Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis

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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

- Standardize the care of patients undergoing posterior spinal fusion (PSF) pre-op, intra-op, post-op, and at discharge home
- Promote early mobilization
- Decrease length of stay
- Minimize opioid exposure and related side effects
- Provide access to Narcan and education of opioid overdose treatment
- Educate of safe use/storage and disposal of medications including opioids

Why is Pathway Necessary?

- Posterior spinal fusion for adolescent idiopathic scoliosis is associated with significant pain and prolonged hospitalization[1].
  - Standardizing care for posterior spinal fusion patients utilizing a multimodal approach can allow for early mobilization, decreased LOS and potentially minimize opioid exposure related side effects[2-12]
- Medication safety:
  - Provide access to Narcan and education of opioid overdose treatment[13-20]
  - Educate of safe use/storage and disposal of medications including opioids

Background

- Scoliosis: a curvature of the spine in the coronal plane
  - Adolescent idiopathic scoliosis is the most common pediatric spinal disorder in North America[1]
- Spinal fusion correction surgery has many challenges, including inadequate pain control, prolonged hospitalization, difficulties with management of opioid related side effects, and a delay in mobilization[1]

Background

- Pain control can be a challenge post-operatively[1]
- Although opioids can be beneficial in controlling severe pain, rates of poisoning and overdose have increased in the pediatric population[13-20]
- Balancing how to safely prescribe opioids and rescue medications (i.e., Narcan) is important to ensure pain is adequately treated while keeping the patient safe[13-20]

This is the Posterior Spinal Fusion Clinical Pathway.

The pathway is divided into pre-op, peri-op, intra-op and post-op care.

We will be reviewing each component in the following slides.

CLINICAL PATHWAY:

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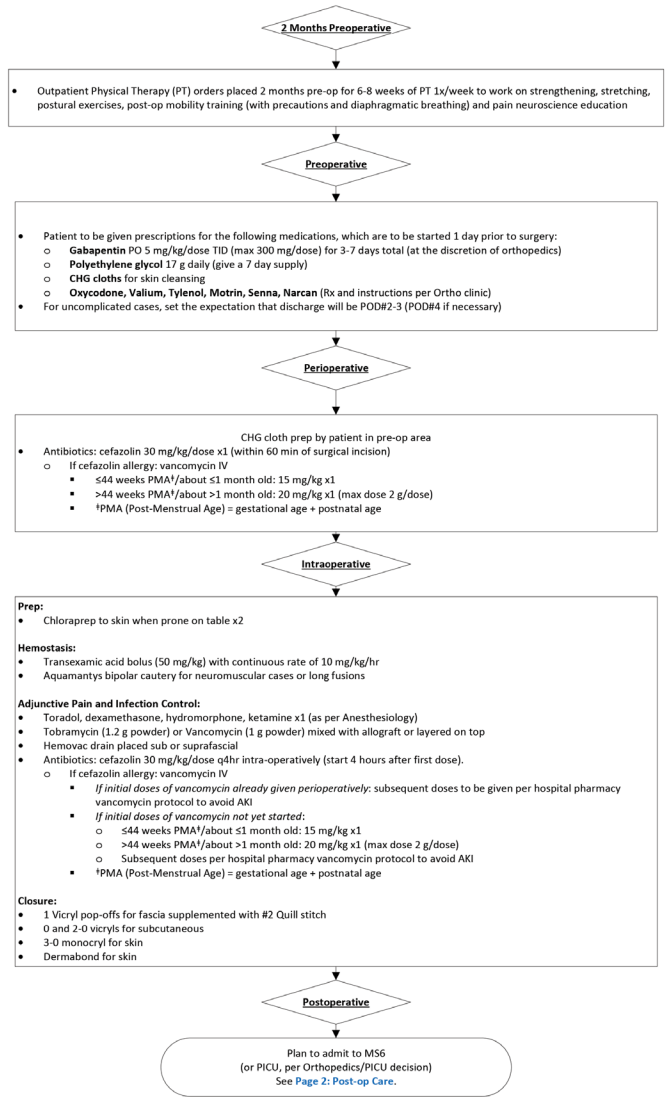

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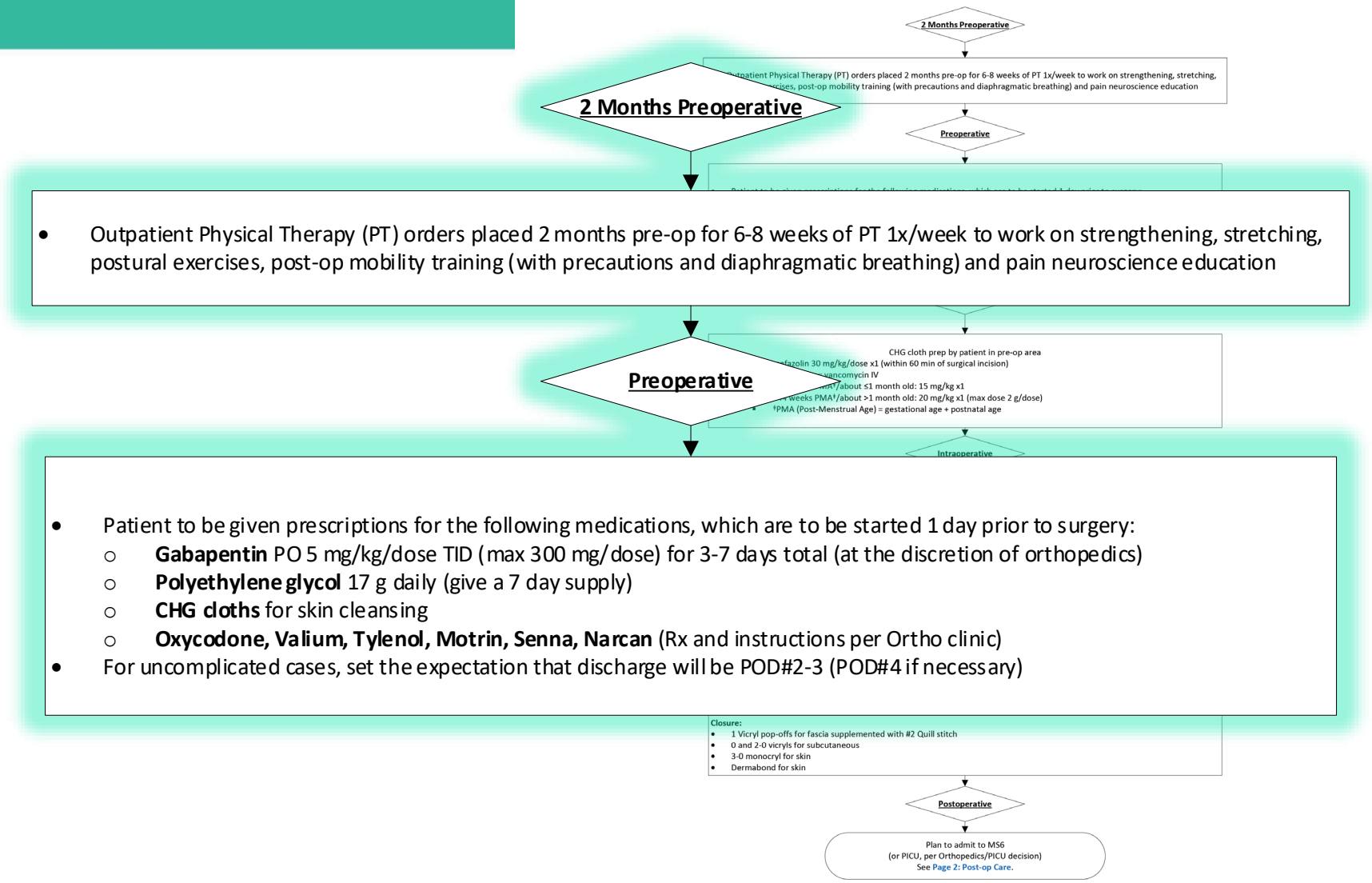
Pre-op patients will be seen in the Ortho Clinic.

