

Stroke: Post-Acute Complications & Management

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Disclosures

- Research grants, speaker, and consultant
 - Allergan-Abbvie
 - IPSEN
 - Revance

Outline

- Epidemiology of stroke
- Risk factors
- Signs and symptoms of stroke
- Current status of post acute care
- Common post-acute stroke complications
 - identification
 - management
- Spasticity

STROKE

Epidemiology - USA

- 3rd leading cause of death
- Number one cause of adult disability
- Approximately 800,000 strokes per year
- Every 40 sec someone has a stroke
- Every 4 minutes someone dies from a stroke
- 28% any given year are under 65
- African Americans are at a greater risk
- African Americans are more likely to die post stroke

STROKE

Epidemiology - USA

- 50-60% with mild-mod disability
- 22-25% die within the 1st year
- 30% are severely impaired – LTC
- >50% of stroke victims are alive after 5 yrs
- Incidence doubles every decade beyond 55

Stroke

Risk Factors - controllable

- Hypertension – 4X
- Hyperlipidemia
- Atrial fibrillation – 15% of stroke pts -5X
- Sleep disordered breathing
- Smokers – 2X for ischemic stroke
- Alcohol ?
- Weight
- Diabetes

Stroke

Risk Factors - uncontrollable

- Age
- Gender
- Race
- Family history

Stroke

Common symptoms

- Sudden numbness or weakness
- Sudden confusion, trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden severe headache

Stroke

Common signs

- Unilateral motor weakness (hemiparesis)
- Unilateral sensory loss
- Abnormal speech
- Vision loss or visual field deficit

Stroke Location

- Lobe – frontal, parietal, posterior, etc
- Cortical versus subcortical
- Involvement of motor strip, sensory strip
- Speech areas
- Coordination
- Vision

Common issues post stroke



Current transition from acute

- admit to hospital
- work up and transfer to ...
- disposition based on
 - severity
 - comorbidities
 - day of the week
 - insurance
 - luck

Levels of Rehabilitation Care

- Acute Care Hospital
- Inpatient Rehabilitation Facility (IRF)
- Subacute Inpatient Rehabilitation – LTAC, SNF
- Comprehensive Day Rehabilitation
- Outpatient Rehabilitation
- Home Rehabilitation

The Goals of Stroke Rehabilitation

- prevent, recognize, and manage comorbid medical conditions
- maximize functional independence
- optimize psychosocial adaptation of patients and families
- facilitate resumption of prior life roles and community reintegration
- enhance quality of life

Rehabilitation during the Acute Phase

GOALS:

- prevention of medical complications
- prevention of deconditioning and contractures
- training of new skills

Natural progression after Stroke

MOTOR CONTROL:

- flaccid hemiplegia
- increasing tone and spasticity
- emergence of synergy patterns
- gradually increasing isolated voluntary movements

Principles of Stroke Rehabilitation

- Interdisciplinary team approach
- Holistic and comprehensive
- Uses learning theory:
 - Graded levels of task difficulty
 - Opportunities for repetition of skill performance
 - Professional supervision and feedback
 - “Protected practice”

Principles of Stroke Rehabilitation

- attention to psychological issues
- involvement of family
- need to recruit community resources
- importance of functional activities
- attention to quality of life issues

Complications post stroke

Stroke complications

Post-acute setting

- Deconditioning
- Depression
- Contractures
- Spasticity
- Falls
- Infections
- Skin breakdown
- Malnutrition
- Pain syndromes

Recovery after stroke

- natural recovery
- additional recovery with rehabilitation
- outcomes depend on various factors
 - severity
 - rehabilitation
 - prevention of early and late complications

Neuroplasticity

- Post stroke, the brain is affected by activity
 - Even with chronic stroke survivors there is potential for change
1. Liepert et al. Treatment-induced cortical reorganization after stroke in humans. *Stroke*. 31(6):1210-16, 2000.
 2. Nudo. Postinfarct cortical plasticity and behavioral recovery. *Stroke*. 38(2):840-45, 2007.
 3. Cramer & Riley. Neuroplasticity and brain repair after stroke. *Curr Opin in Neurology*. 21:76-82, 2008.

