

EARLY MOBILIZATION FOLLOWING ACUTE STROKE: IS SOONER BETTER?

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Disclosure

The author report no actual or potential conflict of interest in relation to this presentation

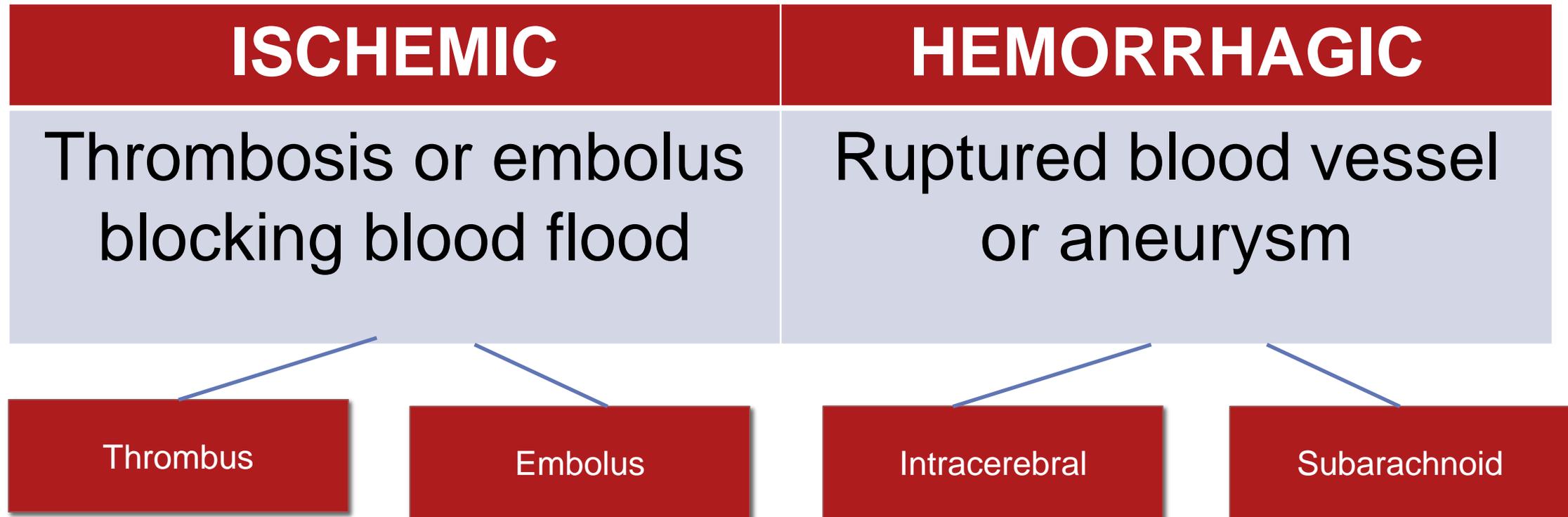
Objectives

- Learners will understand the consequences of bed rest or immobilization in a patient in the ICU setting.
- Learner will understand the benefits of early mobility in the ICU setting
- Learners will understand the physical therapy trajectory of a patient with a stroke in the ICU
- Learner will understand strategies used by physical therapists when treating patient with a stroke in the ICU or acute care setting
- Learner will understand the clinical implications related to physical therapy when treating the different types of strokes in the ICU setting

What is a stroke?

- Described as a brain attack
- Abrupt onset of neurological deficits secondary to a vascular event
- High burden of death and disability

Types of Strokes



Transient Ischemic Attack

Signs and Symptoms

- Sudden numbness or weakness especially on one side of the body
- Sudden confusion, or trouble talking or understanding speech
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, or loss of balance or coordination
- Sudden severe headache with no known cause



Treatment of a stroke

“Current stroke therapy, therefore, is mainly based on general care and **rehabilitation**”¹



What is Physical Therapy (PT)?

- “Rehabilitation concerned with the restoration of function and prevention of physical disability following disease, injury, or illness.”³

Immobility in the ICU/Neuro ICU: What does the Research Say?

Creutzfeldt CJ, Hough CL. Get out of bed: Immobility in the Neuro ICU. *Crit Care Med*. 2015;43(4):926-927.