Patients will have a PT order placed and be given instructions, an informational packet, and Rx to utilize after they are discharged home post-surgery.

In addition, patients/families will be provided education on Narcan/Opioid overdose and medication safety/storage/disposal.



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Perioperatively, a chlorhexidine gluconate (CHG) cloth will be used to cleanse the back in the pre-op area.

The first dose of antibiotic will be given within 60 minutes of incision.

2 Months Preoperative

- Outpatient Physical Therapy (PT) orders placed 2 months pre-op for 6-8 weeks of PT 1x/week to work on strengthening, stretching, postural exercises, post-op mobility training (with precautions and diaphragmatic breathing) and pain neuroscience education

Preoperative

Perioperative

- Patient to be given prescriptions for the following medications, which are to be started 1 day prior to surgery:
  - **Gabapentin** PO 5 mg/kg/dose TID (max 300 mg/dose) for 3-7 days total (at the discretion of orthopedics)
  - **Polyethylene glycol** 17 g daily (give a 7 day supply)
  - **CHG cloths** for skin cleansing
  - **Oxycodone, Valium, Tylenol, Motrin, Senna, Narcan** (Rx and instructions per Ortho clinic)

CHG cloth prep by patient in pre-op area

- Antibiotics: cefazolin 30 mg/kg/dose x1 (within 60 min of surgical incision)
  - If cefazolin allergy: vancomycin IV
    - ≤44 weeks PMA‡/about ≤1 month old: 15 mg/kg x1
    - >44 weeks PMA‡/about >1 month old: 20 mg/kg x1 (max dose 2 g/dose)
    - ‡PMA (Post-Menstrual Age) = gestational age + postnatal age

Prep:
- Chloraprep to skin when prone on table x2

Hemostasis:
- Transexamic acid bolus (50 mg/kg) with continuous rate of 10 mg/kg/hr
- Aquamantys bipolar cautery for neuromuscular cases or long fusions

Adjunctive Pain and Infection Control:
- Toradol, dexamethasone, hydromorphone, ketamine x1 (as per Anesthesiology)
- Tobramycin (1.2 g powder) or Vancomycin (1 g powder) mixed with allograft or layered on top
- Hemovac drain placed sub or suprafascial
- Antibiotics: cefazolin 30 mg/kg/dose q4hr intra-operatively (start 4 hours after first dose).
  - If cefazolin allergy: vancomycin IV
    - *If initial doses of vancomycin already given perioperatively*: subsequent doses to be given per hospital pharmacy vancomycin protocol to avoid AKI
    - *If initial doses of vancomycin not yet started*:
      - ≤44 weeks PMA‡/about ≤1 month old: 15 mg/kg x1
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Closure:
- 1 Vicryl pop-offs for fascia supplemented with #2 Quill stitch
- 0 and 2-0 vicryls for subcutaneous
- 3-0 monocryl for skin
- Dermabond for skin

Postoperative

Plan to admit to MS6
(or PICU, per Orthopedics/PICU decision)
See Page 2: Post-op Care.

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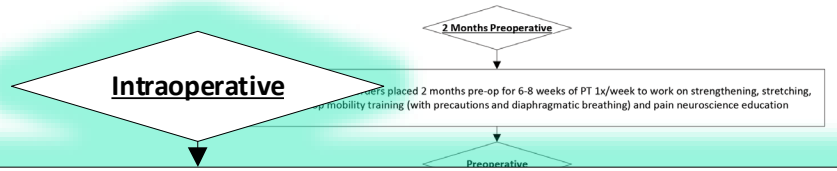

Intraoperative care has been outlined here.

Notable updates in 2026 include the removal of morphine and an updated antibiotic plan.

Prep:

- Chloraprep to skin when prone on table x2

Hemostasis:

- Transexamic acid bolus (50 mg/kg) with continuous rate of 10 mg/kg/hr
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Post-operative care is outlined by topic and post-op day.

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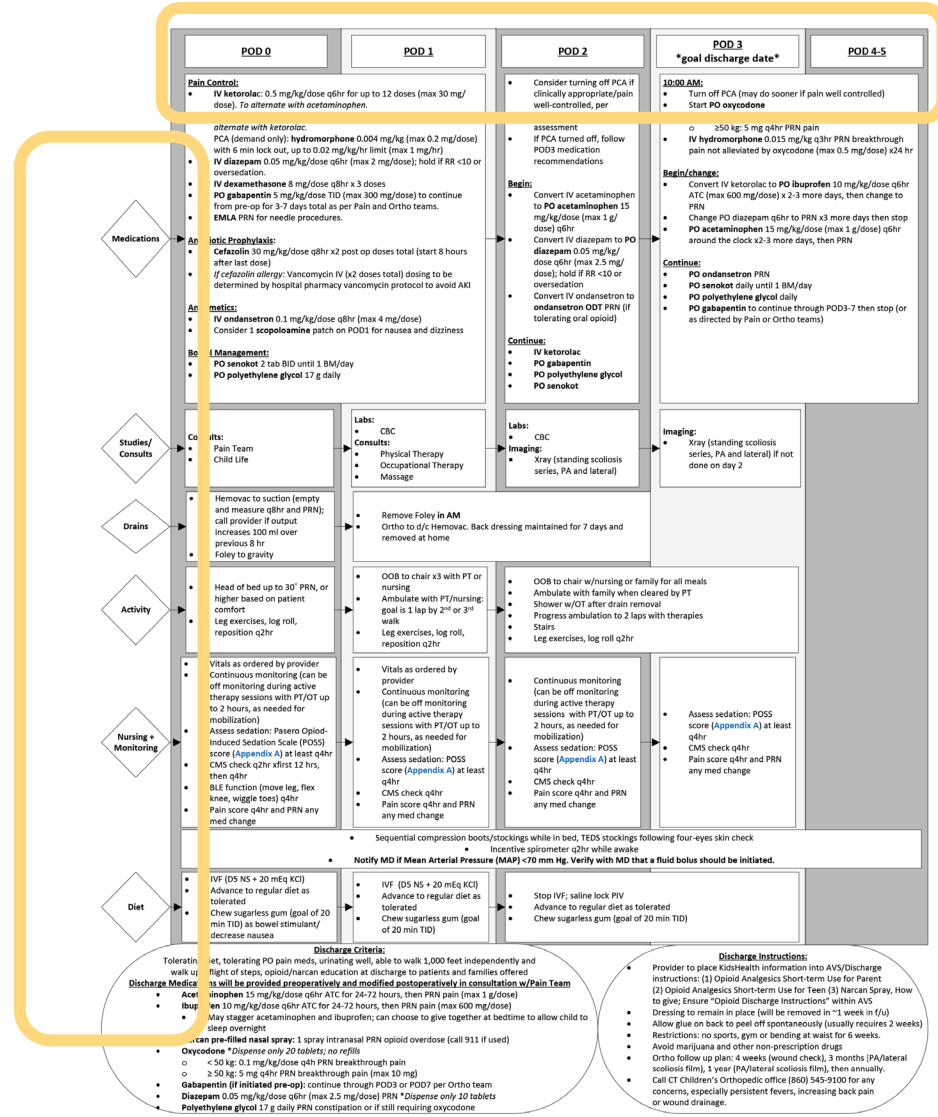

