Clinical Pathways

Post-Operative Tethered Cord Patients

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Connecticut Children's

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What is a Clinical Pathway?

- An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective and consistent patient care.

Objectives of Pathway

- To improve and standardize post-operative care of the patient undergoing tethered cord surgery
- To eliminate variability and establish a standard of care for these patients

Why do we need this pathway?

- To change practice for post operative care of these select group of patients
- To guide care for these children
- To ensure standard of care is successfully implemented for the safety of the patient

What is Tethered Cord?

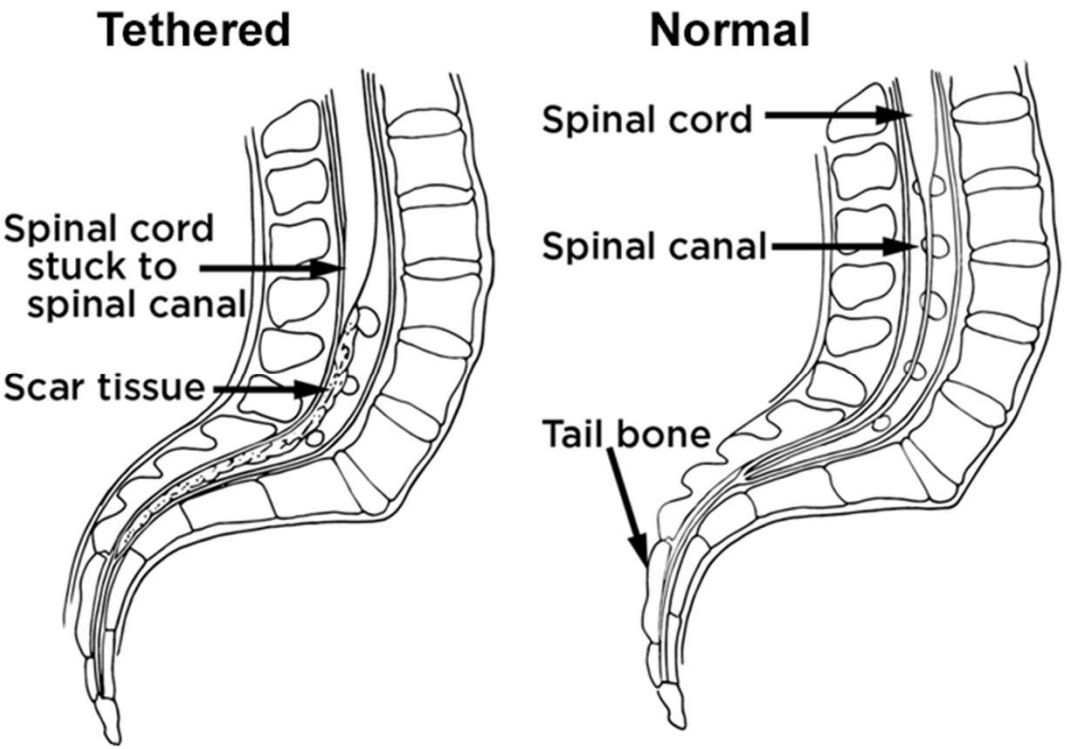


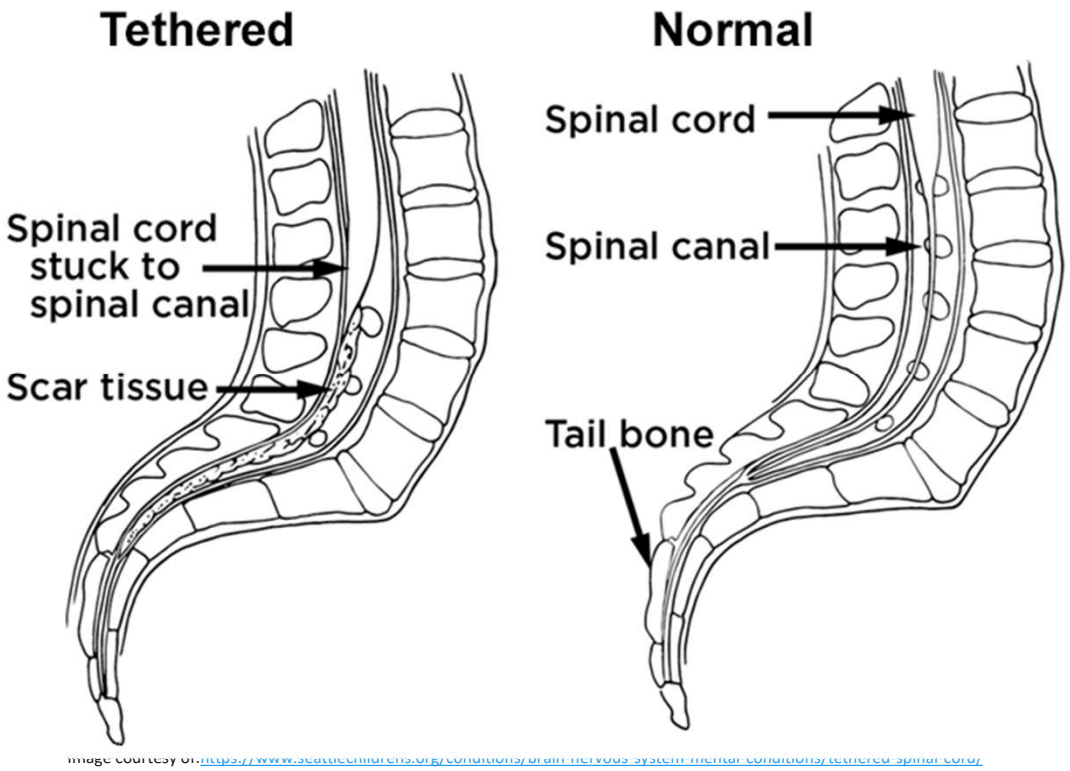
Image courtesy of: https://www.seattlechildrens.org/conditions/brain-nervous-system-mental-conditions/tethered-spinal-cord/