New Rehabilitation Interventions

- Partial Body Weight-Supported Treadmill Training
- Orthotics
- Electrical Stimulation
- Constraint-Induced Therapy
- Robotic-Assisted Therapeutic Exercise
- Spasticity Management

“New” Treatment Principles

- Task specific
- Challenging and skilled
- Performed with a lot of repetitions
- Done with relatively normal movement patterns

Page SJ. Intensity versus task-specificity after stroke. How important is intensity? *Am J Phys Med Rehabil.* 82(9):730-2, 2003.

Nudo. The role of skill versus use in the recovery of motor function after stroke. *OTJR: Occupation, Participation and Health.* 27(supp):24S-32S, 2007.

Lang et al. Counting repetitions: An observational study of outpatient therapy for people with hemiparesis post-stroke. *JNPT.* 31:3-10, 2007.

Morris et al. Constraint-induced movement therapy for motor recovery after stroke. *NeuroRehabilitation.* 9:29-43, 1997.

Partial Body Weight-Supported Treadmill Training



Automated Treadmill Training



Electromechanical -assisted gait training: Cochrane Database

- 8 clinical trials (414 participants) “some evidence that combined with physiotherapy may improve recovery of independent walking and increase walking distance in patients after stroke who could not initially walk independently”
- “It is not clear if such devices should be applied in routine rehabilitation or when and how often they should be used.”

Saebo



Bioness



Constraint-Induced Therapy



Robotic-Assisted Therapeutic Exercise



Spasticity



Patient selection - What is spasticity?

- Classic definition: velocity dependent increase in tone (resistance to passive range of motion) associated with UMN lesions
- 2005 SPASM consortium definition: disordered sensorimotor control, resulting from an upper motor neuron lesion, presenting as intermittent or sustained involuntary activation of muscles

6.7 Million People in the US Are Living With Adult Spasticity¹

Spasticity patients can be found across a variety of neurologic conditions

3.2M

Stroke²⁻⁴

7M stroke patients in US

> 600K

Multiple sclerosis^{5,6}

≈ 1M MS patients in US

> 194K

Adult cerebral palsy^{7,8}

266K adults with CP in US

≈ 189K

Spinal cord injury^{9,10}

> 290K SCI patients in US

> 140K

Traumatic brain injury^{11,12}

≈ 250K TBI patients in US

MS = multiple sclerosis; CP = cerebral palsy; SCI = spinal cord injury; TBI = traumatic brain injury.

1. Data on file, Allergan; **2.** Virani et al. *Circulation*. 2020; **3.** Opheim et al. *Neurology*. 2015; **4.** Kuo et al. *Int J Gerontol*. 2018; **5.** Oreja-Guevara et al. *Int J Neurol*. 2013; **6.** NMSS. NMSS database. Accessed March 28, 2020; **7.** Data on file, Allergan; Global Safety and Epidemiology. 200; **8.** Birth Injury Help Center website. Accessed March 28, 2020; **9.** Holtz et al. *Arch Phys Med Rehabil*. 2017; **10.** NSCISC. 2019; **11.** CDC website. Accessed March 28, 2020; **12.** Ganesh et al. *Arch Phys Med Rehabil*. 2013.

Spasticity Impacts Many Lives



Patient^{1,2}

- Clinical condition (eg, contractures, pain, pressure ulcers, infections, weakness)
- Personal life (eg, self-care, mobility, self-image, sleep, rehabilitation)



Caregiver^{3,4}

- Significantly higher odds of depression and anxiety
- 46% neglect their personal lives and well-being (n =647)