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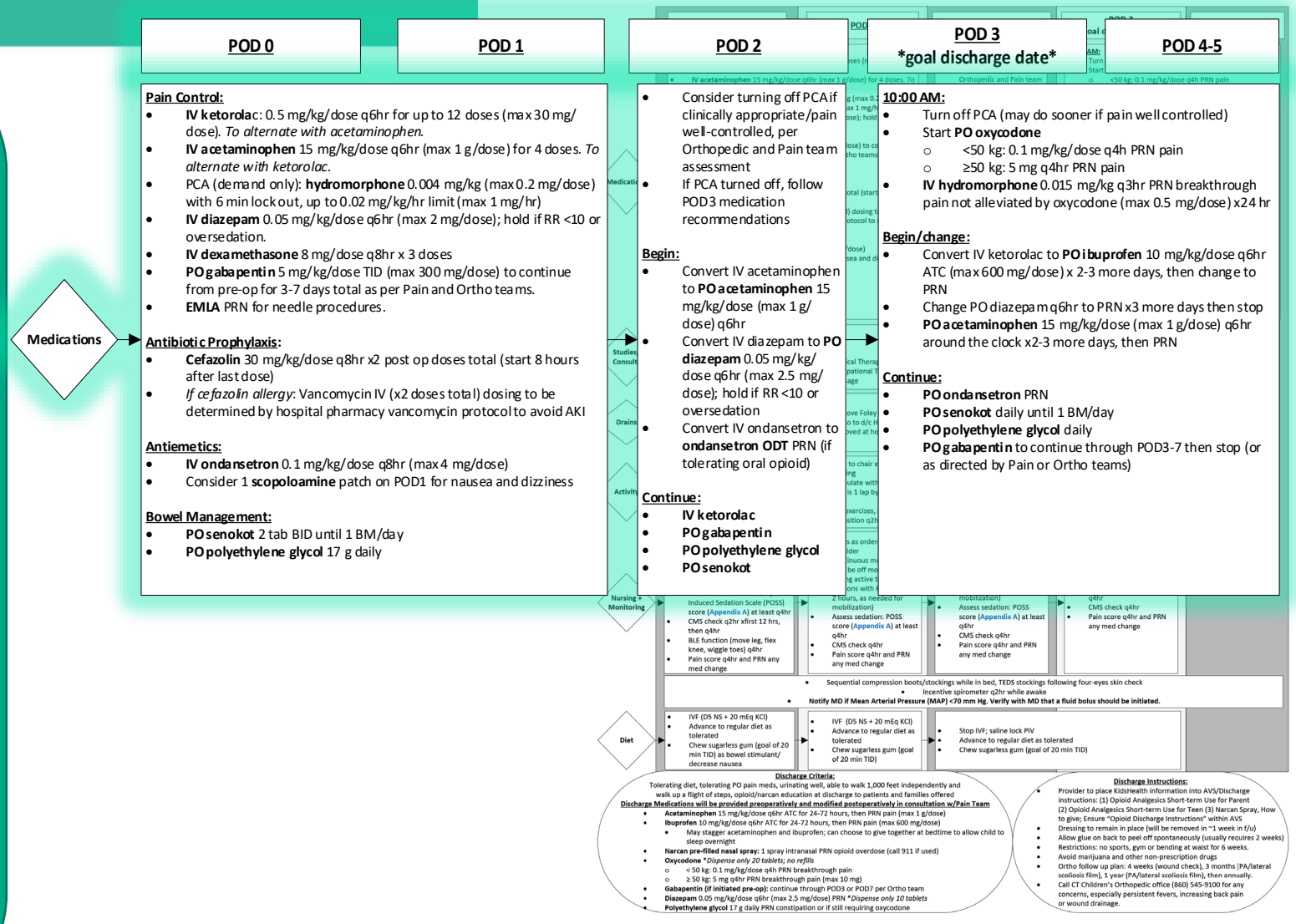
Medications

We utilize a multimodal approach to manage pain and limit side effects of opioids.

Note the following:

- Gabapentin: if it is initiated pre-op, will continue through POD3 or POD7 per Ortho team
- The PCA should be turned off at POD2 or POD3 (or sooner), and PO oxycodone started
- Acetaminophen and ketorolac/ibuprofen should be continued ATC.



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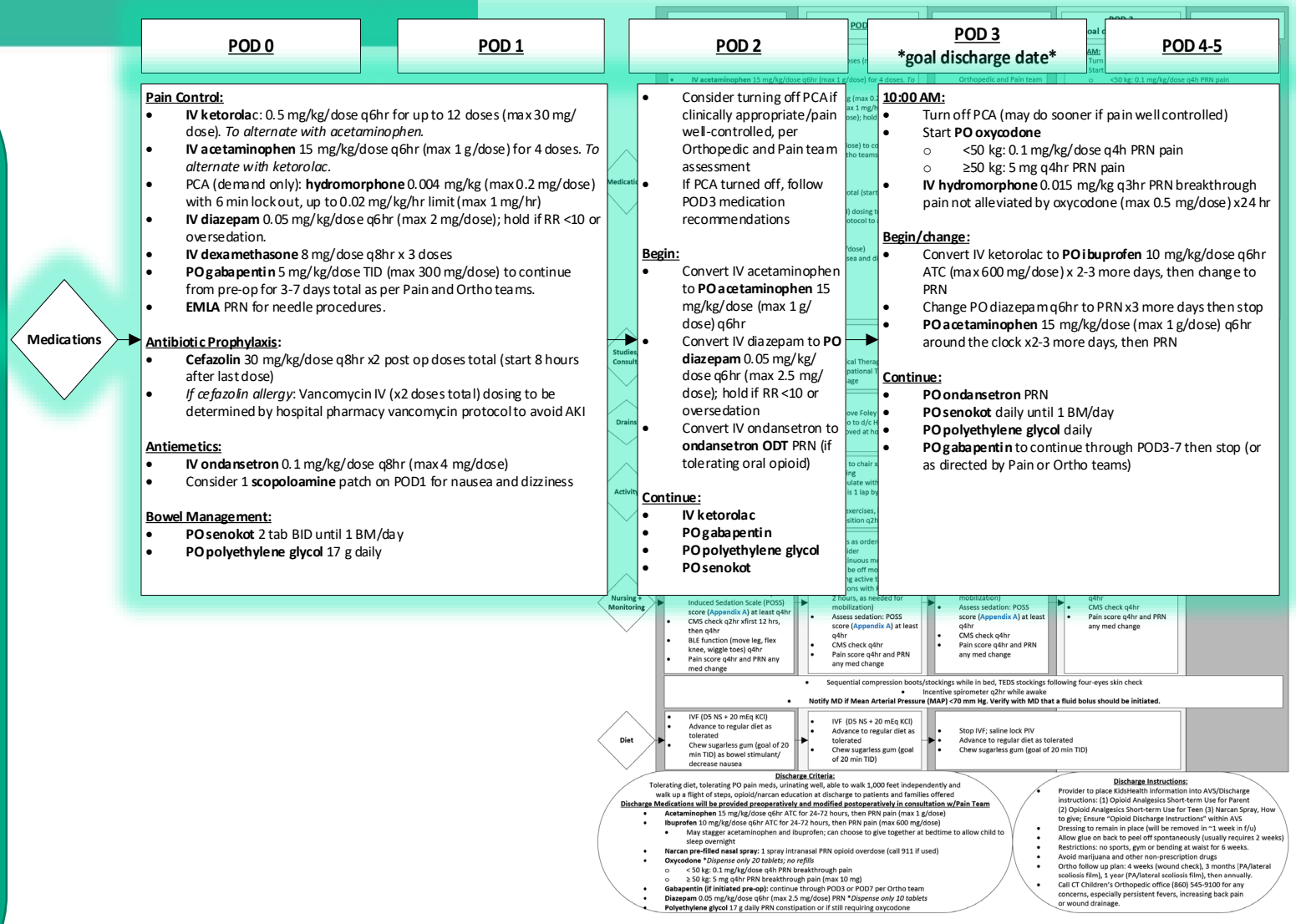
Medications