- Tethered cord occurs when the spinal cord is attached to tissues around the spine, most commonly at the base of the spine.
- The attached tissue limits the movement of the spinal cord within the spinal column and causes an abnormal stretching of the spinal cord and impairment of blood flow to the nerve tissue.
- Can be closely associated with spina bifida

OR

- Can occur as an independent entity related to disorders of secondary neurulation and some tumors.

What is Tethered Cord?



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- The lower tip of the spinal cord (conus medullaris) is normally located opposite the disc between the first and second lumbar vertebrae.
- With tethered cord, the conus medullaris may be located below the interspace between the second and third lumbar vertebrae, and/or there may be radiographic evidence of abnormal points of attachment (i.e. thickened filum terminale, intraspinal mass, spinal cord adjacent to thecal sack in a fixed position).

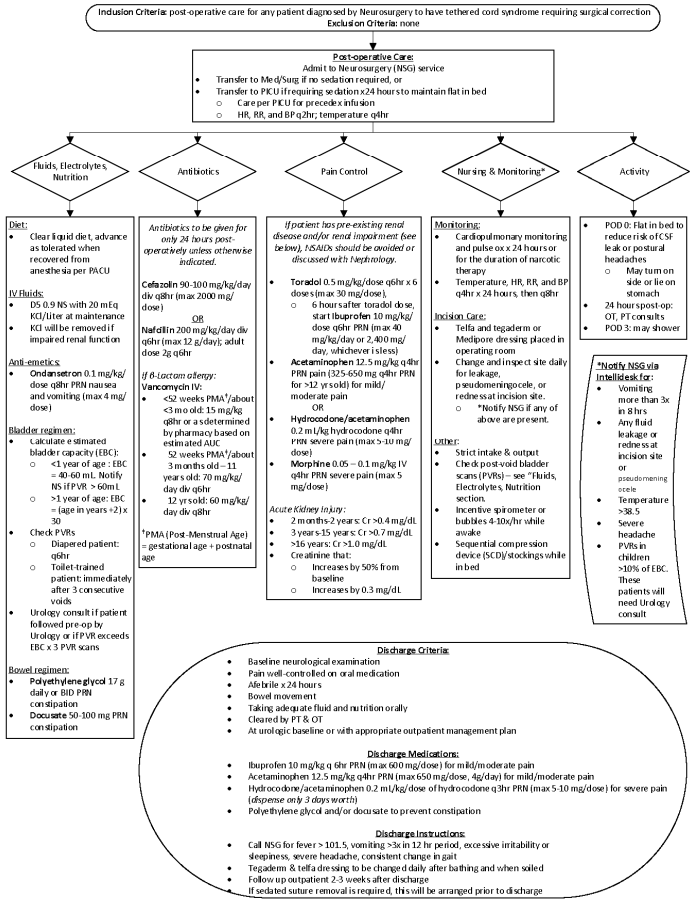
This is the Post Operative Tethered Cord Clinical Pathway.

We will be reviewing each component in the following slides.

CLINICAL PATHWAY:

Post-Operative Tethered Cord

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.



CONTACTS: PETRONELLA STOLTZ, APRN, DNP | MARKUS BOOKLAND, MD | JONATHAN MARTIN, MD

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This pathway is specifically for patients who have tethered cord that required surgical correction.

Patients need to be flat in bed for 24 hours post procedure.

- Some patients will require PICU admission for sedation with precedex during this initial period of recovery.
- Most children can then transfer to the Med/Surg unit after 24 hours.