Society⁵

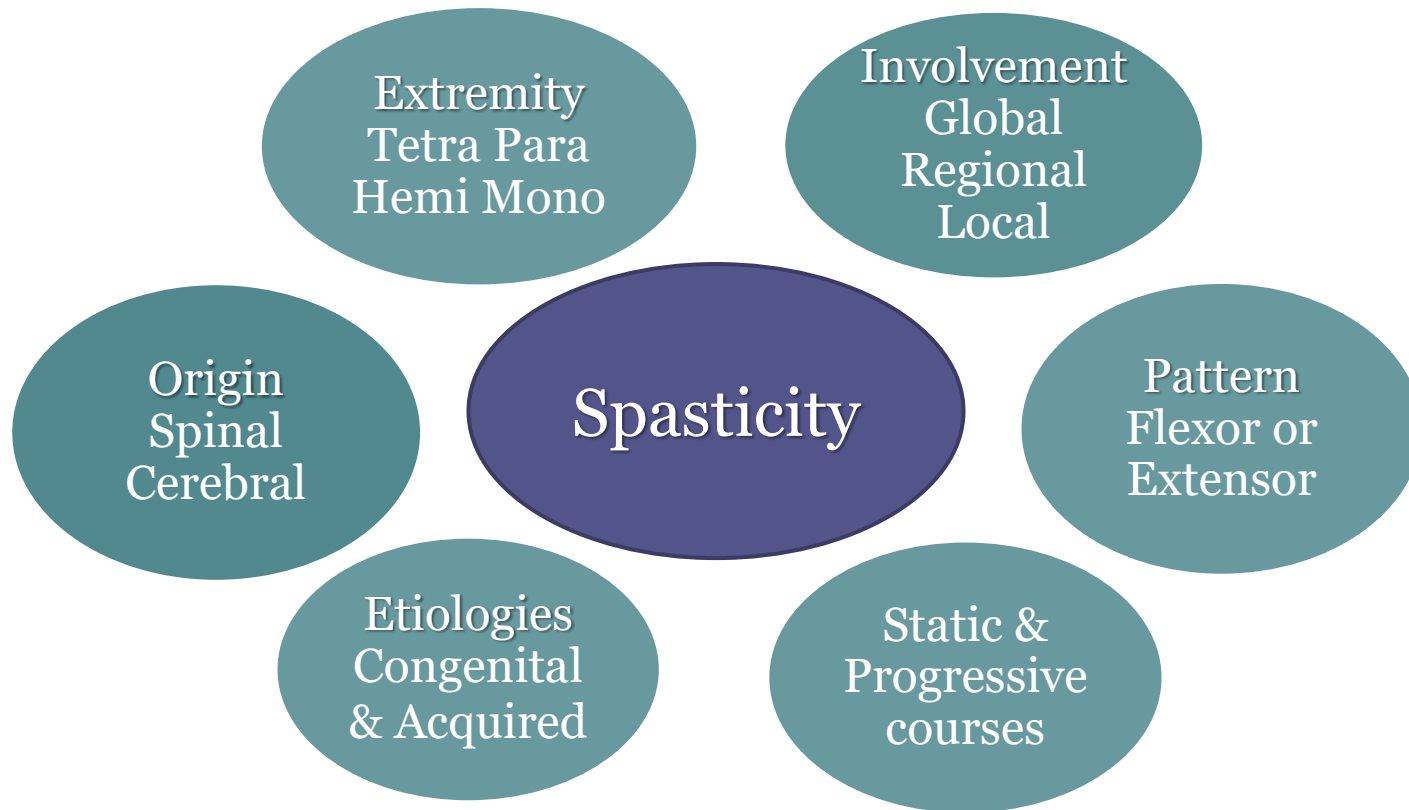
- 4x higher costs than post-stroke patients without spasticity*
- Direct costs would be ≈ \$4.2 million per 100,000 inhabitants per year[†]

*\$84,195 vs \$21,842 in 2003 US dollars.

