Rehabilitation in the PICU

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Disclosures

• Advisory board and speaker bureau
• All related to Intrathecal Baclofen Pump
  • Medtronic
  • Piramal Critical Care
Frequent Problems with Rehab Patients in the PICU

• All Patients
  • Sleep/Wake Cycle Disturbance
  • Muscle wasting, atrophy, and weakness
  • Joint Contractures

• Acquired Brain Injury
  • Neurostorming
    • Paroxysmal sympathetic hyperactivity (PSH)
    • Paroxysmal autonomic instability with dystonia (PAID)

• Cognition and Behavior
  • Agitation
Sleep/Wake Cycle Disruption

• Increases delirium and agitation

• Dark at night, light and by window during day

• Limit night time interruptions
  • Stopped vitals at night especially blood pressure
  • Prevent alarms/iv pumps etc. from alarming

• Medications
  • Melatonin
  • Trazodone
  • Avoid benzos and diphenhydramine
Muscle Atrophy

- Muscle wasting occurs early and rapidly
- 3-5% per day
- Quadriceps impacted the most
  - 10-15% loss of cross sectional area within 72 hours
- Kids don’t get severe deconditioning < month
  - If profound weakness
    - Critical Illness Myopathy
    - Critical Illness Neuropathy
    - CNS insult
Contractures

- Begin to develop within 8 hours of immobility
- Passive stretching without proper positioning likely of minimal benefit
- PT and OT can aid in proper positioning and provide devices to support proper positioning
  - PRAFO’s or multi podus boots for ankles
  - Comfy splints for wrist and fingers.
Neurostorming
-Paroxysmal Sympathetic Hyperactivity-

- Hyperthermia
- Hypertension
- Diaphoresis
- Rigidity
- Tachypnea
- Posturing
- Tachycardia
- Pupil changes
- Cycles throughout day often with circadian rhythm
Neurostorming/PSH Treatment

- *Rule out infection*
  - Check CRP

- Sympathetic Blockade
  - Non-selective beta blocker
    - Propranolol - crosses blood brain barrier
  - Alpha and beta blocker
    - Labetolol - does not cross blood brain barrier

- Tone Management
  - Baclofen – can help agitation and tone
  - Dantrolene - minimal to no CNS effects

- Refractory or Severe Cases
  - Intrathecal baclofen Pump
Cognition and Behavior

**AGITATION**

- Occurs in >50% of all ABI
  - Delirium, seizures, pain, hypoxia can also manifest with agitation.
- Neuro agitation should be treated with environmental and behavioral interventions first
- Propranolol 1st Line
  - Crosses Blood Brain Barrier
  - Minimal Sedation
  - Limited by bradycardia and hypotension
- Atypical Antipsychotics 2nd Line
  - Side Effects
  - Sedation
  - Stigma
Cognition and Behavior

• Cognitive-Improving Medications
  • Amantadine [Symmetrel]
  • Stimulants [Methylphenidate, Dexamphetamine]
  • Bromocriptine [Parlodel]

• Cognitive-Impairing Medications
  • Central Acting Antihypertensives (Clonidine)
  • Central Acting Antispasmodics (Tizanidine)
  • GI Agents (H2 Blockers, Reglan)
  • Pain Medications (Narcotics)
  • Sedatives (Benzodiazepines, diphenhydramine)
  • Anticonvulsants (Phenytoin, Carbamazepine, Phenobarbital)
Placebo-Controlled Trial of Amantadine for Severe Traumatic Brain Injury

CONCLUSIONS
Amantadine accelerated the pace of functional recovery during active treatment in patients with post-traumatic disorders of consciousness. (Funded by the National...
Time is Brain

- Heart Attack
  - “time is muscle”

- Acquired Brain injury
  - Time is Brain
    - Delays into rehab may impact overall recovery
    - Window of recovery
    - Sooner recovery, better prognosis