CLINICAL PATHWAY:

Post-Operative Tethered Cord

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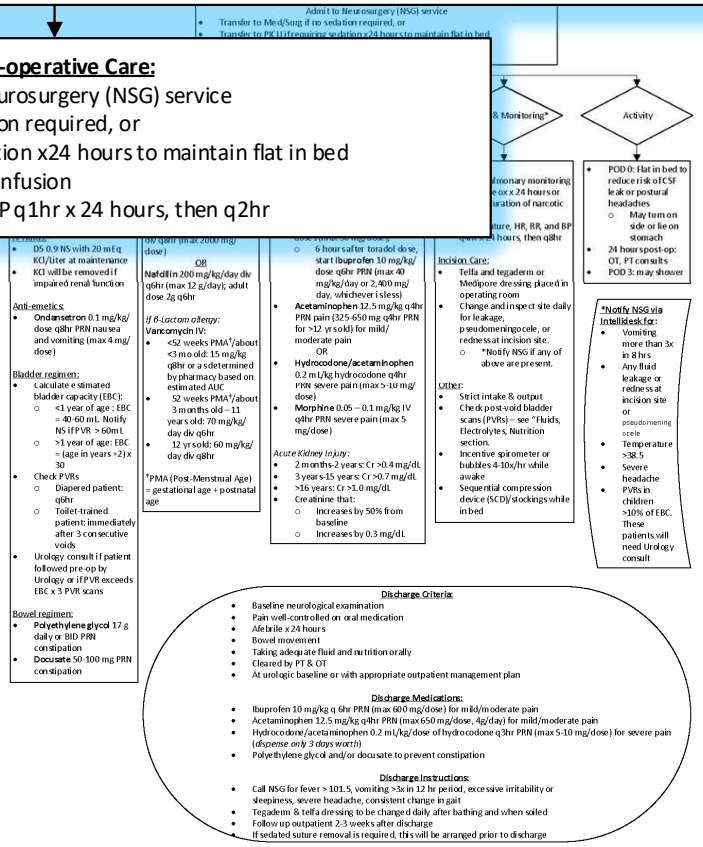
Inclusion Criteria: post-operative care for any patient diagnosed by Neurosurgery to have tethered cord syndrome requiring surgical correction
Exclusion Criteria: none

Post-operative Care:

Admit to Neurosurgery (NSG) service

- Transfer to Med/Surg if no sedation required, or
- Transfer to PICU if requiring sedation x24 hours to maintain flat in bed
  - Care per PICU for precedex infusion
  - Temperature, HR, RR, and BP q1hr x 24 hours, then q2hr



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Fluids, Electrolytes, Nutrition

Antibiotics

Pain Control

Nursing & Monitoring*

Activity

Standardized care for these patients includes five different categories.

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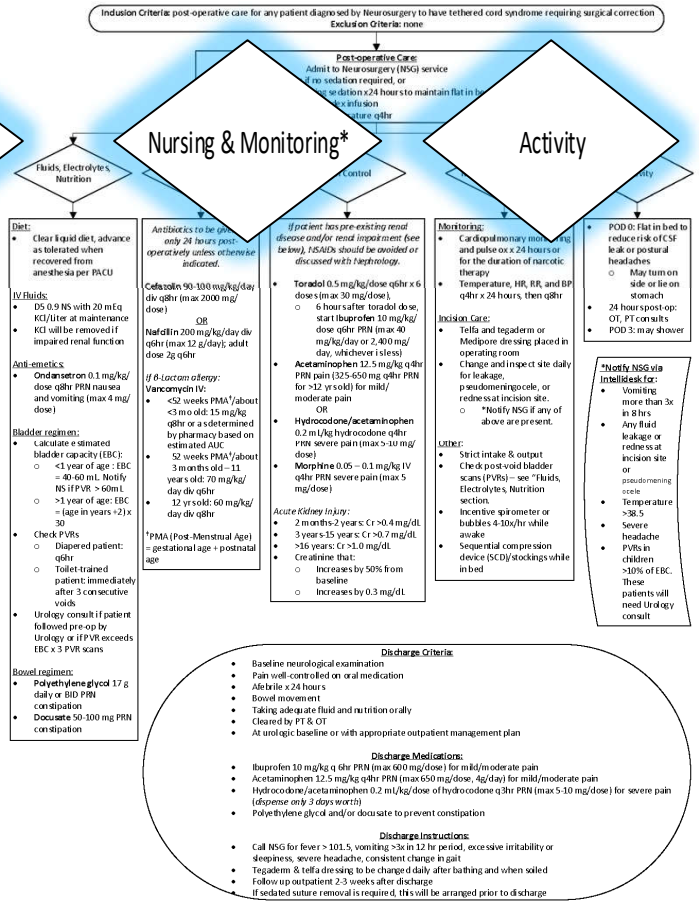

