST include appropriate therapy**

- **No correlation between spasticity and movement per studies** (Sahrman & Norton (Ann Neurol, 1977), Fellows & Thilmann (Ann Neurol, 1994), Wolf et al. (Phys. Ther, 1994), Levin, MF (Brain, 1996)).

- **Tone reduction AND strengthening weak muscles leads to change at the movement and activity level.**
Therapy for Spasticity

- Maintain length of Soft Tissues/Prevent Contractures

- Splinting/orthotics (static, static progressive & dynamic)

- Soft Tissue/Joint Mobilization

- Active range of motion exercises and passive stretching within safe range according to recovery stage


Myboonehealth.com
www.ncmedical.com
Jupiterimages/Creatas/Getty Images
• Guided specific use of motor control, functional patterns
• Controlled pace, slow, no excessive effort
• No repetitive compensations
• Prevent injury & painful syndromes

Trunk Control

- Biomechanics: Trunk malalignment, lateral flexion of trunk, posterior pelvic tilt, kyphosis, secondary UE problems.

- Postural Control: task-oriented, goal-directed movement.
  - Static reach: Stabilize trunk using UE support; work in close range
  - Dynamic reach: Working beyond arm’s length.

- Retraining Postural Control

- Targeting different types of muscle contractions, movement patterns.
Trunk Movements & Weight Shifts

- Reach past arm’s length
- Trunk extension
- Anterior Pelvic Tilt
- Fx: Grooming tasks

- Reach past arm’s length
- Concentric: L lateral flexors
- Weight shift R

- Reach to floor
- Eccentric: L lateral flexors
- Weight shift R
- Fx: LE Dressing, Retrieval

- Behind R, arm’s length
- Trunk Ext, Rotation
- Weight Shift R

- Cross body to L
- Trunk Ext, Rotation
- Weight Shift L
- Back Extensors
- Fx: Bathing

- Above head, behind
- Trunk Ext
- Weight Shift Posterior
- Big Eccentric for Abs
- Fx: Dressing, seated
  transfers: car, tub

Neurological Shoulder

- Trunk/Proximal stability needed for UE movement, proper scapula alignment & stability

- Early Subluxation -> Instability, pain, and impingement at 90 degrees

- Shoulder pain is PREVENTABLE

- Scapula Malalignment due to:
  - Trunk Malalignment
  - Weakness
  - Muscle Imbalance around scapula

Shoulder Subluxation

- Subluxation Patterns:
  - Inferior
  - Anterior
  - Superior

- Minimize sling use to avoid secondary complications

- Positioning and supports

- Other supports for Inferior Subluxation:
  - Hand in pocket, tucked in messenger bag

- Mechanically safe exercises to begin activating scapular muscles

www.stroke4carers.org
No Association with Shoulder Pain

- Spasticity

- Subluxation:
  - IKAI, et. al (AJPMR, 1998) and many other studies

[Images and links provided for further reading]
Factors Associated with Shoulder Pain

• Decreased Passive Range of Motion (PROM) in Shoulder External Rotation
• Impingement, trauma in subacromial space
• Shoulder-Hand Syndrome
• Inappropriate intervention
• Inappropriate handling/assist during ADLs & transfers
Preventative Intervention

- Teach patient’s family External Rotation (ER) at 0 degrees Abduction. No risk for impingement (mechanically safe)

- Monitor ER from day #1.

- AVOID poor mechanics:
  - NO overhead pulleys for neurological patients!
  - NO bilateral upper extremity (UE) clasped hand ROM overhead.
  - Appropriate use of UE skateboard (slow & controlled, NO trunk)
  - Teach patient’s family mechanically safe transfer.

Treating the Neurological Shoulder

- Prevent Adhesive Capsulitis & Impingement Syndromes
- External Rotation, External Rotation, External Rotation!
- Scapula Mobilization
- Overhead ROM >70 degrees ONLY if have scapula glide into upward rotation and passive ER.
- No pain during exercise or activity
- Edema control
Initial Biomechanically Safe Exercises for the Neurological Shoulder

- Table-assisted ROM: scapulothoracic glide
- Cradle Arm: to 70 degrees, rock for scapulohumeral glide
- Codman’s: helps tone management also
- Self ROM for ER
- Scapula Roll Over
- Positioning at rest is important

Regaining Motor Control

- Closed chain Weight-Bearing on Forearm or Hand
- Active Assistive range of motion (AAROM), supported reach
  - Ex. UE on table; wiping counter
- Reach into space
- Graded difficulty using gravity and amount of support
- ADL task-oriented treatment
- ROM, strengthening, & fine motor activities to improve grasp, hand control and manipulation skills.
Adjunctive Treatments Supported by Research

- **Functional Electrical Stimulation**: low frequency e-stim for neuromuscular re-education, reduce shoulder subluxation. Questionable for activity level.

- **Mental Practice or Imagery**: Activate the cortex and muscles that correlates with imagined movement. Brain areas are activated during both the movement and while imagining limb movements.

- **Bilateral UE movement training**: both sides doing same movement; combine with sensory feedback/rhythmic cues.

• Mirror Therapy: Look at mirror and imagine affected side functioning
  • promoted distal function, improve surface sense, improved hemi-neglect.
  • Imaging studies showed greater cortical representation for affected UE

• Constraint-Induced Movement Therapy:
  • Counters learned nonuse. Constraint of stronger hand.
  • Substantial improvements in functional use.

www.beaumont.edu/mirror-box-therapy-helps-stroke-patients-get-better-faster/
www.uab.edu
Cognition & Perception Treatment
Attention, Orientation & Memory

- Change environment to support/challenge sustained, alternating, divided attention
- Orientation: calendars, memory books, cue cards
- Memory
  - Internal Aids: Rehearsal, visual imagery, semantic elaboration (story), motor routines
  - External Aids: notebooks, calendars, lists

Problem Solving

- Observation of patient during tasks and strategies such as:
  - Chaining: activity broken down into component parts
  - Patient identifies errors and solutions
  - Cues as needed
  - Written steps to improve memory

www.webmd.com
Visual Hemi-Inattention/Neglect

- Decreased awareness of body, environment; ability to attend and adapt.
- Impaired ADLs, navigating environment, safety

Right Hemisphere CVA:
Treatment

- Scanning Training
- Tactile stimulation
- Cognitive compensation
- Environmental compensation
Apraxia

- Praxis: Ability to motor plan
- Apraxia: Inability to carry out purposeful movement while having intact sensation, movement, and coordination

- Ideomotor apraxia: Able to perform spontaneously but not on verbal command. Mistaken by caregivers as passive aggressiveness.

- Ideational apraxia: Difficulty sequencing motor actions. Ex. doesn’t remember which utensil to use.

Apraxia Treatment

- Gross motor tasks with tactile, kinesthetic, and proprioceptive stimulation
- Manual cues or guiding UE through task
- Chaining
- Talking through task steps
- A lot of sensory input
- Perform task in natural environment, especially ideomotor apraxia (fails on verbal command).


