

ERAS Pathway For Major Urologic Surgery

Pathway Purpose: To enhance the postoperative recovery after major pediatric urologic surgery and achieve a target length of stay of ≤ 5 days

Inclusion Criteria:

- Open bladder reconstructive procedures (e.g. augmentation cystoplasty, Monti (continent ileovesicostomy), Mitrofanoff (continent appendicovesicostomy))
- Incontinent urinary diversions
- Major Uro-oncologic procedures

Exclusion Criteria:

- Revision surgery

Preoperative Phase

Patient Education

- Preoperative ERAS counseling and handout given in urology clinic

Comorbidity Optimization and Review

- Pediatric Anesthesia Resource Center (PARC) visit/phone call

Carbohydrate Loading and Fasting

- Regular diet night before surgery
- 10ml/kg max 350ml ClearFast, Gatorade, Powerade, or Pedialyte up to 1 hr. prior to procedure start time

Bowel Prep

- None; normal bowel regimen up to night before surgery

Intraoperative Phase

General ERAS Guidelines and Strategies

- **No excess surgical drains:** Acceptable: Foley, suprapubic tube, ACE catheter, Mitrofanoff/Monti catheters. Minimize/eliminate: JP drains
- **Euvolemia:** 3-7ml/kg/hr IV fluid rate over entire surgical duration
- **Normothermia:** maintain 36-38° core temperature
- **Minimally invasive:** laparoscopic or robot-assisted surgical approaches when technically feasible
- **DVT Prophylaxis:** follow [LPCHS Policy](#)
- **Antibiotic Prophylaxis:** 2nd/3rd generation **cephalosporin** or aminoglycoside + [metronidazole or clindamycin] within 30 min of incision
- **PONV Prophylaxis:** **dexamethasone** IV 0.1 mg/kg x1 on incision (**max 4 mg**), **ondansetron** IV 0.1 mg/kg prior to emergence (**max 4 mg**)
 - Consider **fosaprepitant** in patients with PONV score ≥ 3

Analgesia: Multimodal and Opioid-Sparing

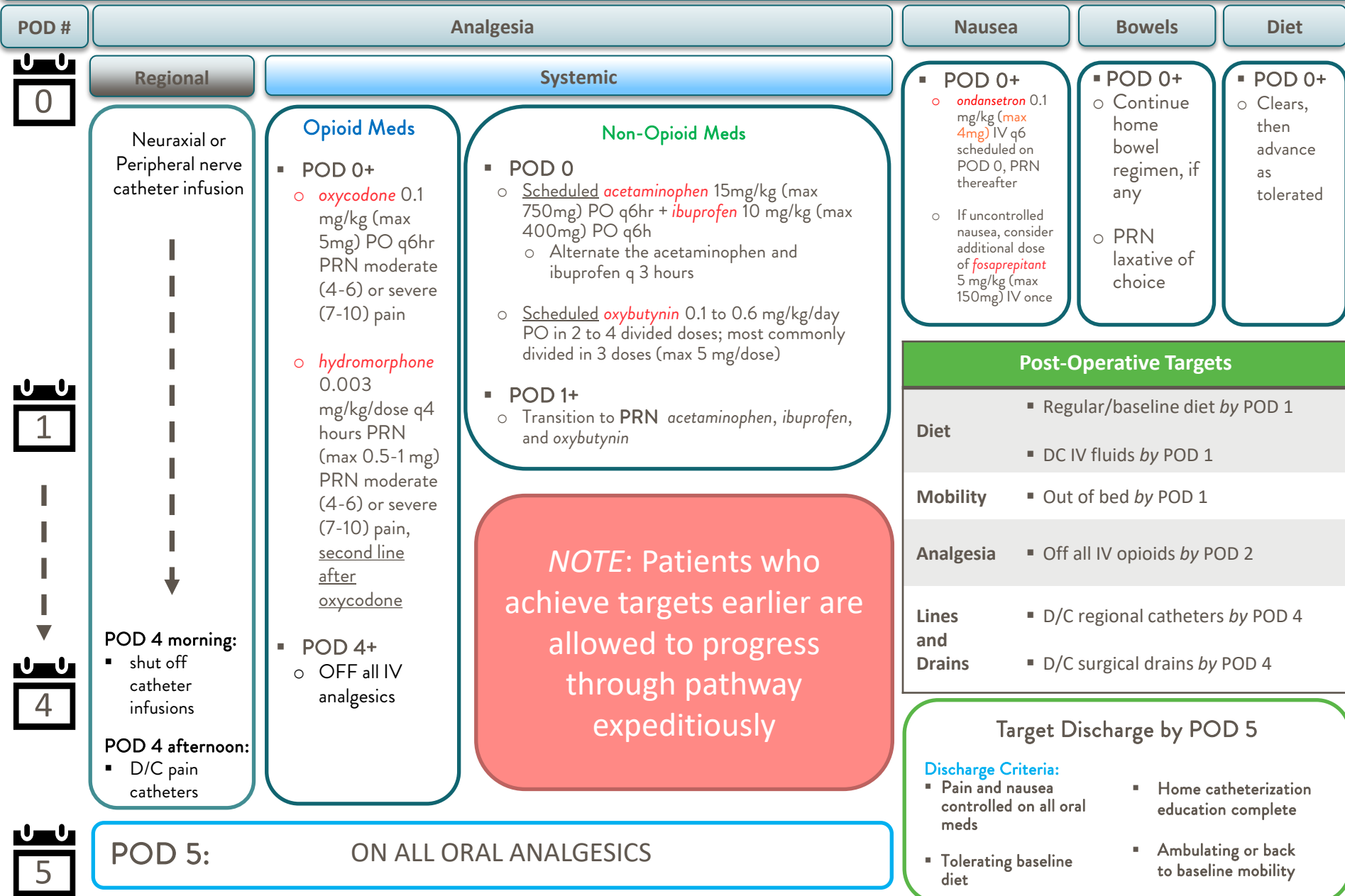
- **Methadone** 0.15-0.2 mg/kg (ideal body weight) IV, on incision (max 15 mg-20 mg) for patients WITHOUT epidural anesthesia
- **Acetaminophen** 15 mg/kg IV x1, prior to emergence (**max 1000 mg**)
- **Ketorolac** 0.5 mg/kg IV x1, per surgeon preference (**max 30mg**)
- **Regional anesthesia** (see [Appendix](#) for perioperative considerations)
 - 1st line: Epidural Anesthesia
 - 2nd line: Bilateral Peripheral Nerve Catheters
 - Rectus sheath block (esp. for midline longitudinal incisions)
 - Quadratus Lumborum (QL) block
 - Transversus Abdominus Plane (TAP) Block
 - Erector Spinae Plane (ESP) block