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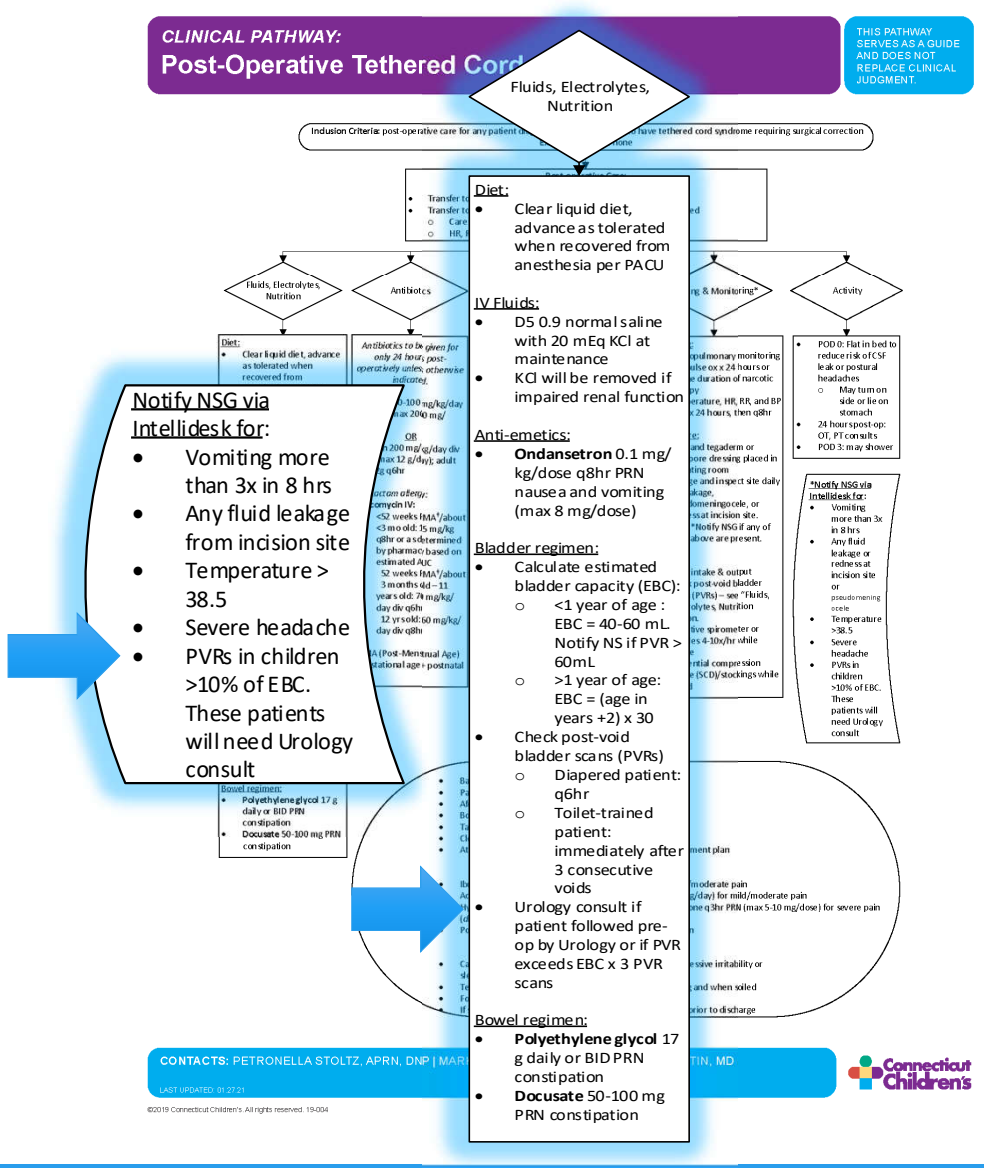
Children will come out of the OR with a foley catheter in place. Once the foley catheter is removed, post void residuals (PVR) need to be checked and documented in the medical record.

- Patients with PVR greater than 10% of their estimated bladder capacity will need a urology consult
- Urology is also consulted for patients with preexisting bladder dysfunction

Other things to note related to Fluids, Nutrition, and Electrolytes:

- Bowel regimen is initiated immediately post op
- There is no need for lab work in stable post operative patients