- Patients coming with a stroke, head trauma or other severe acute brain injury are typically **immobilized** by their illness alone – bed rest seems inevitable
- Immobility causes local and systemic inflammation and escalates the pathogenesis of myopathy and neuropathy
- Immobility can be avoided

Parry SM, Puthuchearry ZA. The impact of extended bed rest on the musculoskeletal system in the critical care environment. *Extrem Physiol Med.* 2015;4:16.

- Antigravity muscles (leg extensors, soleus, and trunk muscles) are particularly affected by lack of mechanical loading
- Muscle wasting within 10 days
- Loss of muscle mass within 7 days
- Up to 40% of muscle strength can be lost within the FIRST week of immobilization
- Greater bone resorption than formation = reduction in bone integrity

Sundseth A, Thommessen B, Ronning OM. Stroke. Outcome after mobilization within 24 hours of acute stroke: a randomized controlled trial. *Stroke*. 2012;43(9):2389-94.

- Early deaths not caused by the stroke are often associated with complications of immobilization such as infections and thromboembolism.
- Data indicate that early mobilization and training are important to utilize brain plasticity.

Brimioulle S, Moraine JJ, Norrenberg D, Kahn. Effects of positioning and exercise on intracranial pressure in a neurosurgical intensive care unit. *Phys Ther.* 1997;77(12):1682-9.

- Supine position is associated with a substantial increase in ICP (6 mmHg)
- Also, can lead to:
 - Deterioration in ventilatory function and gas exchange
 - increase arterial partial pressure of carbon dioxide
 - decrease arterial partial pressure of oxygen
 - contribute to further increases in ICP over time

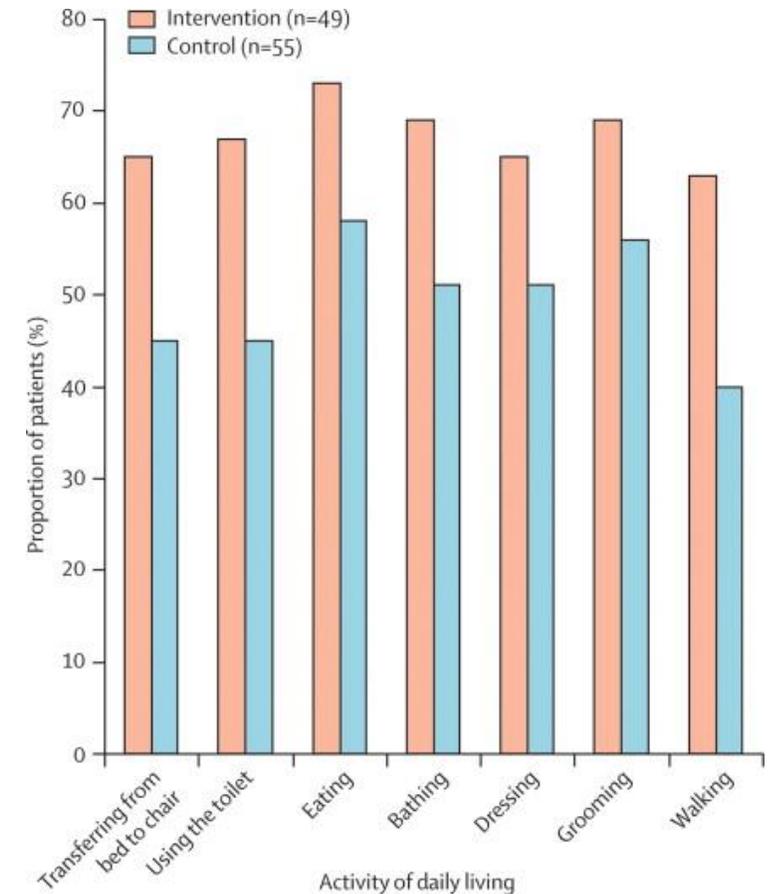
Early Mobility in the **NEURO** ICU: What does the Research Say?

Sprenkle KJ, Pechulis M. Early Mobility of Patients Poststroke in the Intensive Care Unit. *J. Acute Care Phys. Ther.* 2013;4(3):101-109.

