Objectives

• Will understand the concept of neuroplasticity as it relates to the stroke patient.
• Will be able to understand and discuss neurogenesis and brain remapping.
• Will understand the rehab nurses role in capitalizing on neuroplasticity in the care of the stroke patient.

History – Stroke Rehabilitation

• Long believed & practiced:
  – Functional and / or cognitive deficits are related to cerebral edema only.
  – After 6-12 month window of recovery, any additional functional and / cognitive gains could not be achieved.
  – 1 billion neurons that do not re-generate
  – Cortical organization and mapping is fixed
  – Leading with the “unaffected side”
Cortical Organization / Mapping

Set Organization  Sensory Mapping

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Today – Stroke Rehabilitation

- **Neuroplasticity**
  - Changes in neural pathways and synapses which are due to changes in behavior, environment, neural processes or resulting in bodily injury.
  
  - Neuro re-generation
  - Cortical organization no longer fixed
  - Continued recovery past 6 to 12 months

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Landmark Research

- **Silver Spring Monkey Study (1981-1991)**
  - Edward Taub
  - “Neuroplasticity” established

- **Study:**
  - severed the afferent ganglia that supplied sensation to the brain from the arms.
  - Compensated with using the unaffected to feed self and move around
  - “Learned non-use” discovered
Landmark Research (con't)

- Arm slings were used to restrain the unaffected limb to re-train the monkey to use the arm that it could not feel.
- PETA
- Result: on post-mortem dissection of the monkeys significant cortical remapping occurred, suggesting that being forced to use limbs with no sensory input had triggered changes in the brains' organization.
- Plasticity

Landmark Research (con't)

- Proof of Plasticity
  - Remapping was discovered to move to the facial sensory area from the set organizational area of the hand/ arm area.

Edward Taub

- University of Alabama – research grant
  - Constraint Induced movement therapy (CIMT)
- CIMT
  - Overcome "learned non-use"
CIMT

- Forced restriction of a patient’s stronger limb to encourage focused and frequent use of the impaired limb during functional tasks.
  - intense, structured, task specific-training

- Repetition

- Forced use of the hemiplegic upper extremity and the subsequent emergence of CIMT has shown promise in helping stroke survivors avoid or overcome learned non-use and regain upper limb function.

Literature around CIMT
- Kunkel, Kopp & Muller, 1999
- Miltner, Bauder & Smmer, 1999
- Taub et al., 1993
- Wolf, Lecraw, Barton & Jann, 1989
- Taub & Wolf, 1997

Example: Making a telephone call
- Adaptive task practice or shaping
  - Small steps focused on completing part of the task

Nursing Application

- Understanding principles of rehab
- Collaboration and learning from our therapy colleagues

- Assisting patient with ADLs
  - Task segmentation, hand over hand cueing
- Repetition with EOB, sit to stand
- Imagery
- Feedback utilizing a mirror
Nursing Application

• Intention
  – The patient must initiate the movement, and actively participate in the exercise or task.

• Intensive
  – The exercise or activity must demand the patient work hard – putting forth maximal effort

• Repetition
  – The patient must repeatedly perform the intention-initiated, intensive exercise or activity.

Remember

Repetition “bakes in” the education of brain and muscles.