Antibiotic prophylaxis should only continue for 2 doses post-operatively.

Vancomycin dosing (if utilized) will be determined by the hospital pharmacy protocol to avoid AKI.



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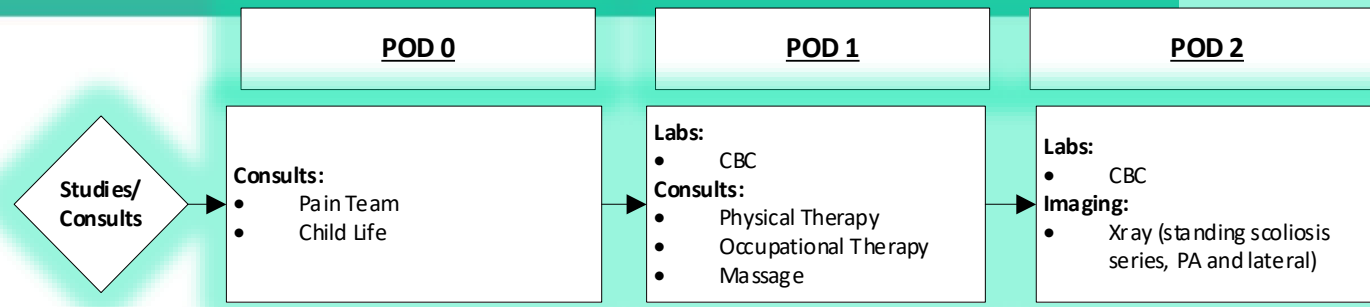
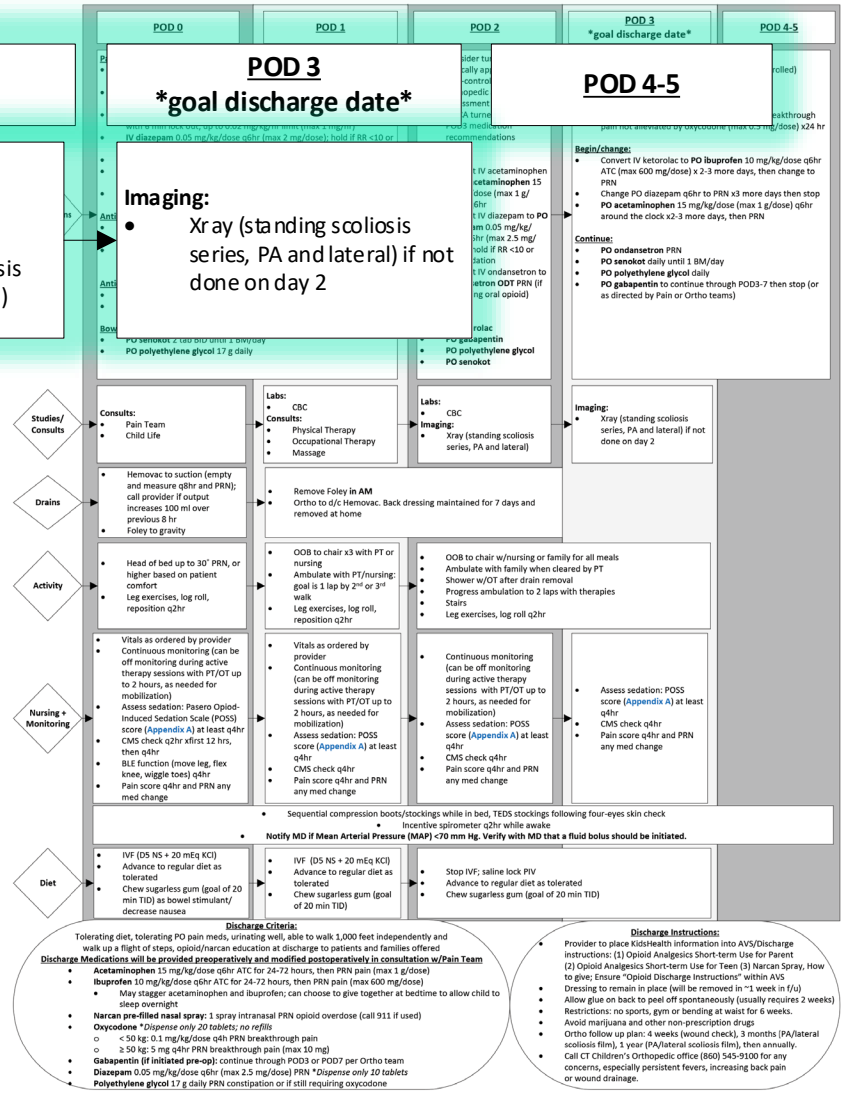


Studies

- Post-op studies include CBC on POD1 and POD2, as well as an Xray on POD2 or POD3.

Consults

- Consulting the Pain Team and Child Life on POD0 allows for early intervention and improved outcomes.
- OT, PT and massage will be consulted on POD1 to allow for early mobilization and functioning.



