Massachusetts General Hospital
Founding Member, Mass General Brigham

MGH ERAS Guidelines for Neurosurgical Perioperative Care of the Pediatric Tethered Cord Release Patients

Created November 2023

PURPOSE:
The purpose of this policy is to outline common expected procedures for the perioperative care of the tethered cord release patients in the care of the MGH neurosurgery service.

GUIDING PRINCIPLES:
Direct communication between Neurosurgery, PACU, and admitting team/staff/ICU or floor is essential. No single entity to be placed in the role of intermediary between Neurosurgery and final admission location. Neuromonitoring is done throughout case, and final checks are run at completion of case.

Pre-Operative Considerations
 	
Surgeons, fellows, APPs, residents, Anesthesia, pre-operative nursing
	• Pre-operative patient (and/or family) education and counseling in clinic to be provided, including surgery overview and hospitalization expectations.
	  ○ The Neurosurgery clinic will provide pre-operative teaching/education handouts in office
	• Premedication/multimodal opioid-sparing analgesia:
	  ○ Patients may receive acetaminophen *orally* prior to OR while in PACU if not contraindicated.
	  ▪ PO Acetaminophen
	  • <50kg infant/child: 10-15mg/kg (max dose 750mg x1)
	  • >50kg and > 12 years: 325-650mg
	  • Adolescents > 16 years: 650-975mg
	  ○ Patients may receive gabapentin prior to surgery unless patient is already taking gabapentin and already took gabapentin at home.
	  ○ If starting gabapentin: 5mg/kg up to 300mg, titrate daily to TID
	• Home Medication Management:
	  ○ Medication reconciliation must be completed both by pre-op nursing and by neurosurgery team member.
	  • Instruct patient (or family/representative) for any antiplatelet, anticoagulation, ARB, ACEi, or any anti-inflammatory medications to be discontinued 7 days prior to surgery
	  • Instruct patient (or family/representative) for Vitamin/herbal supplements, and fish oil to be held 7 days prior to surgery.

Guidelines for post-operative admission to pediatric floor vs. PICU Surgeons, fellows, APPs, residents, admitting, PICU resource nurses, Ellison 17/18 resource nurses	**Patients are considered candidates for floor/non-ICU admission when the following are true:** • Underwent tethered cord release without intra-operative complications. • Does not require medical and/or nursing observation and/or treatment every two hours. • Does not require invasive monitoring or continuous observation. • Does not require lumbar drain. • Does not require sedation to maintain flat bedrest. **Patients require further discussion regarding PICU vs. floor admission if any of the following be true:** • There was major blood loss, either during surgery (EBL) or post-operatively • The procedure was a complex cord detethering for which post-operative monitoring or continuous observation may require an invasive device (i.e. lumbar drain, etc.) • There was an intra-operative occurrence prompting q2h neuro checks (neuromonitoring signals were lost). • Patient requires sedation to maintain flat bedrest. • Patient has severe or potentially life-threatening pulmonary or airway disease (mechanical ventilation, supplemental oxygen requirement (FiO2 > 0.5), other advanced airway support) • Patient has severe, life-threatening, or unstable cardiovascular disease or require fluid volume resuscitation and/or vasopressor therapy. • Patient has altered mental status, acute inflammation or infection of the spinal cord, meninges, or brain. • Patient has evidence of/or known increased intracranial pressure. • Patient has severe or unstable hematologic or oncologic disease or active life-threatening bleeding, endocrine, metabolic disease, gastrointestinal disease, renal disease, multi-system disease, or conditions requiring application oof special technological needs/monitoring/complex intervention. Please also refer to "PICU Admission and Discharge Criteria" https://hospitalpolicies.ellucid.com/documents/view/12030 for full description of ICU admission criteria within MassGeneral Hospital For Children
POD0 Surgeons, fellows, APPs, residents	• Antibiotics: IV Cefazolin (50mg/kg, max. dose of 1g) q8 hours x 24 hours post-op (up to 72 hours when indicated) *Cannot be used in neonates <41 weeks PMA ○ If penicillin/cephalosporin allergy, or PMH MRSA: IV Vancomycin (20 mg/kg, q6h up to 750mg max dose) • Pain Control Options: ○ ***The routine use of multimodal analgesic regimens to improve pain control and reduce opioid consumption is recommended.*** ○ IV Acetaminophen (500mg or 1000mg pre-mixed bags available) ▪ 1mo-2 years: 10mg/kg q6 hours ATC ▪ 2-12 years or <50kg: 15mg/kg q6 hours ATC ▪ > 12 years and >50kg: 500mg or 1000mg q6 hours ATC