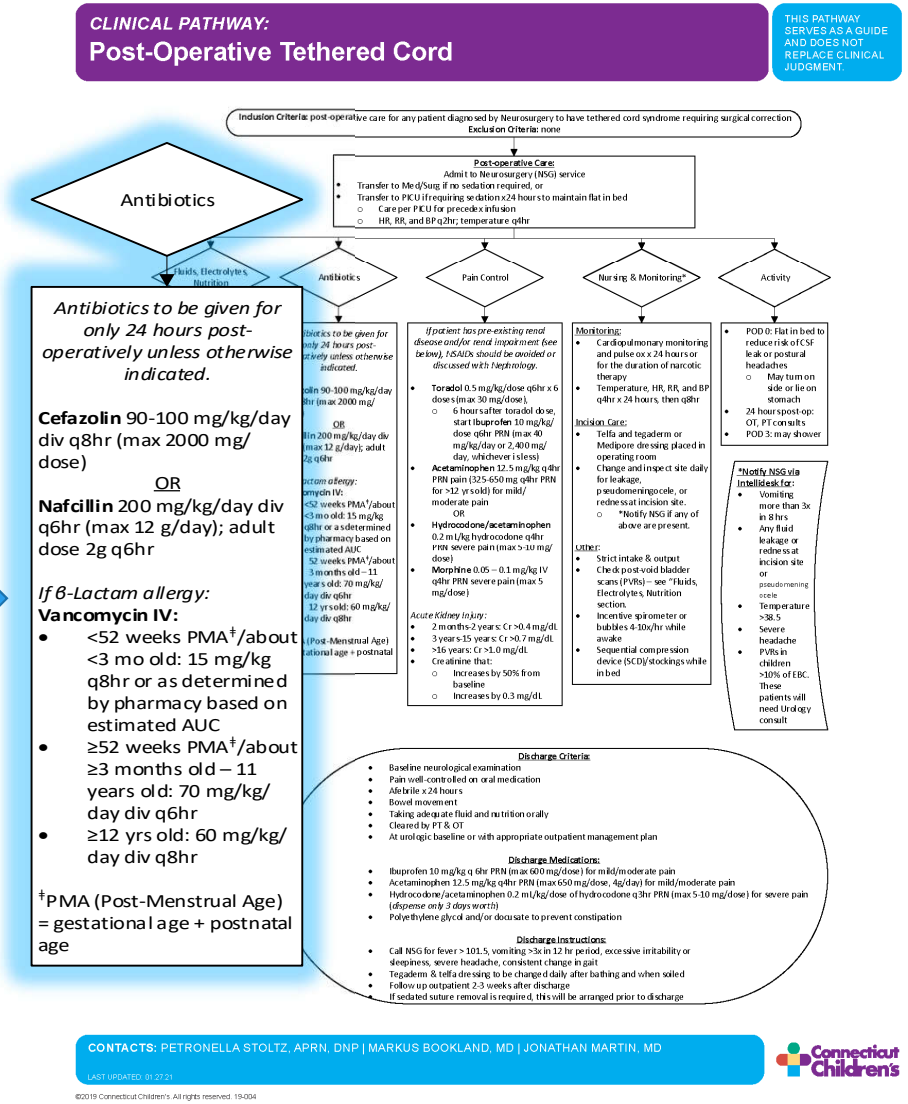


All children will receive antibiotics for the first 24 hours post procedure.

- There is no indication for routine administration of antibiotics beyond 24 hours.

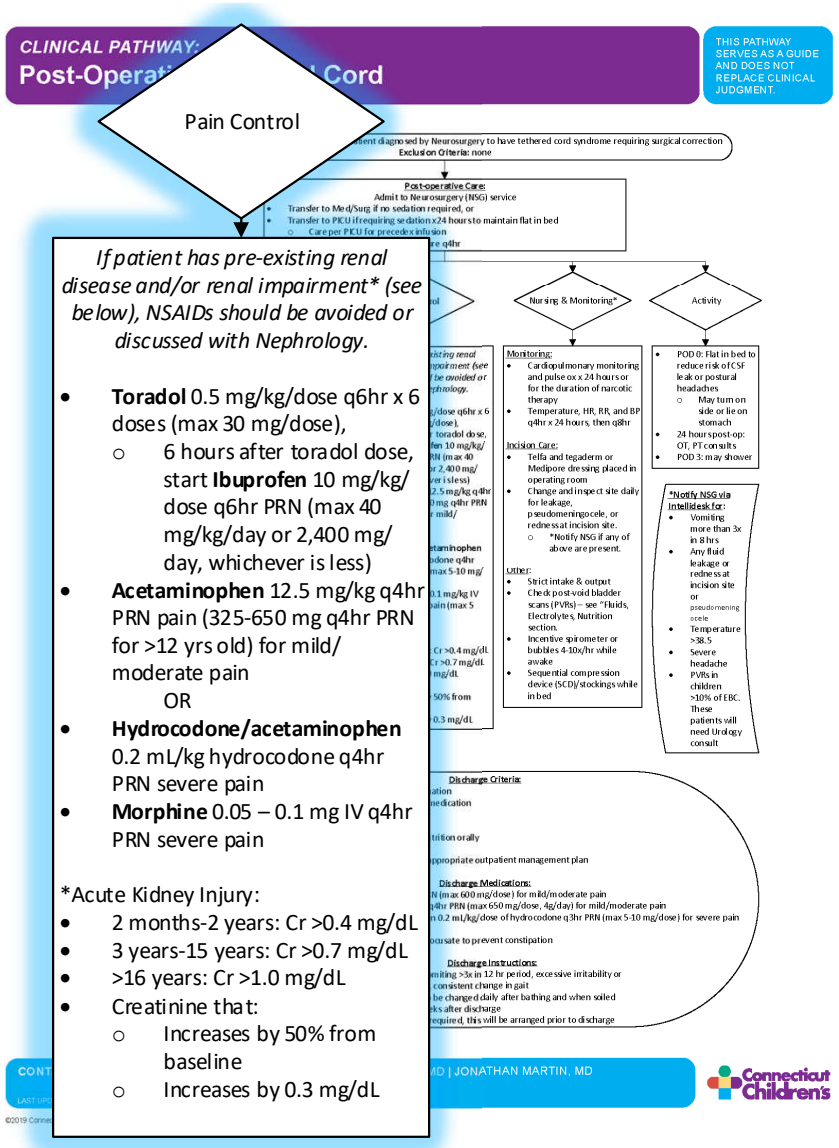
The pharmacy's vancomycin protocol was updated in Feb 2021.

- All patients who have vancomycin IV ordered will be followed by the clinical pharmacist to help determine appropriate dosing parameters.
- Providers will order initial doses per pathway/order set and provide indication within the order.
- IV vancomycin dosing and recommended labs will be managed by pharmacy in conjunction with primary teams.



NSAIDs, such as Toradol are an important part of post operative pain management.