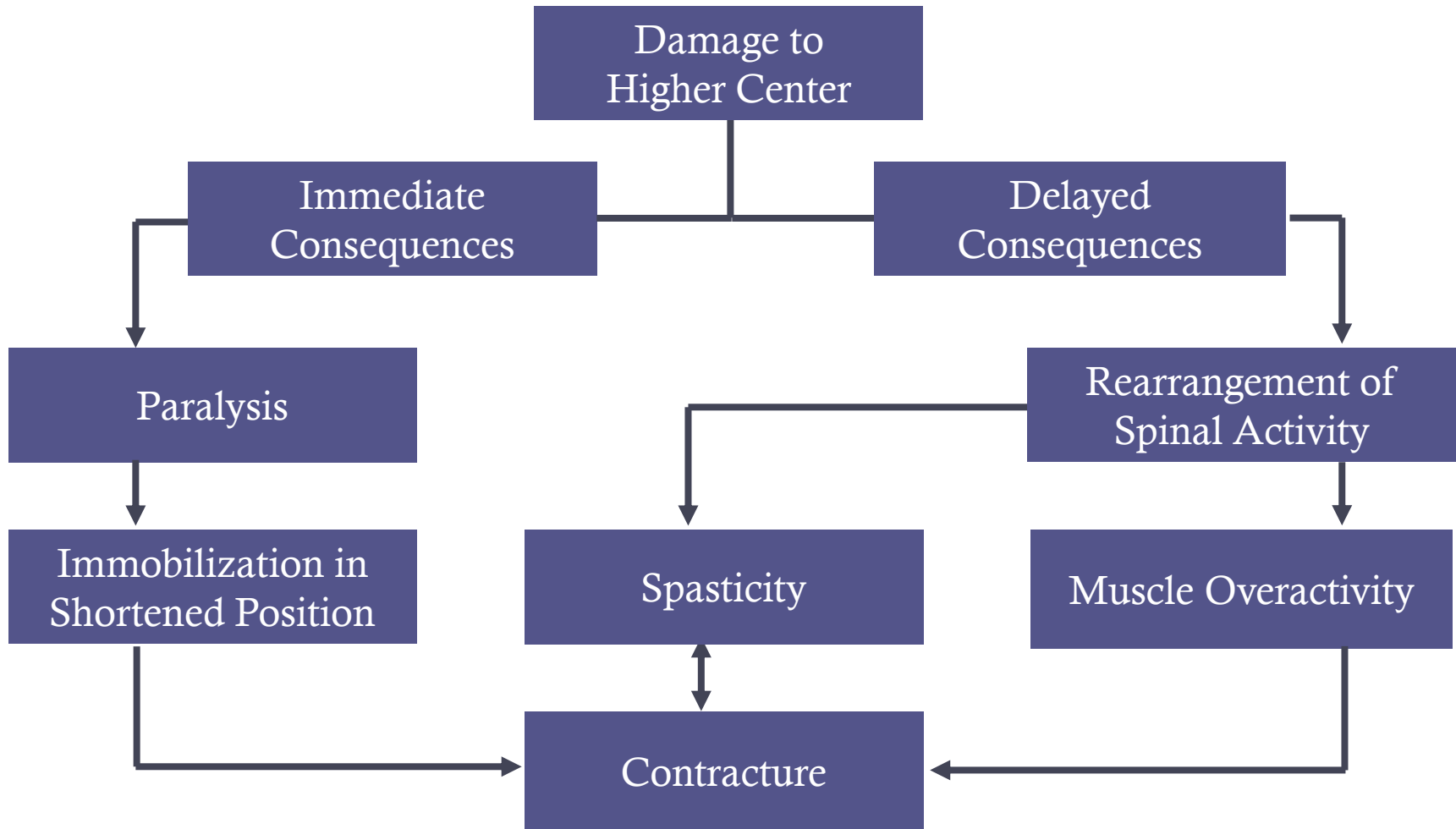
[†]Based on the assumption that 20% of stroke patients experience spasticity.

1. Adams and Hicks. *Spinal Cord*. 2005; 2. Brainin et al. *Int J Stroke*. 2011; 3. Denno et al. *Arch Phys Med Rehabil*. 2013; 4. Caregiver Action Network website; 2020; 5. Lundström et al. *Stroke*. 2010.