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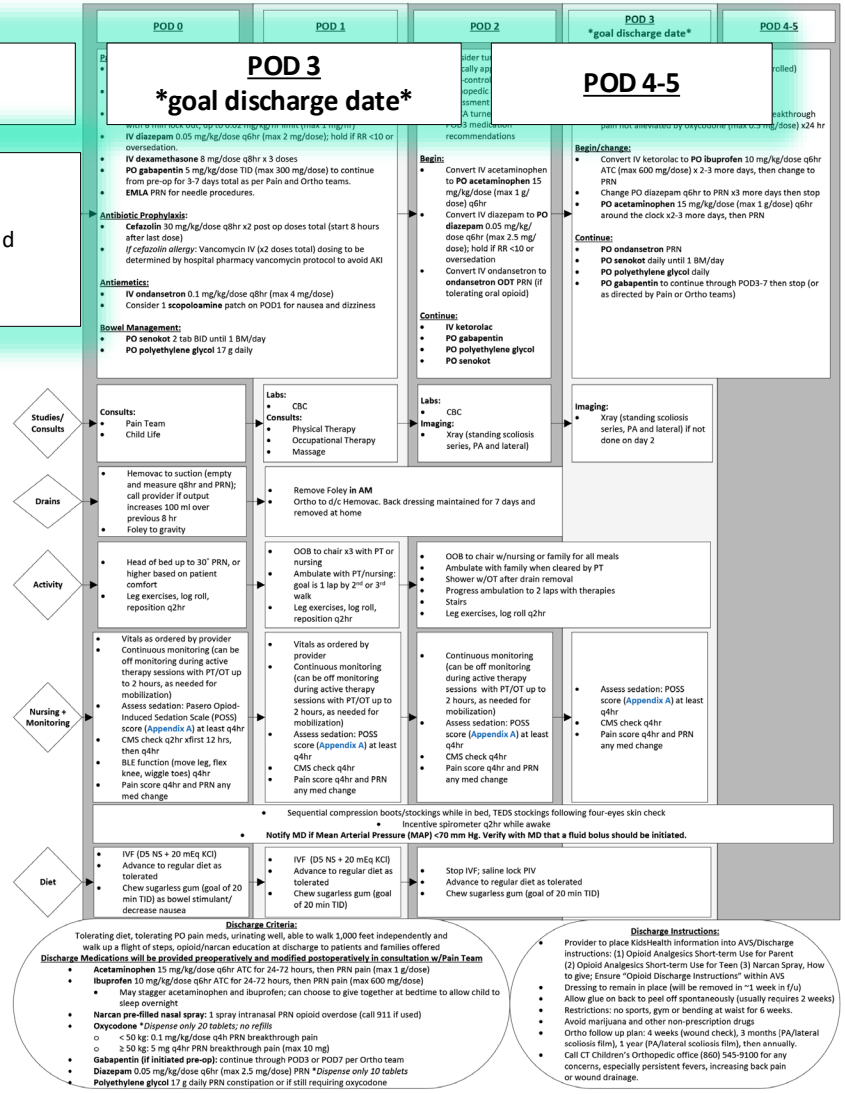
	POD 0	POD 1	POD 2	POD 3 *goal discharge date*	POD 4-5
Drains	• Hemovac to suction (empty and measure q8hr and PRN); call provider if output increases 100 ml over previous 8 hr • Foley to gravity	• Remove Foley **in AM** • Ortho to d/c Hemovac. Back dressing maintained for 7 days and removed at home			

Drains

- On POD1, the foley will be removed in the AM and Orthopedics will d/c the Hemovac.
- NOTE: The back dressing is to be maintained for 7 days and removed at home.



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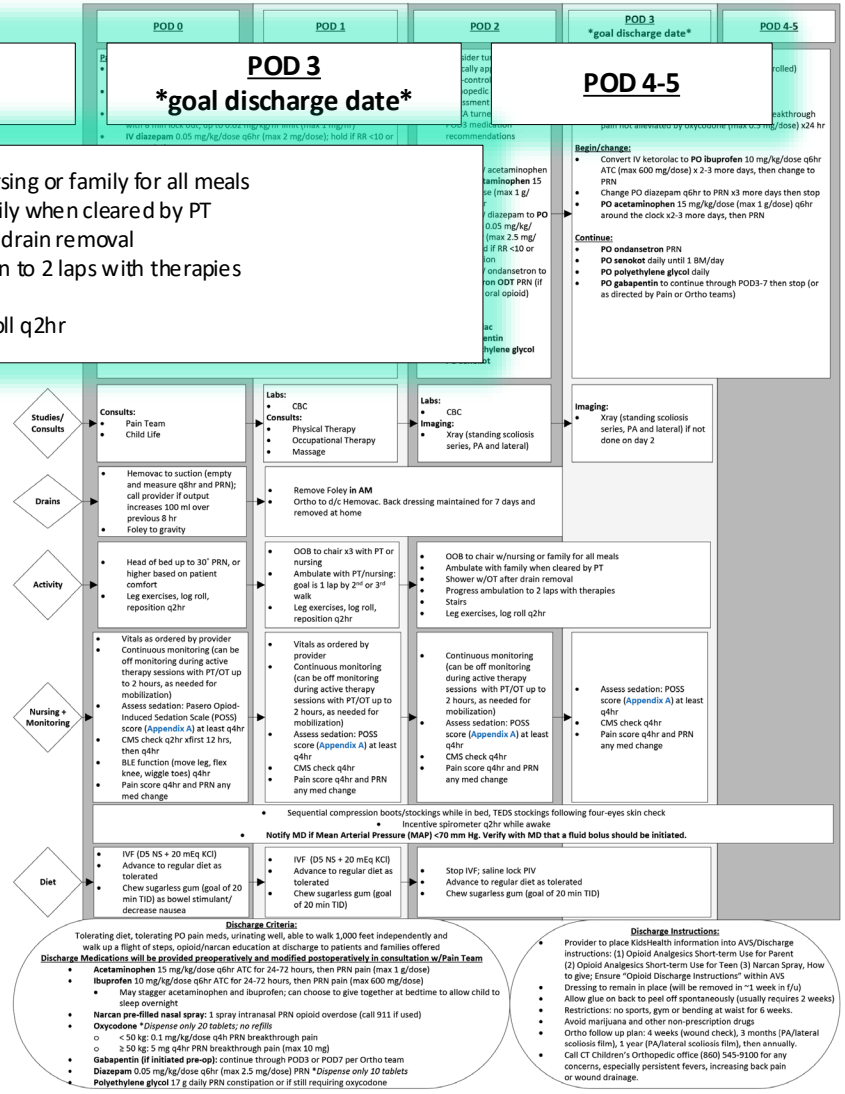
	POD 0	POD 1	POD 2	POD 3 *goal discharge date*	POD 4-5
Activity	• Head of bed up to 30˚ PRN, or higher based on patient comfort • Leg exercises, log roll, reposition q2hr	• OOB to chair x3 with PT or nursing • Ambulate with PT/nursing: goal is 1 lap by 2nd or 3rd walk • Leg exercises, log roll, reposition q2hr	• OOB to chair w/nursing or family for all meals • Ambulate with family when cleared by PT • Shower w/OT after drain removal • Progress ambulation to 2 laps with therapies • Stairs • Leg exercises, log roll q2hr		

Activity

Activity is integrated early, with guidance from PT/OT



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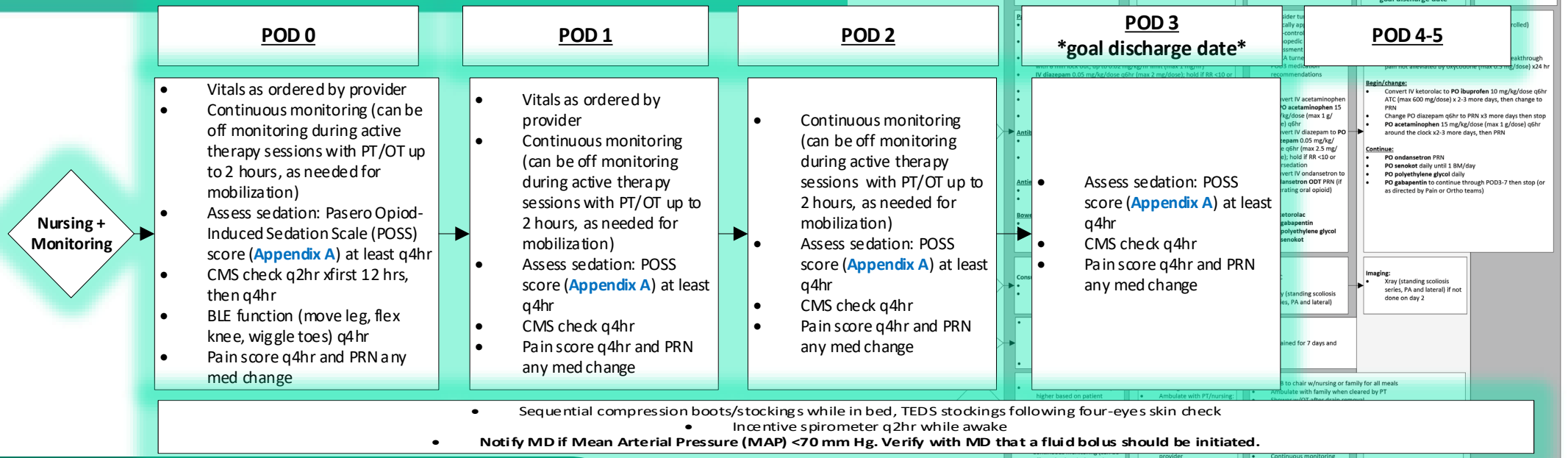