- Children with known renal impairment should only get NSAIDs after discussion with Nephrology



If patient has pre-existing renal disease and/or renal impairment (see below), NSAIDs should be avoided or discussed with Nephrology.*

- **Toradol** 0.5 mg/kg/dose q6hr x 6 doses (max 30 mg/dose),
  - 6 hours after toradol dose, start **Ibuprofen** 10 mg/kg/dose q6hr PRN (max 40 mg/kg/day or 2,400 mg/day, whichever is less)
- **Acetaminophen** 12.5 mg/kg q4hr PRN pain (325-650 mg q4hr PRN for >12 yrs old) for mild/moderate pain

  OR
- **Hydrocodone/acetaminophen** 0.2 mL/kg hydrocodone q4hr PRN severe pain
- **Morphine** 0.05 – 0.1 mg IV q4hr PRN severe pain

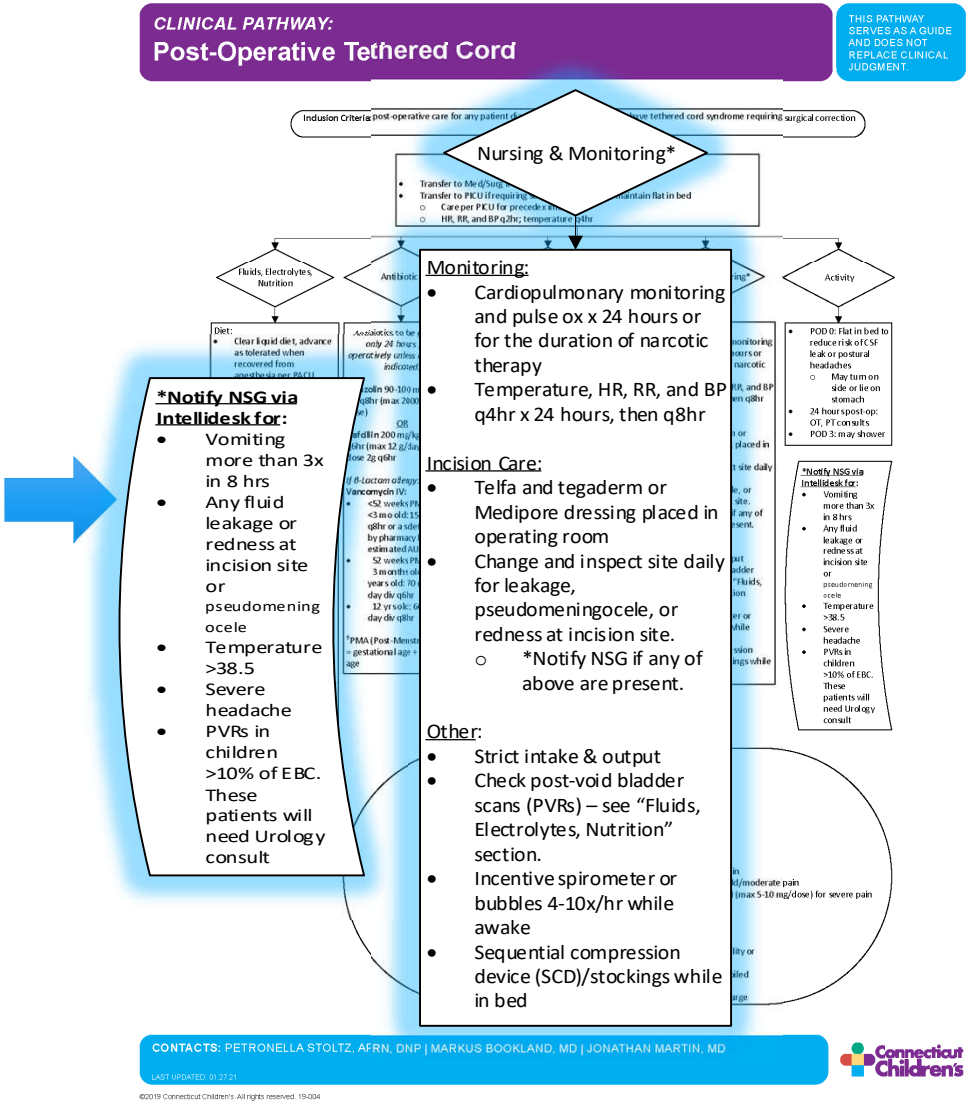
*Acute Kidney Injury:

- 2 months-2 years: Cr >0.4 mg/dL
- 3 years-15 years: Cr >0.7 mg/dL
- >16 years: Cr >1.0 mg/dL
- Creatinine that:
  - Increases by 50% from baseline
  - Increases by 0.3 mg/dL

Nursing care includes both routine vital sign monitoring, incentive spirometry, and venous throbmo-embolism (VTE) prevention.

The surgical incision should be closely monitored.