Or PO Acetaminophen
- <50kg: 10-15mg/kg q4-6 hours ATC (max dose 75mg/kg/day)
- >50kg and > 12 years: 325-650mg q4-6 hours ATC

- IV Morphine
  - > 1 year: 0.05-0.1mg/kg q2-3 hours PRN for **breakthrough** (must monitor RR and O2 sats)
- PO Oxycodone (immediate release) standing
  - Available as 5mg/mL syrup or 5mg tablets or 10mg tablets
  - < 50kg: 0.05-0.15mg/kg q4-6 hours
  - > 50kg: 5-10mg q4-6 hours
- IV/PO Weight-based dosed Diazepam:
  - PRN indication: muscle spasm
  - Consider lower doses while utilizing IV formulation
    - <50kg: 0.04-0.2 mg/kg q8 hours PRN
    - >50kg: 2.5-10mg q8h PRN

- Antiemetics:
  - 1st Line: Ondansetron (Zofran)
    - IV/PO
      - <40kg: 0.1 mg/kg q8h PRN nausea/vomiting
      - >40kg: 4mg q8h PRN nausea/vomiting
  - 2nd Line: Benadryl
    - IV/PO
      - < 50kg: 0.5-1mg/kg q6h PRN nausea/vomiting
      - >50kg: 12-25mg q6-8h PRN (max dose 50mg)
- Dexamethasone Taper:
  - *Pediatric patients <40kg must be ordered for **weight-based** doses
  - <40kg: 0.1mg/kg q6h x4 doses, 0.075mg/kg q6h x4 doses, 0.05mg/kg q6h x4 doses, 0.025mg/kg q6h x4 doses
  - >40kg: 4mg q6h x4 doses, 3mg q6h x4 doses, 2mg q6h x4 doses, 1mg q6h x4 doses
- Diet:
  - Regular/pediatric/adolescent diet as tolerated.
  - Maintenance IV fluids while flat bedrest
- Activity:
  - Flat bedrest first 24 hours post-operatively
    - Frequent position changes to prevent skin ulceration.
    - Side to side is permitted.
- GI/GU:
  - Indwelling urinary catheter in place: option provided to patient to be removed overnight and use bedpan
  - Initiate Bowel Regimen w/stool softeners on POD0:
    - Docusate (>6 months, <40kg):
      - 5-10 kg 12.5 mg BID
      - 10-20 kg 25 mg BID
      - 20-30 kg 50 mg BID
      - 30-40 kg 75 mg BID
    - Docusate (>40kg): 100mg BID (max 400 mg/day)
- Consults:
  - Place PT/OT consults asking to evaluate patient when off bedrest.
- DVT prophylaxis:
  - Utilize risk stratification tool in Epic order set.