Spasticity Characteristics



Pathophysiology of Impairment After a CNS Lesion

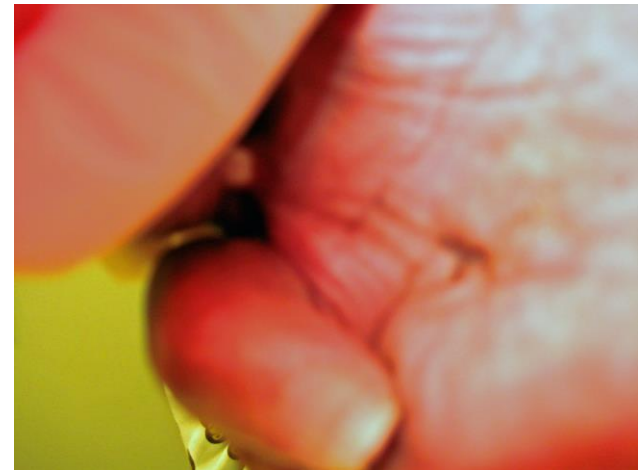
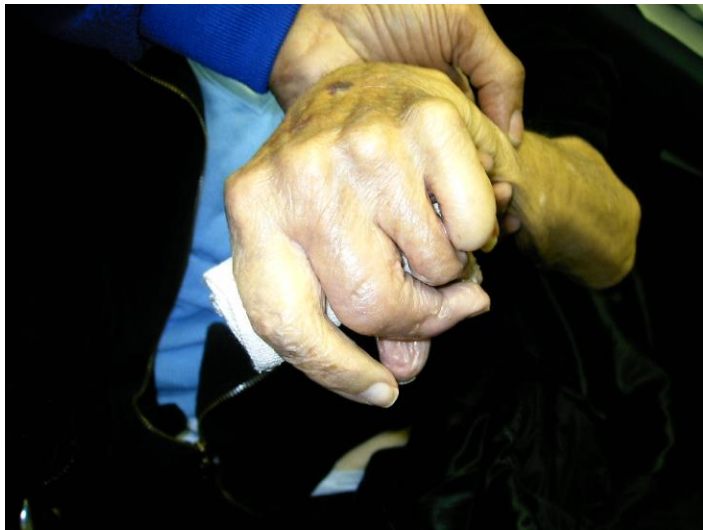


Spasticity related complications

- Impact on ADLs
- Impact of mobility
- Pain
- Caregiver burden
- Hygiene
- Deconditioning

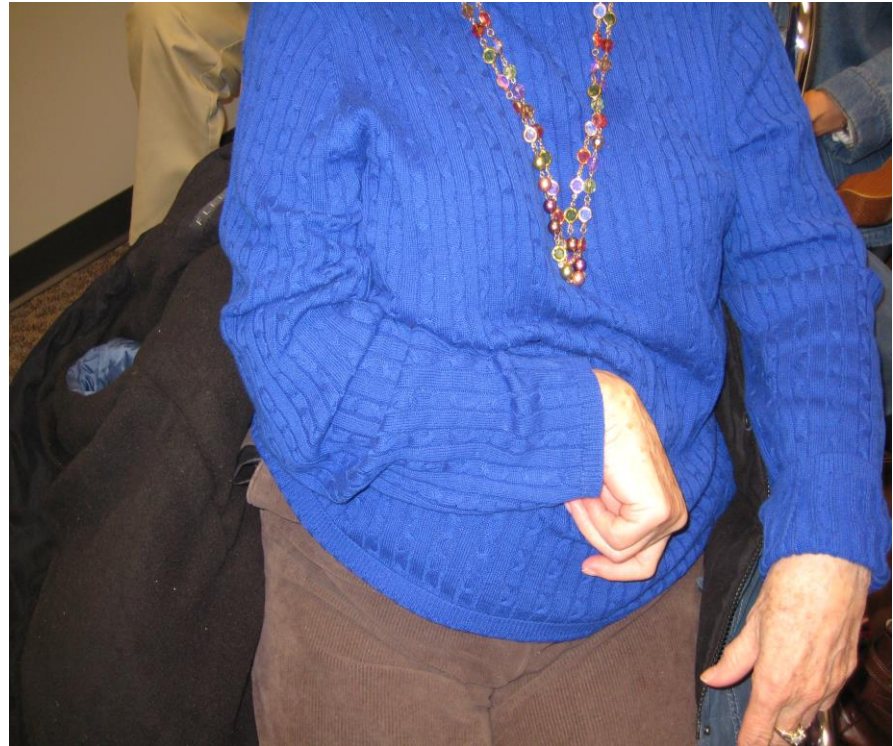
Clenched fist

- fingers clasped into palm
- inability to wash palm
- may lead to skin maceration and breakdown