- Prolonged mechanical ventilation time is associated with diaphragmatic atrophy, delirium, and the development of contractures, pressure areas, and shoulder subluxation.
- Early mobility fosters progress through the rehab continuum of care
- Early mobility facilitates the discharge process
- Early mobility could potentially decrease the length of stay

Scheweickert WD, Pohlman MC, Pohlman AS, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomized controlled trial. Lancet. 2009 May 30;373(9678):1874-82.

- Sedated adults (≥ 18 years of age) on mechanical ventilation for less than 72 h, and expected to continue for at least 24 h
- Randomly assigned
 - Control (n=55): Standard care with PT and OT ordered by primary team
 - Experimental (n=49) : Exercise and mobilization on the day of enrollment (if stable)
- Every morning unresponsive patients underwent passive ROM for all limbs without sedation
- Results:
 - Patients in the intervention group had higher Barthel Index scores a higher number of independent ADLs and greater unassisted walking distance at hospital discharge than did controls



Sundseth A, Thommessen B, Ronning OM. Stroke. Outcome after mobilization within 24 hours of acute stroke: a randomized controlled trial. *Stroke*. 2012;43(9):2389-94. .

- **56 patients**

- 27 in the Very Early Mobilization (VEM) group (mobilized within 24 hrs.)
- 29 in the Control group (mobilized within 24-48 hrs.)

- **Results:**

- VEM: higher odds of POOR outcome
- CG: Better neurological improvement

Mobilization starting 1 day after stroke does not increase risk of death, poor outcome, dependency.

Klein K, Mulkey M, Bena JF, Albert NM. Clinical and Psychologic Effects of Early Mobilization in Patients Treated in a Neurologic ICU: A Comparative Study. *Crit Care Med.* 2015;43(4):865-73.

- 637 patients with a neurological injury were treated during a 4-month period
 - Two groups, “pre-intervention” and “post-intervention”
 - Early progressive mobility program since day of admission or when stable
 - Turning every 2 hours to walking → “MILESTONES”
 - Additional recliner chairs and mobile patient lifts were purchased
- **Results:**
 - Length of stay reduced 33% compared to “control” group
 - Discharge from hospital to home > increased by 11.3%
 - Lower anxiety scores
 - Decreased blood stream infections
 - Decreased pressure ulcers

Brimioulle S, Moraine JJ, Norrenberg D, Kahn. Effects of positioning and exercise on intracranial pressure in a neurosurgical intensive care unit. *Phys Ther.* 1997;77(12):1682-9.

- The subjects were comatose and non-comatose patients in a neurosurgical intensive care unit who had normal ICP (15 mm Hg) or increased ICP (>15 mm Hg).
- **Comatose:** PROM exercises in a 30 degrees head-up position
- **Non-Comatose:** AROM exercises and isometrics in a 30 degrees head-up position.

PROM:

- Did not worsen cerebral perfusion pressure or ICP
- In patients with high ICP: contributed to a decrease in abnormal ICP waves and improvement in consciousness.

• **AROM + ISOMETRICS:**

- ICP and cerebral perfusion didn't change with AROM
- Isometrics increase ICP (even in patients with normal ICP) → **AVOID**

A photograph of a hospital room, likely a Neuro ICU. In the foreground, a patient bed is covered with a white sheet. To the left, there is a wooden table on a stand. In the background, a Philips monitor is mounted on a stand, displaying the Philips logo. A large, white, articulated medical device, possibly a C-arm, is positioned above the bed. The room has a clean, clinical appearance with light-colored walls and a tiled ceiling.

What things could be in the patient's room that we should be aware of?

So now you are getting ready to mobilize patient in the Neuro ICU...