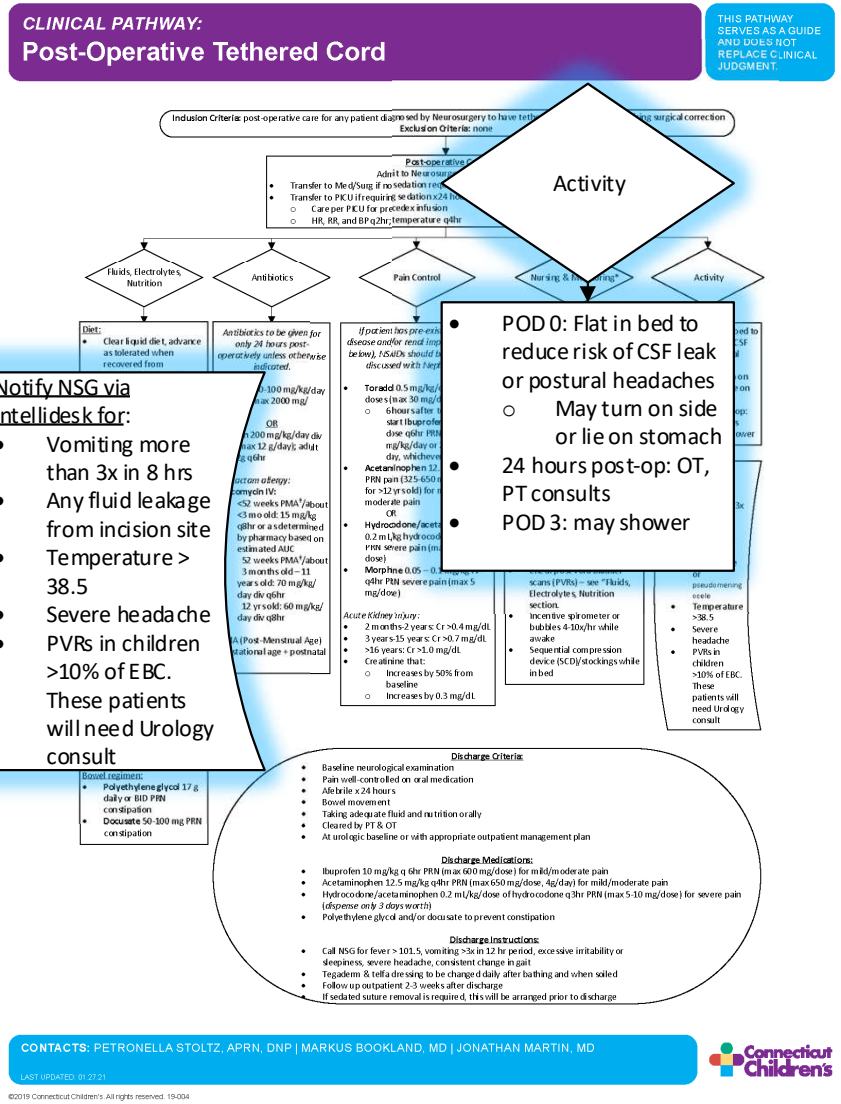
Neurosurgery should be notified of any fluid leakage from the incision



As discussed, children will be on bedrest with the bed flat for the first 24 hours after surgery.

- Once patient is allowed to sit up, RN should evaluate for headaches. If a patient experiences a severe headache, they should return to having the head of bed (HOB) flat then gradually increase the HOB over several hours.

Early PT and OT consults are important to help reduce the risk of complications that may result from immobility.



Children will meet discharge criteria once they are:

- Afebrile for greater than 24 hours
- At their neurologic baseline
- Have good pain management on oral medications
- Tolerating their home diet

And

- Have had a bowel movement

CLINICAL PATHWAY:

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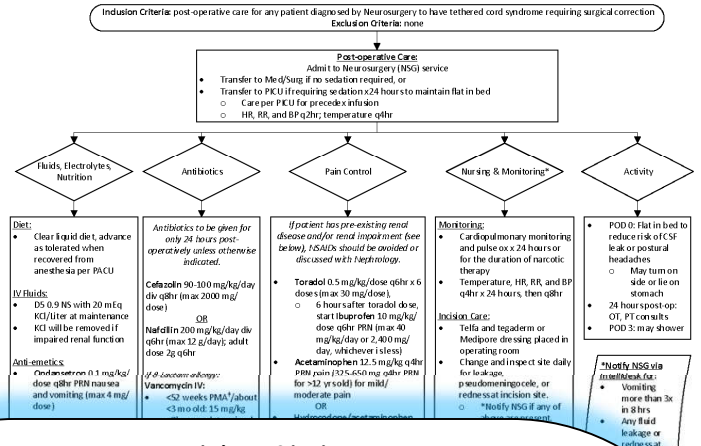

Discharge Criteria:

- Baseline neurological examination
- Pain well-controlled on oral medication
- Afebrile x 24 hours
- Bowel movement
- Taking adequate fluid and nutrition orally
- Cleared by PT & OT
- At urologic baseline or with appropriate outpatient management plan

Discharge Medications:

- Ibuprofen 10 mg/kg q 6hr PRN (max 600 mg/dose) for mild/moderate pain
- Acetaminophen 12.5 mg/kg q4hr PRN (max 650 mg/dose, 4g/day) for mild/moderate pain
- Hydrocodone/acetaminophen 0.2 mL/kg/dose of hydrocodone q3hr PRN (max 5-10 mg/dose) for severe pain
- Polyethylene glycol and/or docusate to prevent constipation

