

# Early Mobility After Stroke

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Practical Management of Stroke  
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## Objectives

- Understand current literature re: when it is appropriate to mobilize a patient after a stroke.
- Understand the risks and benefits of early mobility after stroke
- Understand the timeliness in which patients after stroke receive care

# Acknowledgements

- Alexandra Harrison, PT, DPT, NCS

# History



## What is “Early”

24 hours?

72 hours?

48 hours?

2 weeks?

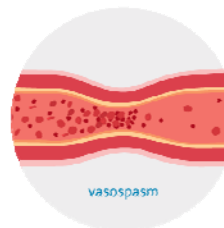
1 week?

- VERY early = < 24 hours
- EARLY = 24-48 hours



## What are the risks?<sup>1</sup>

- Falls
- Poor perfusion
  - Orthostatic hypotension from BP meds, blocked cerebral flow
- Cerebral edema/metabolic cascade
- Vasospasm
- Seizure



## Why early?<sup>1,2</sup>

- General
  - Combating risks of immobilization
    - DVT/VTE
    - Loss of strength
    - Cardiac/pulmonary complications
    - Cognitive/physical impairments
    - Bone resorption

## Why early<sup>3</sup>

- Stroke population
  - Promoting brain recovery and neuroplastic changes
    - Early shift of brain activity from contralesional side back to ipsilesional side
    - Triggers synaptogenesis and angiogenesis
  - Early exercise in animal models promotes:
    - Decreased inflammatory cytokines
    - Tightens blood brain barrier
    - Suppresses apoptosis, exotoxic processes
    - Increases BDNF
    - Promotes neurogenesis
  - Long term potentiation enhanced

## Why early?

- Stroke population
  - Benefit from **intensive, functional task practice** more compared to impairment-based programs<sup>4</sup>
    - Impairment-based programs fail to generalize to functional improvements
  - Evidence that **task-specific training** delivered with enough **repetitions** at an adequate **intensity** produces “lasting physiological changes in motor neural networks and behavioral changes in motor learning and motor function”<sup>5</sup>
    - But when?
      - Interaction between timing and dose
      - More therapy is better, but may not be better in 1<sup>st</sup> few hours and days after stroke → AVERT trial

## A Very Early Rehabilitation Trial (AVERT)<sup>6</sup>

- AVERT
  - Data collected 2006-2014
    - Published in 2015

## AVERT II<sup>6</sup>

- 52 patients with goal of mobility within 24 hours of stroke
  - Experimental: Very Early Mobility (VEM)
    - Mean time to start rehab: 18.5hrs
  - Control: Standard Care (SC)
    - Mean time to start rehab: 22.4hrs
      - >60% of SC group started OOB within 24hrs of stroke onset
- Results:
  - VEM safe and feasible, no significant difference in primary outcome of death at 3 months
- Limitations:
  - There was small sig. diff. in time to mobilize.

## AVERT III<sup>7</sup>

- 2,104 patients RCT
  - Experimental: very early mobility
  - Control: usual care
- Primary outcome was modified Rankin score to determine favorable outcome
- Statistical difference was found in INTENSITY OF MOBILIZATION
  - Intervention group spent ~3 times longer OOB than controls (mean 201.5 versus 70 min)
  - **“Shorter, more frequent mobilization early after stroke may be associated with a more favorable outcome.”**

## AVERT III Dosage

- 2 → 10 sessions a day (no upper limit)
- Never exceeding 10 minutes per session
- 13% increased odds of a favorable outcome with each additional OOB session per day
- Conversely, increasing the amount of time spent in OOB activity, reduced the odds of a favorable outcome.

## Akershus Early Mobilization in Stroke Study (AKEMIS)<sup>8</sup>

- 44 patients
  - Experimental: VEM out of bed within 24 hours
  - Control: 24-48 hours
- Results: non-significant trend towards **increased disability, mortality, and dependency in experimental group**
  - Also no reduction in immobility-related complications
- Limitations to study: low power, limited patients

## Active Mobility Very Early After Stroke (AMOBES)<sup>9</sup>

- RCT, n=104, multicenter
  - Both started within 72hrs of stroke onset
  - Soft PT
    - 20-min/d
    - passive range-of-motion exercises aimed at preventing immobility-related complications
  - Intensive PT
    - soft PT plus 45 min of active intensive exercises
- Results: **no difference** in motor impairment at 90 days

## Cochrane Review<sup>10</sup>

- Very Early Mobility has moderate to low evidence.
- Concern that VEM commencing within 24 hours may carry an increased risk
- Given the uncertainty around these effect estimates, more detailed research is still required.