In the Neuro ICU room you can find:

- Peripheral IV
- EVD
- Central Line
- Ventilator
- NG-tube
- Foley catheter
- Flexi-seal
- Restraints
- Femoral sheaths



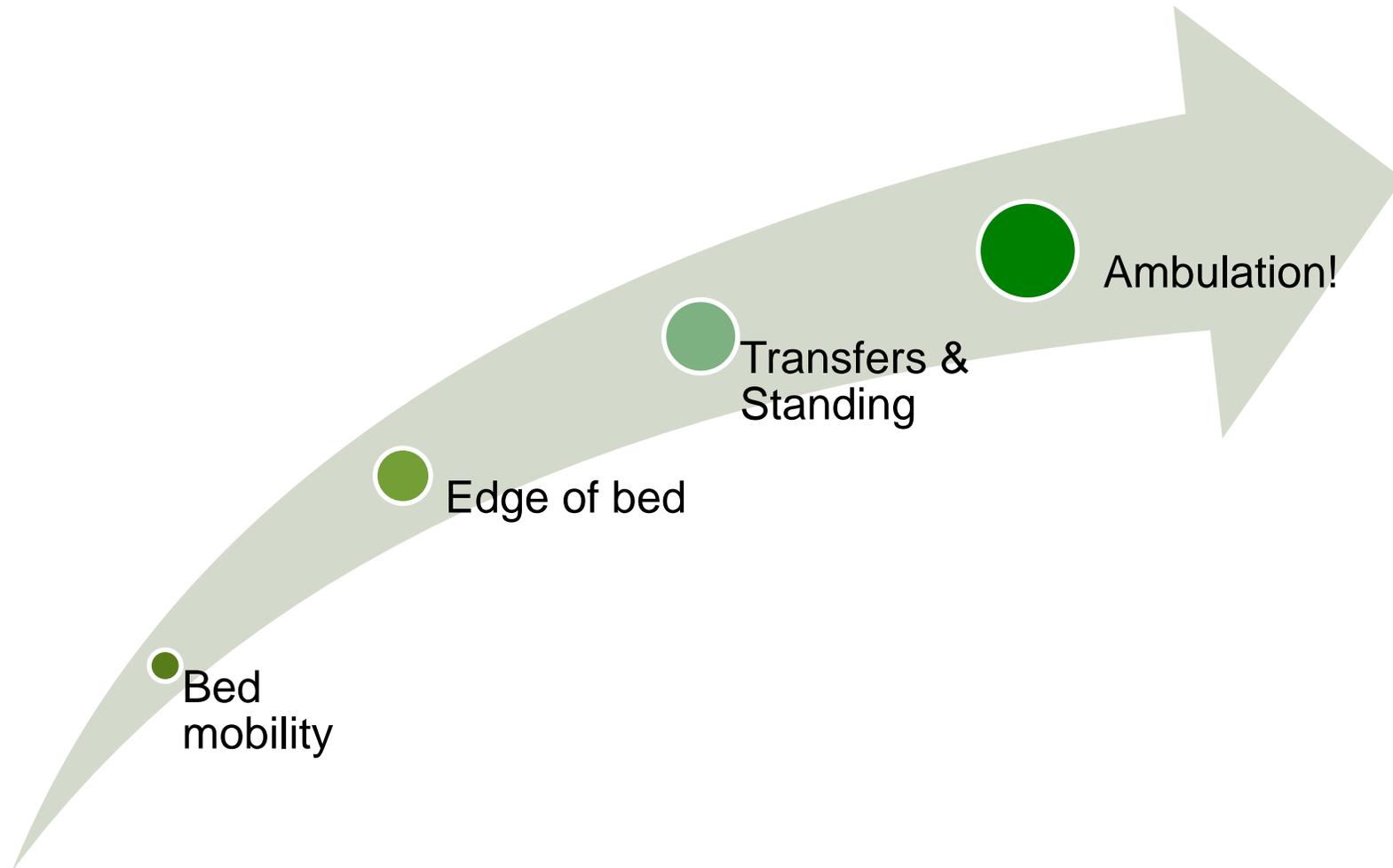
What other things we should take into consideration before mobilizing a patient?