	▪ SCD use if needed per risk assessment order set ▪ No chemoprophylaxis until 24h post-op • Nursing Communication Orders to be placed: ○ Vital signs q4h, pain assessment q4h ○ Neuro checks q2h if neuromonitoring issues occurred intraop, otherwise q4 hours ○ Telemetry not required unless cardiac history or otherwise indicated ○ Must be ordered for continuous O2 monitoring if using IV morphine. ○ Incentive spirometer QID ○ HOB flat until POD1 ○ Monitor I&O until foley catheter removed (q2h recording available on floor if needed)
POD1 Surgeons, fellows, APPs, residents	• Antibiotics: IV Cefazolin (50mg/kg, max. dose of 1g) q8 hours x 24 hours post-op (up to 72 hours when indicated) *Cannot be used in neonates <41 weeks PMA ○ If penicillin/cephalosporin allergy, or PMH MRSA: IV Vancomycin (20 mg/kg, q6h up to 750mg max dose) • Pain Control: ***Assess changing medications from standing to PRN as able*** ○ IV Acetaminophen (500mg or 1000mg pre-mixed bags available) ▪ 1mo-2 years: 10mg/kg q6 hours ATC or PRN ▪ 2-12 years or <50kg: 15mg/kg q6 hours ATC or PRN ▪ >12 yrs and >50kg: 500mg or 1000mg q6 hours ATC or PRN Or PO Acetaminophen ▪ <50kg: 10-15mg/kg q4-6 hours ATC or PRN (max dose 75mg/kg/day) ▪ >50kg and > 12 years: 325-650mg q4-6 hours ATC or PRN ○ **IV Ketorolac** (OK for use as of POD1) ▪ 6 mo-16 years: 0.5mg/kg q8 hours (max dose 15mg) PRN ▪ > 16 years and > 50kg: 15mg 8 hours PRN ▪ Ketorolac use x 8 doses total, end morning of POD2 (Do not exceed 72h) Or PO Ibuprofen ▪ Not approved for < 6 months ▪ > 6 months, <50kg: 5-10mg/kg q6-8 hours (max dose: 40mg/kg/day) PRN ▪ >50kg and > 12 years: 400-600mg q6-8 hours PRN ○ IV Morphine ***space to q4h if tolerable for patient* ▪ > 1 year: 0.05-0.1mg/kg q4 hours PRN (must monitor RR and O2 sats) ○ PO Oxycodone (immediate release) ▪ Available as 5mg/mL syrup or 5mg tablets or 10mg tablets ▪ < 50kg: 0.05-0.15mg/kg q4-6 hours PRN ▪ > 50kg: 5-10mg q4-6 hours PRN ○ IV/PO Weight-based dosed Diazepam: ▪ PRN indication: muscle spasm • <50kg: 0.04-0.2 mg/kg q8 hours PRN • >50kg: 2.5-10mg q8h PRN • Antiemetics: ○ 1st Line: Ondansetron (Zofran) ▪ IV/PO • <40kg: 0.1 mg/kg q8h PRN nausea/vomiting • >40kg: 4mg q8h PRN nausea/vomiting

	○ 2nd Line: Benadryl ▪ IV/PO • < 50kg: 0.5-1mg/kg q6h PRN nausea/vomiting • >50kg: 12-25mg q6-8h PRN (max dose 50mg) • Continuing Dexamethasone Taper: ○ *Pediatric patients <40kg must be ordered for **weight-based** doses ○ <40kg: 0.1mg/kg q6h x4 doses, 0.075mg/kg q6h x4 doses, 0.05mg/kg q6h x4 doses, 0.025mg/kg q6h x4 doses ○ >40kg: 4mg q6h x4 doses, 3mg q6h x4 doses, 2mg q6h x4 doses, 1mg q6h x4 doses • Diet: ○ Regular/pediatric/adolescent diet as tolerated ○ Maintenance IV fluids: DC POD1 if liberalizing HOB. Encourage adequate PO intake • Activity: ○ Flat bedrest to be liberalized morning of POD1. ▪ Allow patient to sit up in bed & if no HA or CSF leak from incision then the flat bedrest order can be DC'd ▪ Change activity order to ambulate in room/in hall with staff/OOB to chair • GU/GI: ○ Indwelling urinary catheter to be DC'd via nurse driven protocol once flat bedrest discontinued if not yet done. ○ Once liberalized from HOB flat, add to stimulant bowel regimen ▪ <40kg: • Senna oral liquid: ○ 0-10kg 2.2 mg QHS ○ 10-20kg 4.4 mg QHS ○ 20-30kg 6.6 mg QHS ○ 30-40kg 8.8 mg QHS May consider BID if constipated ▪ >40kg: • Senna oral liquid: 8.8-17.2 mg qHS. May consider BID if constipated. • Senna tablets: 1-2 tablets qHS. May consider BID if constipated. • Docusate: 100mg BID (max 400 mg/day) • MiraLAX: 17g (1 packet) daily PRN • Consults: ○ PT/OT should now evaluate patient after bedrest discontinued. • DVT prophylaxis: ○ SCDs while in bed if needed per EPIC. ○ Chemoprophylaxis to start night of POD1 (24 hours post-op) if not low risk. • Nursing Communication Orders: ○ Vital signs q4 ○ Neuro checks q4 ○ Incentive spirometer QID ○ HOB liberalization/activity orders to be updated
POD2 Surgeons, fellows, APPs, residents, nursing	• Surgical antibiotic prophylaxis completed. • Pain Control:

- PO Acetaminophen
  - <50kg: 10-15mg/kg q4-6 hours PRN (max dose 75mg/kg/day)
  - >50kg and > 12 years: 325-650mg q4-6 hours PRN
- PO Ibuprofen
  - Not approved for < 6 months
  - > 6 months, <50kg: 5-10mg/kg q6-8 hours (max dose: 40mg/kg/day) PRN
  - >50kg and > 12 years: 400-600mg q6-8 hours PRN
- PO Oxycodone (immediate release)
  - Available as 5mg/mL syrup or 5mg tablets or 10mg tablets
  - < 50kg: 0.05-0.15mg/kg q4-6 hours PRN
  - > 50kg: 5-10mg q4-6 hours PRN
- PO Weight-based dosed Diazepam:
  - PRN indication: muscle spasm
    - <50kg: 0.04-0.2 mg/kg q8 hours PRN
    - >50kg: 2.5-10mg q8h PRN

- Antiemetics:
  - 1st Line: Ondansetron (Zofran)
    - PO (ODT)
      - <40kg: 0.1 mg/kg q8h PRN nausea/vomiting
      - >40kg: 4mg q8h PRN nausea/vomiting
  - 2nd Line: Benadryl
    - PO
      - < 50kg: 0.5-1mg/kg q6h PRN nausea/vomiting
      - >50kg: 12-25mg q6-8h PRN (max dose 50mg)
- Continuing Dexamethasone Taper:
  - *Pediatric patients <40kg must be ordered for **weight-based** doses
  - <40kg: 0.1mg/kg q6h x4 doses, 0.075mg/kg q6h x4 doses, 0.05mg/kg q6h x4 doses, 0.025mg/kg q6h x4 doses
  - >40kg: 4mg q6h x4 doses, 3mg q6h x4 doses, 2mg q6h x4 doses, 1mg q6h x4 doses
- Diet:
  - Regular/pediatric/adolescent diet as tolerated
- Activity:
  - Ambulate BID
  - Frequent position changes while in bed
- GU/GI:
  - Indwelling urinary catheter should have been removed
  - Continue bowel regimen
  - OOB to bathroom
- Consults:
  - PT/OT eval or follow up if needed for stairs (depending on timing)
  - Encourage ambulation
- DVT prophylaxis:
  - SCDs continue if needed
  - Chemical prophylaxis started POD1/24h post-op if not low risk
- Nursing Communication Orders:
  - Vital signs q4 hours
  - Neuro checks q4 hours
  - Incentive spirometer QID
  - Adjust activity orders as needed

POD3
Surgeons, fellows, APPs, residents, nursing
	• Antibiotics: course complete unless otherwise indicated
	• Patient may shower, monocryls to stay dry until POD4
	  ○ Continue all pain control. Goal to utilize oral medications only.
	• Antiemetics:
	  ○ ODT Zofran PRN
	• Diet:
	  ○ Regular/pediatric/adolescent diet as tolerated
	• Activity:
	  ○ Ambulate BID with staff
	  ○ Frequent position changes while in bed
	• GU/GI:
	  ○ Expect patient to be voiding spontaneously. If not, begin workup for urinary retention. If not yet moving bowels, consider causes of constipation and possible need for workup.
	• Consults:
	  ○ PT/OT continue working with patient to progress toward discharge readiness
	• DVT prophylaxis:
	  ○ SCDs, chemoprophylaxis as directed per low or high risk needs
	• Nursing Communication Orders:
	  ○ Vital signs q4 hours
	  ○ Neuro checks q4 hours
	  ○ Incentive spirometer QID
	  ○ Ambulate patient BID with staff

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