## Very Early Constraint-Induced Movement during Stroke Rehabilitation: VECTORS<sup>11</sup>

- 3hr therapy/day + 90% of waking hours of CIMT, compared with 1–2 h therapy/day + 6hrs, resulted in *worse* motor outcomes



Compared to control: Standard Care and Standard CIMT

## Does type of stroke matter?

- Ischemic
  - Early mobility appears to be safe and feasible
  - Can improve outcomes compared to delayed mobility
  - However, VEM (< 24 hours) may have increased risk and decreased outcomes
    - If very early, may consider shorter time out of bed initially
- tPA considerations<sup>13</sup>
  - Small study mobilized patients within 24 hours of tPA administration with 72% mobilizing without adverse events/symptoms
  - Limitations: small sample, lack of control
  - Require vital sign and neurological monitoring

## Does type of stroke matter?

- Intracerebral hemorrhage
  - Study in China that compared early care (48 hours) vs standard care (within 7 days) showed early care were more likely to be alive at 6 months, had shorter LOS, greater QOL, improved mental health<sup>14</sup>
  - Considerations: management of blood pressure and then subsequent monitoring before, during, and after mobility

## Does type of stroke matter?

- Subarachnoid hemorrhage
  - Early mobilization appears to be safe and feasible after aneurysm treatment and **48 hours** of monitoring<sup>12</sup>
  - In patients with external ventricular drains (EVD), early mobilization had less frequent and severe vasospasm<sup>2</sup>
  - Early mobility may decrease LOS, disability

# How Far Can We Go?<sup>12</sup>

- Considerations of Mobility in Neuro ICU
  - The effect of positional changes and exercise on physiologic and hemodynamic stability.
  - The time from symptom onset to the initiation of early mobilization.
  - The type and intensity of the exercise prescribed during early mobilization.
  - The impact of medical and surgical management on early mobilization.

# How Far Can We Go?<sup>12</sup>

**Table 1** Progressive early mobility program for patients with critical illness

	Level 1	Level 2	Level 3	Level 4
Location	Bed	Bed EOB	Bedside chair Standing	Room Hallway
Activity	HOB elevation Bed mobility	Bed mobility Sitting EOB	Transfer to chair Sitting OOB Standing	Walking
Therapeutic exercise	Passive ROM Active ROM	Passive ROM Active ROM Reaching	Active ROM Weight shifting	Endurance Dual task
Functional training	Bed mobility Positioning	Bed mobility Posture Balance ADL	Transfers Posture Standing balance ADL	Gait balance Posture ADL
Education	Positioning Family training	Positioning Safety Family training	Safety Assistive device Family training	Safety Assistive device Family training
Goal	Upright tolerance	Sitting balance	OOB activity Standing balance	Strength Gait balance Endurance

*HOB* head of bed, *EOB* edge of bed, *OOB* out of bed, *ROM* range of motion, *ADL* activities of daily living

# How Far Can We Go?<sup>12</sup>

**Table 2** Recommendations and considerations for early mobilization in the NICU

Diagnosis	Time to initiation	Intensity	Level of evidence*	Consideration	Solution
Acute ischemic stroke	24 h after symptom onset	No benefit to increased intensity during 24–48 h after symptom onset	2	HOB elevation within 24 h of symptom onset Maintain arterial hypertension	HeadPoST/CHORUS to determine outcomes of head of bed elevation Close BP monitoring before, during and after mobilization. Consider mobilization if patient stable and not actively titrating parenteral vasopressors or antihypertensives
Aneurysmal Subarachnoid hemorrhage	24–48 h after aneurysm treatment	After aneurysm treatment, HOB elevation within 24–48 h and mobilization out of bed after 48 h	3	EVD Asymptomatic vasospasm Single ICP spike	Ensure EVD securely placed and ICP levels consistently below 20 mmHg If stable neurologic exam, should not preclude mobilization ICP spike related to an acceptable reason (i.e., during bowel movement, needle insertion) should not preclude mobilization
Spontaneous Intracerebral hemorrhage	24 h after stable ICH volume	Unknown	3	BP fluctuations Single ICP spike	Ensure proper control of BP with oral or continuous medications prior to mobilization ICP spike related to an acceptable reason (i.e., during bowel movement, needle insertion, etc.) should not preclude mobilization

# Timeliness of Care<sup>15</sup>

- Study to determine whether patients received therapy in acute setting and then in home and outpatient settings
  - With shorter hospital LOS, the burden of therapy care shifts to post-acute care including skilled nursing and acute rehabilitation
  - However, 60% of patients after stroke discharge home from the hospital
- 78% of patients received therapist care during their inpatient stay
- 40.8% received care within 30 days of discharge
  - More likely to receive care in home (vs outpatient setting)
  - HHC: Mean number of days to 1<sup>st</sup> visit 5.2 ± 4.6
  - OP: Mean number of days to 1<sup>st</sup> visit 9.4 ± 7.0

# Timeliness of Care

- Higher predictors of therapist use:
  - Inpatient:
    - Higher RN staffing levels
    - Non-government, not-for-profit hospital
    - Located in metropolitan area
    - Counties with greater PCP supply
  - Home:
    - Joint-commission accredited hospitals
    - Government hospitals
    - Patients who are black, dual eligible, and lived in counties with lower median household incomes
  - Outpatient:
    - Counties with greater PCP and therapist supply

# Clinical Implications

- Patient Specific
- **Safe, feasible**, and can **improve patient outcomes** including disability, death rate, length of stay
- Stability scan after 24 hours
- Monitor vitals and neuro status!
- **INTENSITY MATTERS**
  - Mobility
    - Increase the frequency
    - Decrease duration per session
  - UE
    - mCIMT within 8 days

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