- Level of Alertness
 - Confusion and delirium
 - Glasgow Coma Score (GCS) score
 - GCS + ventilator + High ICP (Brimioulle et al, 1997)
- Patient agitation
- Safety/resources
 - Rehab aides/techs
 - Co-treating with other healthcare provider
- Family
 - At bedside?
 - Culture preferences
 - Language
 - Health Literacy
- ICP
- Medication Side effects
- Fear
- Uncertainty of knowledge
- Bone flap
 - Absence? ...Helmet?
- Unstable spine
- Obesity

It is O K A Y TO MOBILIZE IF:

- “Low level” patient
- Low GCS (Brimioulle et al, 1997)
- Ventilated
- EVDs (more than 1 sometimes...) (Sprenkle KJ, Pechulis M., 2013)
- Foley present
- Pressure lines
- High blood pressures (ischemic strokes)

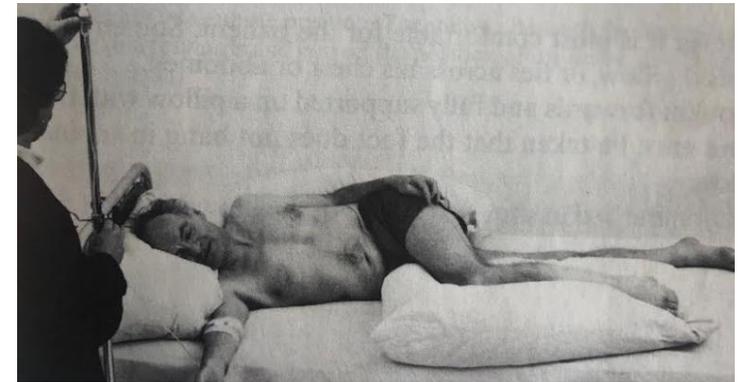
You have the **GREEN** light!



	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Location	Bed	Bed Edge of Bed (EOB)	Bedside Chair Standing	Room Hallway
Activity	Head of Bed elevated	Bed mobility Sitting EOB	Transfer to chair Sitting OOB Standing	Walking
Therapeutic Exercise or Activity	Passive ROM Active ROM	Passive ROM Active ROM Reaching	Active ROM Weight shifting	Endurance Dual task Balance Activities
Functional Training	Bed mobility Positioning	Bed mobility Positioning Posture Sitting Balance	Transfers Posture Standing balance ADL	Gait (stairs) Dynamic balance Posture ADLs
Education	Positioning Family training	Positioning Safety Family training	Safety Assistive device Family training	Safety Assistive device Family training
Goals	Upright tolerance	Sitting balance	OOB activity Standing balance	Strength Gait balance Endurance

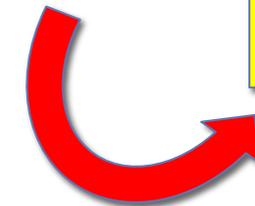
Level 1: Bed

- **Barriers:** Decreased arousal, vital signs instability, safety
- Interventions:
 - If EVD is present: **IS IT CLAMPED?**
 - Trial HOB elevation
 - Passive/Active/Active assisted Range of Motion
 - Lying on the affected side: awareness of the side*
 - Rolling > bed mobility
 - Face patient towards family members or towards where stimulation is AUGMENTED
 - ALL nursing duties will be carried out from the AFFECTED SIDE
 - ALL doctors and visitors should approach patient from the AFFECTED SIDE



(Davies, 1985)

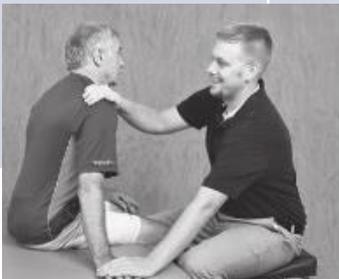
INPUT!



Level 2: Edge of Bed

- **Barriers:** Vital signs (orthostatic hypotension?), pushing, hemineglect, posture, pain.
- **Interventions:**

Pusher Syndrome	Hemi neglect	Sitting Balance	Impaired Coordination
<ul style="list-style-type: none"> • Mirrors for Feedback • Tactile Feedback (Shepherd et al., 2005) • Lateral elbow prop (Shepherd et al., 2005) 	<ul style="list-style-type: none"> • Crossing midline • Reaching activities (Shepherd et al., 2005; Davies, 1985; O'Sullivan, 2016) • Head rotation <ul style="list-style-type: none"> • Family Weight shift with UE support (O'Sullivan, 2016) 	<ul style="list-style-type: none"> • Crossing midline • Reaching activities • Sitting with feet SUPPORTED (Shepherd et al., 2005) • Stamping heel on the floor (Davies 1985) • Weight Shifting (Davies, 1985) <ul style="list-style-type: none"> • Pelvic tilts (Davies 1985) 	<ul style="list-style-type: none"> • Reaching • Alternating movements • Kicking