Upper limb posture

- Adducted shoulder
- Flexed elbow
- Pronated forearm
- Flexed wrist
- Flexed fingers



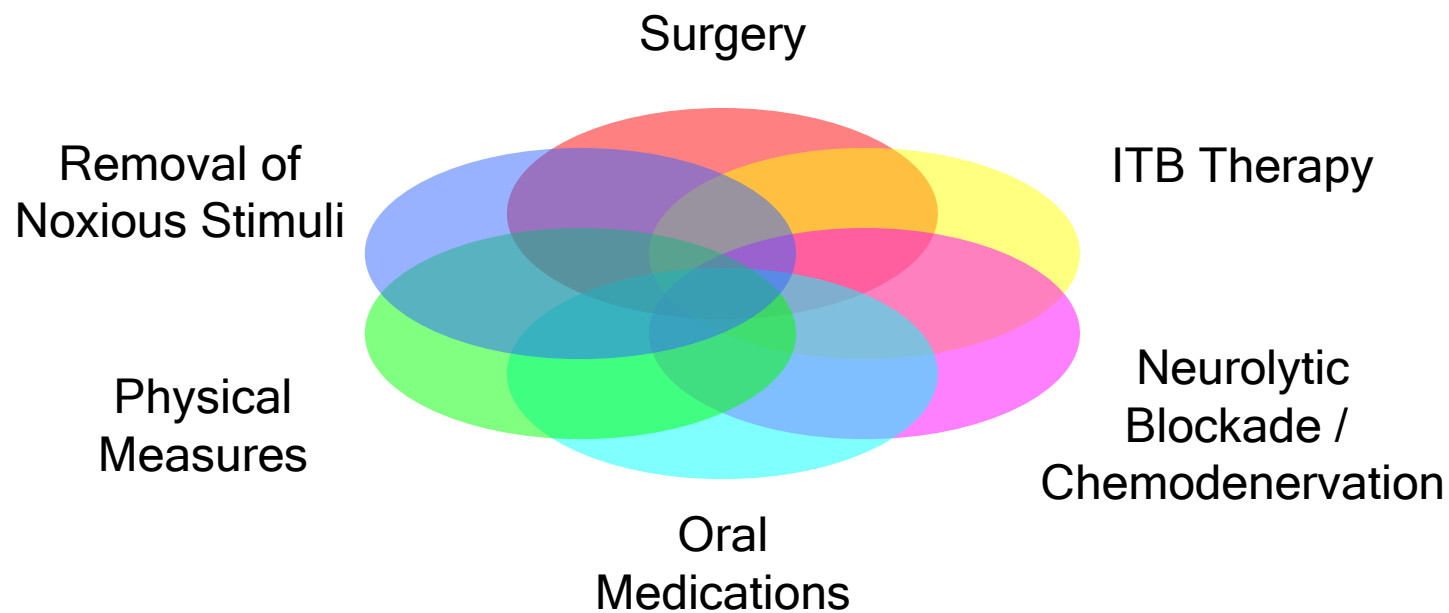
Equinovarus Deformity



Hyperextended Hallux



Synergistic Model of Spasticity Management



Patient selection

- Spasticity management is not a linear or hierarchical process (monotherapy or in combination).
- Potential to improve ambulatory function with concomitant rehabilitative therapy
- Highly effective tool in the pediatric population with attention to unique considerations.
- Consideration of other factors - medical and nonmedical



Closing Remarks

- Stroke is a leading cause of disability.
- Need for better post acute management.
- Need for better preventive management – both 1° and 2° .
- Several different treatment options available to choose from.
- How high-tech can we get?
- Most patients are not getting the basics.

Rehabilitation

- Goals:
 - Optimize function
 - Focus on what is working
 - Minimize effect of what is not working
 - Use appropriate equipment
 - Train caregivers

THANK YOU