Discharge Instructions:

- Call NS for fever > 101.5, vomiting >3x in 12 hr period, excessive irritability or sleepiness, severe headache, consistent change in gait
- Tegaderm & telfa dressing to be changed daily after bathing and when soiled
- Follow up outpatient 2-3 weeks after discharge
- If sedated suture removal is required, this will be arranged prior to discharge

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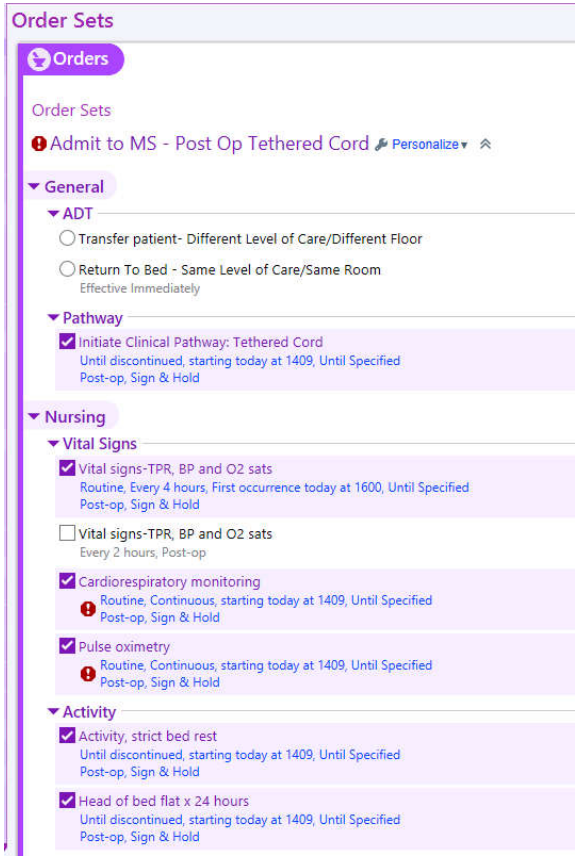
Review of Key Points

- Vital signs and Neuro checks for floor patients 4 hours for first 24 hours then every 8 hours if patient stable or not receiving regular narcotics
- Vital signs and Neuro checks for PICU patients 1 hours for first 24 hours then every 2 hours if patient stable or not receiving regular narcotics
- If patient requires Precedex then patient requires admission to PICU
- No BLOOD WORK required for patient post operatively unless unstable
- Pain Control
- Antibiotics x 24 hours
- Notify NS attending for any bleeding, instability or wound drainage immediately
- PVR are essential once foley is out
- If PVR are significant (see algorithm in pathway) urology consult is indicated

Use of Order Set



The Post-Op Tethered Cord Order set should be used for all patients who are post procedure. It will help ensure that all pathway elements are ordered correctly.

Order sets also help track pathway usage and pathway metrics.

*NOTE: This order set is not to be used for PICU patients. Patients going to the PICU post operatively should use the PICU – Neurosurgery Order Set instead

Quality Metrics

- Percentage of patients with pathway order set usage
- Percentage of patients with deep wound infections
- Percentage of patients with superficial skin infections (SSI)
- Number of patients with organ space infection within 30 days of principal operative procedure
- Readmission within 30 days
- Return to the OR within 30 days

Pathway Contacts

- Petronella Stotlz, APRN, DNP
  - Department of Pediatric Neurosurgery
- Marcus Bookland, MD
  - Department of Pediatric Neurosurgery
- Jonathan Martin, MD
  - Department of Pediatric Neurosurgery

References

- Bowman RM, Mohan A, Ito J, Seibly JM, McLone DG. Tethered cord release: a long-term study in 114 patients. *J Neurosurg Pediatr*. 2009 Mar;3(3):181-187.
- Yamada S, Won DJ, Pezeshkpour G, et al. Pathophysiology of tethered cord syndrome and similar complex disorders. *Neurosurg Focus*. 2007;23(2):E6.
- Bratzler DW, Dellinger EP, Olsen KM, et al. Clinical practice guideline for antimicrobial prophylaxis in surgery. *Sur Infect (Larchmt).* 2013 Feb;14(1):73-156.

Thank You!

About Connecticut Children's Clinical Pathways Program

The Clinical Pathways Program at Connecticut Children's aims to improve the quality of care our patients receive, across both ambulatory and acute care settings. We have implemented a standardized process for clinical pathway development and maintenance to ensure meaningful improvements to patient care as well as systematic continual improvement. Development of a clinical pathway includes a multidisciplinary team, which may include doctors, advanced practitioners, nurses, pharmacists, other specialists, and even patients/families. Each clinical pathway has a flow algorithm, an educational module for end-user education, associated order set(s) in the electronic medical record, and quality metrics that are evaluated regularly to measure the pathway's effectiveness. Additionally, clinical pathways are reviewed annually and updated to ensure alignment with the most up to date evidence. These pathways serve as a guide for providers and do not replace clinical judgment.