Nursing

- Nursing care will focus on monitoring for side effects from opioids, CMS checks, pain monitoring and BLE functioning
- Patients can be off of the monitor during active PT
- Sequential stockings, skin checks and incentive spirometer per standard postoperative care is recommended.
- Patient's room should be set up with a high back chair

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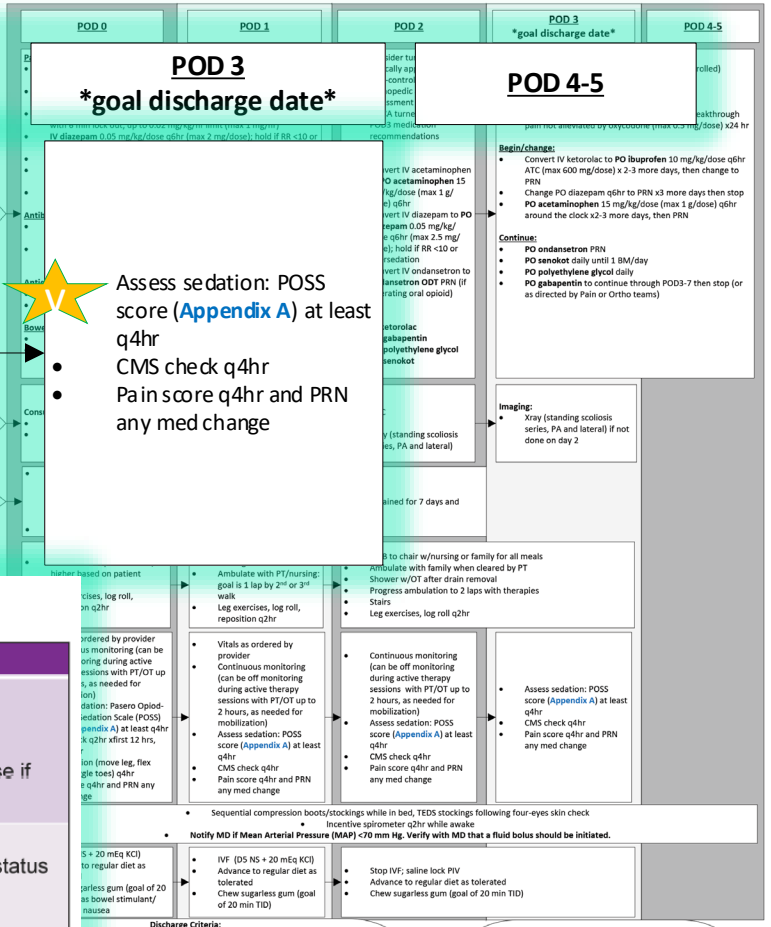
Nursing + Monitoring

POD 0	POD 1	POD 2	POD 3 *goal discharge date*	POD 4-5
• Vitals as ordered by provider • Continuous monitoring (can be off monitoring during active therapy sessions with PT/OT up to 2 hours, as needed for mobilization) • Assess sedation: Pasero Opiod-Induced Sedation Scale (POSS) score (Appendix A) at least q4hr • CMS check q2hr xfirst 12 hrs, then q4hr • BLE function (move leg, flex knee, wiggle toes) q4hr • Pain score q4hr and PRN any med change	• Vitals as ordered by provider • Continuous monitoring (can be off monitoring during active therapy sessions with PT/OT up to 2 hours, as needed for mobilization) • Assess sedation: POSS score (Appendix A) at least q4hr • CMS check q4hr • Pain score q4hr and PRN any med change	• Continuous monitoring (can be off monitoring during active therapy sessions with PT/OT up to 2 hours, as needed for mobilization) • Assess sedation: POSS score (Appendix A) at least q4hr • CMS check q4hr • Pain score q4hr and PRN any med change	• Assess sedation: POSS score (Appendix A) at least q4hr • CMS check q4hr • Pain score q4hr and PRN any med change	



Nursing

- Note that the Pasero Opioid-Induced Sedation Scale (POSS) score is done at least every 4 hours (Appendix A).
- This is important to ensure that opioid-induced side effects are avoided and kept at a minimum.

POSS Scale (Pasero Opioid-Induced Sedation Scale)

Sedation Level	Description	Nursing Intervention
S	Sleep, easy to arouse	**Acceptable** **No action necessary** • May consider increasing dose if needed
1	Awake and alert	
2	Slightly drowsy, easily aroused	
3	Frequently drowsy, arousable, drifts off to sleep during conversation	**Unacceptable** • Closely monitor respiratory status and sedation level • Notify prescriber
4	Somnolent, minimal or no response to verbal and physical stimulation	**PAUSE OPIOID INFUSION.** **Unacceptable** • Closely monitor respiratory status and sedation level • Notify prescriber • Consider Narcan

The POSS Scale is a validated tool used to assess sedation after every opioid administration (e.g., Fentanyl, Morphine, Oxycodone).

INSTRUCTIONS:

1. Complete POSS score within 1 hour of every opioid administration, including ATC and PRN dosing.
2. Complete POSS and pain re-assessment at the same time.
3. Document the level of sedation that best describes the assessment of your patient's sedation.

For patients on a PCA/NCA or continuous infusion:

1. Assess POSS sedation level/respiratory status every 1-2 hours for the first 24 hours, and with a dose change.
2. After 24 hours and stable, assess POSS every 4 hours with pain assessment and vital signs.

In the PICU, POSS is not used when the patient is intubated as long as the patient is being assessed with a validated sedation tool (e.g., SBS).