Level 3: Transfers & Standing

- **Barriers:** Muscle strength, Balance, posture, vital signs, minimal lifting equipment
- **Interventions:**
 - Some things to consider: distractions, family members, excessive verbal cues, impulsivity

Pusher Syndrome	Hemi neglect	Standing Balance	SIT > STAND TRANSFER
<ul style="list-style-type: none">• Mirrors for Feedback• Tactile Feedback (Shepherd et al., 2005)	<ul style="list-style-type: none">• Crossing midline• Reaching activities (Shepherd et al., 2005)• Head rotation• Family	<ul style="list-style-type: none">• Base of support• Weight Shifting• Simple stepping<ul style="list-style-type: none">-Forward and Backward-Different directions-Side stepping	<ul style="list-style-type: none">• Rocking forward and backward (O'Sullivan, 2016)



Level 4: Ambulation

- Barriers: Muscle strength, coordination, balance, muscle tone, vital signs
- Interventions:
 - Pre-gait:
 - Stepping: marching, different directions
 - Sit > stands
 - Gait:
 - Verbal cues
 - Metronome
- Other things to consider before/during gait:
 - Supplemental Oxygen?
 - Wheelchair follow?
 - Endurance?

Level 4: Ambulation (Cont'd)

- What about the higher level patients?
 - Consider DUAL TASKING ACTIVITIES!
 - Consider STAIRS!
 - Consider WALKING LONGER DISTANCES!

Should **all** patients with an acute stroke be mobilized **immediately** after admittance to the ICU?

It depends.

Implications for Clinical Practice: ACUTE ISCHEMIC STROKE

- Early mobilization for this type of stroke appears to be **better AFTER 24 hours**
- Achieve hemodynamic and physiologic stability in upright position **FIRST**
 - **Head of bed** within the first 24 hrs matters
- Always know when tPA was administered, IF it was. (<12 hours = HOLD PT)
- Early mobilization **NEEDS** to be terminated if there is a **DROP** of blood pressure of **more than 30 mmHg**
- Increased blood pressure protects vulnerable brain tissue, improving perfusion to the penumbra
 - **200/120 mm Hg** for patient with ischemic stroke **<185/110 mm Hg** for patient with ischemic stroke with tPA

Implications for Clinical Practice: SUBARACHNOID HEMORRHAGE

- HOB elevation can begin after aneurysm has been secured (within 24 hrs.)
- Out of bed activity can begin on the second day (after 48 hrs.)
- Has the source of the bleed been secured?
- Is the EVD clamped?
 - Ensure ICPs are <20 mmHg
- Blood pressure should remain : 140-160 mm Hg (systolic blood pressure)

Implications for Clinical Practice: INTRACEREBRAL HEMORRHAGE (ICH)

- Safe to mobilize within 48 hours after ICH or after hemorrhage has been stabilized for at least 24 hrs.
- Is EVD clamped?
- Ensure proper control of blood pressure medications
 - Before, during, after sessions
- SBP should be kept **<140 mmHg during PT**

Implications for Clinical Practice:

INTRACRANIAL PRESSURE: 101 for PTs

- Intracranial pressure is normally ≤ 15 mmHg in adults
- Pathologic intracranial hypertension (ICH) is present at pressures ≥ 20 mmHg
- Head and trunk elevation up to 30 degrees is useful in helping to decrease ICP, providing that a safe cerebral perfusion pressure (CPP) of at least 70 mmHg or even 80 mmHg is maintained
- **AVOID ISOMETRICS!**
- Momentarily elevations in ICP will occur. If the elevation is **MORE THAN 5 minutes**, contact the nurse.
- **AVOID** trendelenbug, lateral neck flexion, and extreme hip flexion.

Exercise is the best medicine – even in the Neuro ICU.

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