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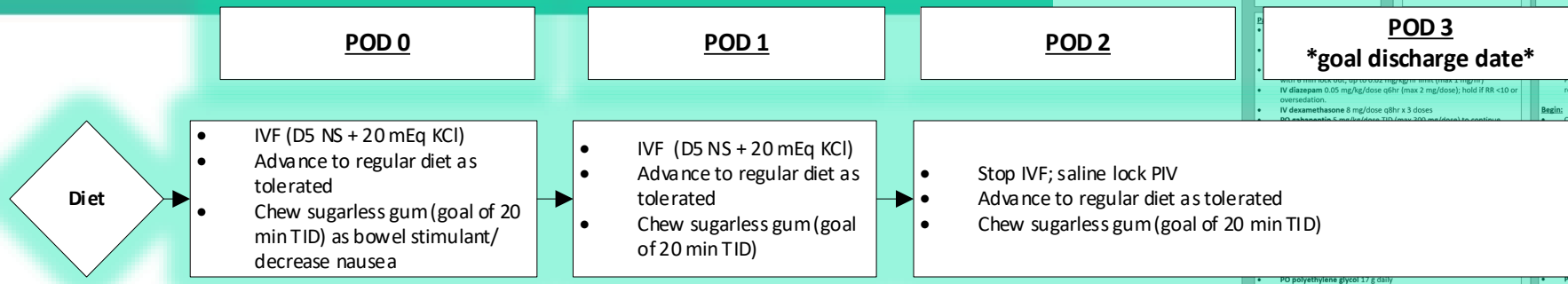
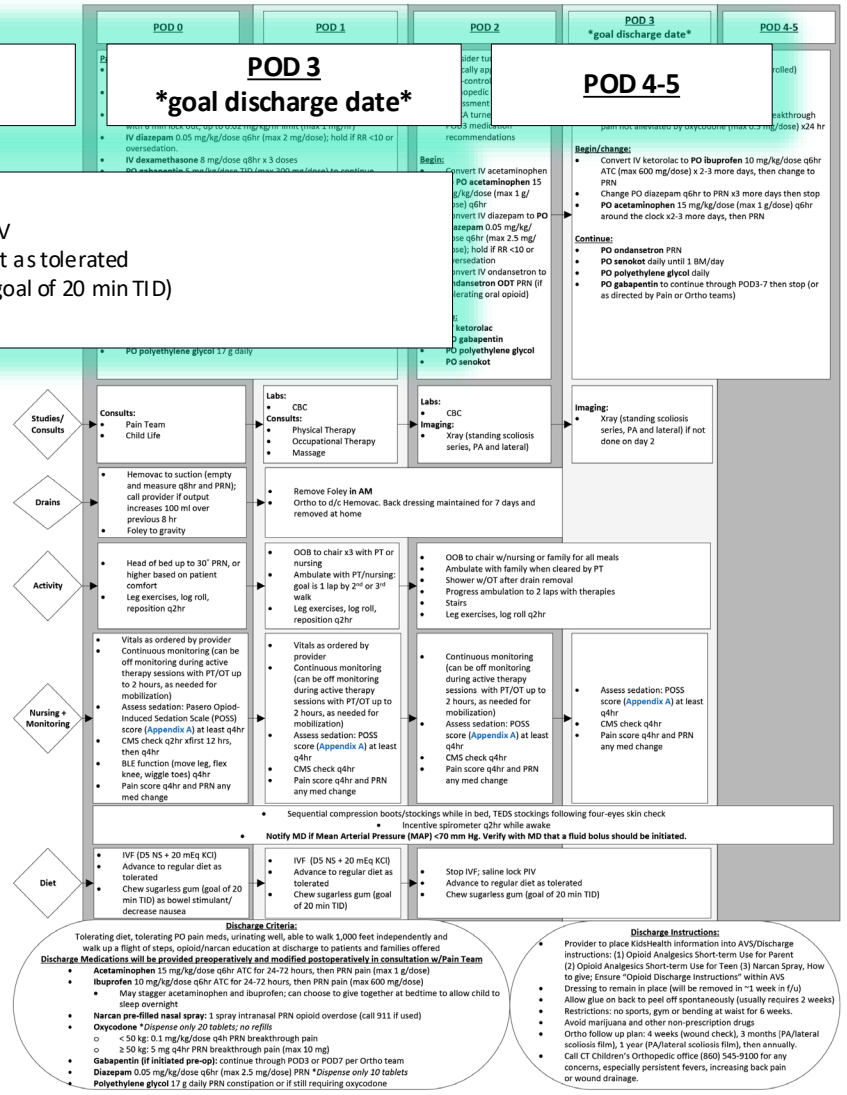


Diet

- Diet can be advanced to regular diet as soon as POD0
- Chewing sugarless gum acts as a bowel stimulant and helps decrease nausea



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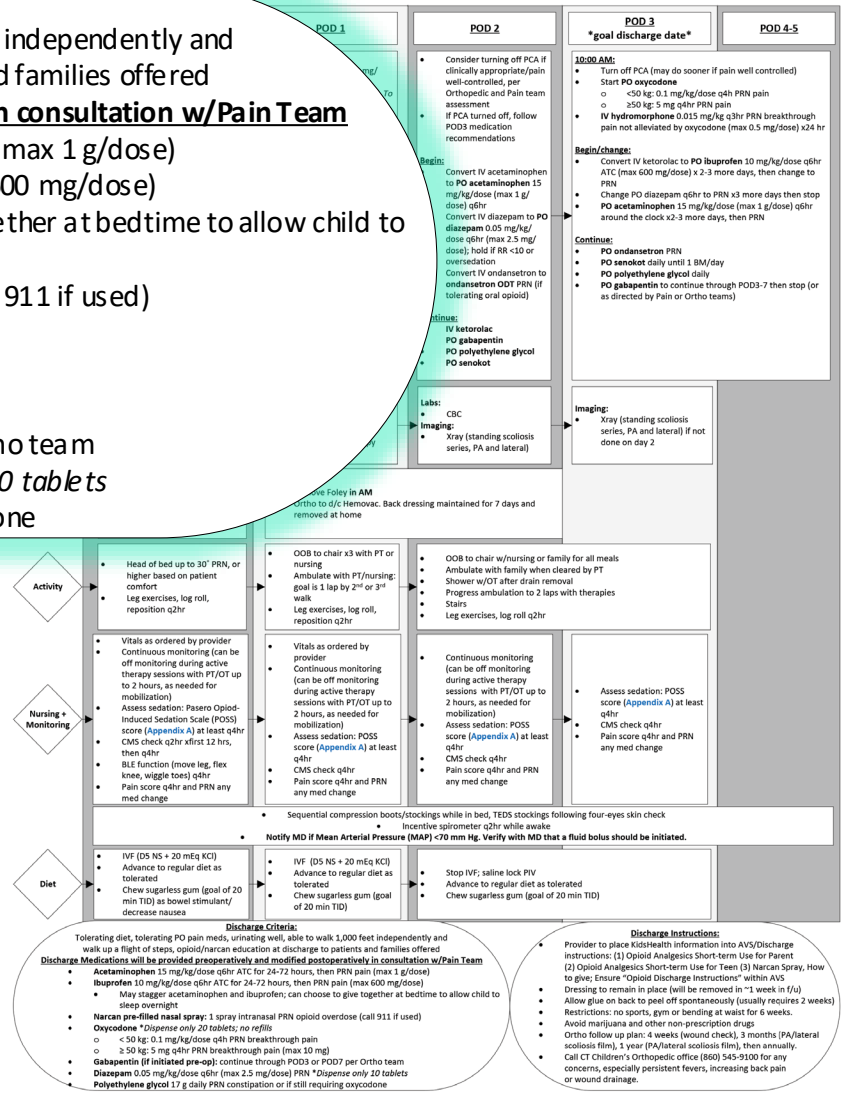
Discharge Criteria:

Tolerating diet, tolerating PO pain meds, urinating well, able to walk 1,000 feet independently and walk up a flight of steps, opioid/narcan education at discharge to patients and families offered

Discharge Medications will be provided preoperatively and modified postoperatively in consultation w/Pain Team

- **Acetaminophen** 15 mg/kg/dose q6hr ATC for 24-72 hours, then PRN pain (max 1 g/dose)
- **Ibuprofen** 10 mg/kg/dose q6hr ATC for 24-72 hours, then PRN pain (max 600 mg/dose)
  - May stagger acetaminophen and ibuprofen; can choose to give together at bedtime to allow child to sleep overnight
- **Narcan pre-filled nasal spray:** 1 spray intranasal PRN opioid overdose (call 911 if used)
- **Oxycodone** **Dispense only 20 tablets; no refills*
  - < 50 kg: 0.1 mg/kg/dose q4h PRN breakthrough pain
  - ≥ 50 kg: 5 mg q4hr PRN breakthrough pain (max 10 mg)
- **Gabapentin (if initiated pre-op):** continue through POD3 or POD7 per Ortho team
- **Diazepam** 0.05 mg/kg/dose q6hr (max 2.5 mg/dose) PRN **Dispense only 10 tablets*
- **Polyethylene glycol** 17 g daily PRN constipation or if still requiring oxycodone



Discharge Criteria

- Discharge criteria includes urination (BM is not a necessity)
- Oxycodone should only have 20 tablets given; diazepam should only have 10 tablets.
- Narcan should always be given, with education on opioid overdose treatment
- Gabapentin (if initiated pre-op) should continue POD3 or POD7 as per Ortho team.
- Education should always be given on safe usage, storage, and disposal of medications (including opioids)

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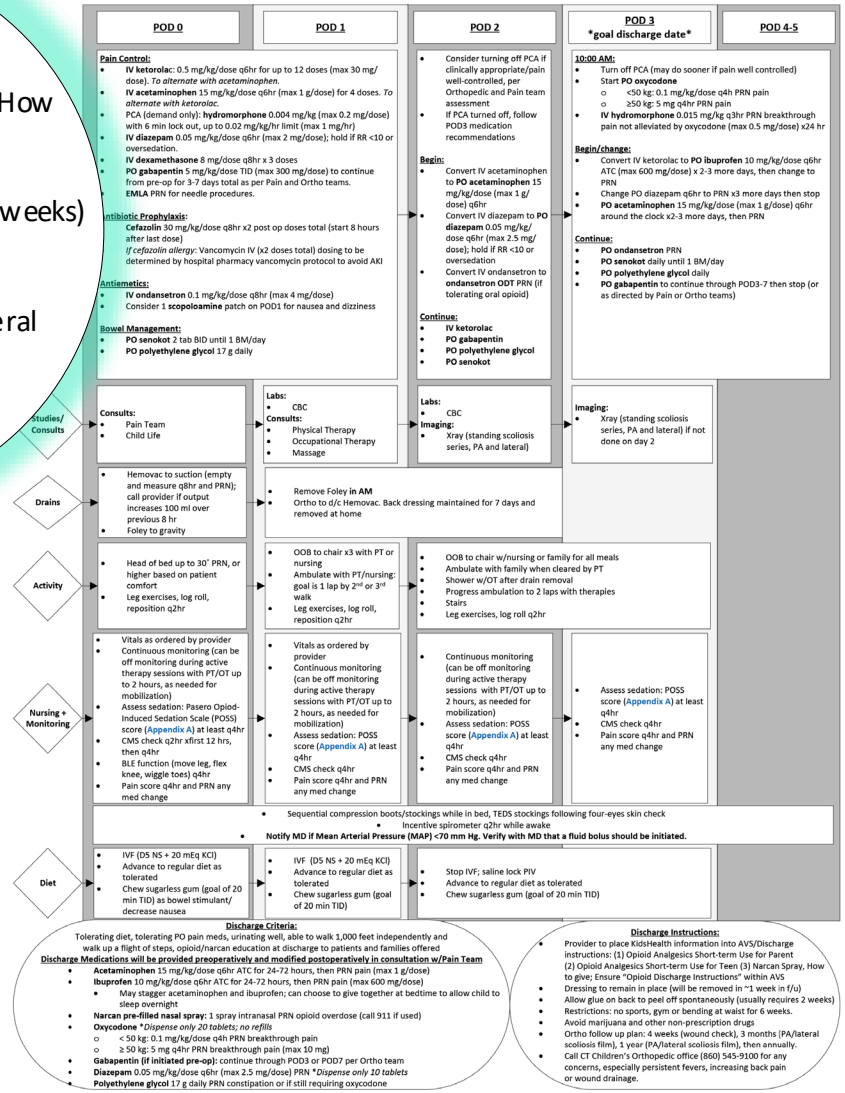
Discharge Instructions:

Provider to place KidsHealth information into AVS/Discharge instructions: (1) Opioid Analgesics Short-term Use for Parent (2) Opioid Analgesics Short-term Use for Teen (3) Narcan Spray, How to give; Ensure "Opioid Discharge Instructions" within AVS

- Dressing to remain in place (will be removed in ~1 week in f/u)
- Allow glue on back to peel off spontaneously (usually requires 2 weeks)
- Restrictions: no sports, gym or bending at waist for 6 weeks.
- Avoid marijuana and other non-prescription drugs
- Ortho follow up plan: 4 weeks (wound check), 3 months (PA/lateral scoliosis film), 1 year (PA/lateral scoliosis film), then annually.
- Call CT Children's Orthopedic office (860) 545-9100 for any concerns, especially persistent fevers, increasing back pain or wound drainage.

Discharge Instructions

- IMPORTANT: The provider should place KidsHealth information for opioid analgesics and Narcan into the AVS/discharge instructions
- It is important that Ortho follow up is in place.



RETURN TO THE BEGINNING

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LAST UPDATED: 05.13.26

Review of Key Points

- **Pain**
  - Provide access to Narcan and education of opioid overdose treatment
  - Educate of safe use/storage and disposal of medications including opioids
  - Discontinue PCA, initiate PO oxycodone PRN on POD2 or POD3
  - Updated Tylenol and Motrin instructions

- **Ortho:**
  - Discontinue PCA earlier if possible (POD2 or POD3)
  - Antibiotic plan updated
  - Remove Foley in AM POD1
  - Ortho to D/C hemovac
  - Back dressing maintained for 7 days and removed at home

Quality Metrics

- Length of time on opioid PCA (in hours)
- % of patients with pathway order set utilization
- Length of stay (LOS)
  - Overall LOS for all patients
  - Breakdown of LOS by #vertebrae fused
- Number of post-op infections
- Average length of time(hours) from functional clearance until discharge
- Opioid dose per day in morphine equivalents
- Number of pain scores above a 6/10 in a 24-hour period
- Narcan prescription and education provided
- Medication safety/storage and disposal education provided

Pathway Contacts

- Taryn J Hamre, DNP, APRN – Pain and Palliative Medicine
- William Zempsky, MD – Pain and Palliative Medicine
- Mark Lee, MD – Orthopedics
- John W. Stelzer, MD – Orthopedics
- Eapen Mathew, MD – Anesthesiology, Pain and Palliative Medicine
- Rachel Petree, CRNA – Anesthesiology
- Kim Koenig, PT – Physical Therapy
- Dana Matos, RN & Kassandra Giammatteo, RN - Orthopedics

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Thank You!

About Connecticut Children's Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children's, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings. These pathways serve as a guide for providers and do not replace clinical judgment.