NOTE: catheters should be bolused **pre-incision** and **continued intraoperatively/post-operatively**



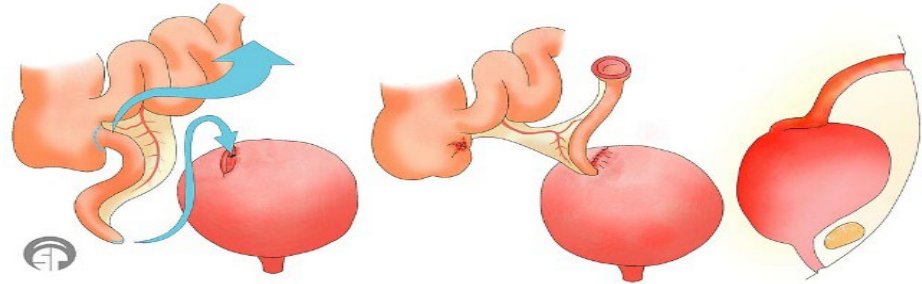
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Post-operative Phase



Definitions and Pathophysiology:

- **Mitrofanoff** Procedure (continent appendicovesicostomy)
 - Appendix used to create channel from bladder to skin surface for urinary catheterization
- **Monti** Procedure (continent ileovesicostomy)
 - Variation of Mitrofanoff where another bowel segment is used as conduit (usually ileal segment)



Mitrofanoff Procedure ([Wikimedia Commons](#))

Regional Anesthesia Considerations

- **Common Incisions**
 - **Reconstructive surgeries** - Pfannenstiel or midline longitudinal below the umbilicus
 - **Uro-oncologic procedures** (i.e. Wilms tumor resection) - transverse/horizontal incision above the umbilicus
- **Goals of care** are to maximize comfort while minimizing postoperative immobility
- **Limit** postoperative local anesthetic (LA) infusions to 0.6 mg/kg/hr (ropi/bupivacaine) and 15mg/kg/hr (chloroprocaine)

• Epidural Analgesia

- **Reconstructive procedures**: consider low thoracic approach covering T9-L1 spinal segments; **Uro-oncologic** – mid thoracic (T7-T10)
- Use minimally effective spinal segment coverage to avoid unnecessary lower limb weakness
- Consider using only LAs initially; may consider adding adjuvants (e.g. clonidine, hydromorphone) to epidural infusate if inadequate analgesia obtained. Beware sedative effects of these adjuvants.
- Bladder spasms (via parasympathetic pelvic nerves) will be managed mostly by **oxybutynin**

• Peripheral Nerve Blocks

- Various abdominal fascial plane blocks; typically limited to cutaneous/muscular pain coverage
- Maximizing LA volume critical to fascial plane spread
- 0.5ml/kg/side typical loading dose; use Programmed Intermittent Bolus (PIB) regimens for post-op infusions
- For bilateral catheters - consider q2hr alternating PIBs with ropi/bupivacaine if maximum LA dose limits volume of delivery

Appendix B

Pathway Measures	Baseline	Target
Hospital Length of stay	6 days (median)	5
TBD		
TBD		

References:

1. Rove KO, Brockel MA, Saltzman AF, et al. Prospective study of enhanced recovery after surgery protocol in children undergoing reconstructive operations. J Pediatr Urol. 2018;14(3):252.e1-252.e9. doi:10.1016/j.jpuro.2018.01.001
2. Strine AC, Chu DI, Brockel MA, et al. Feasibility of Enhanced Recovery After Surgery (ERAS) implementation in Pediatric Urology: Pilot-phase outcomes of a prospective, multi-center study. J Pediatr Urol. 2024;20(2):256.e1-256.e11. doi:10.1016/j.jpuro.2023.12.017
3. Rubenwolf PC, Koller B, Rübber I, Ebert AK, Pohl F, Rösch WH. Perioperatives Schmerzmanagement bei großen plastisch-rekonstruktiven Eingriffen in der Kinderurologie: Ein Plädoyer für die Periduralanästhesie [Perioperative pain management in major reconstructive surgery in pediatric urology: a plea for continuous epidural anesthesia]. Urologe A. 2011;50(5):566-572. doi:10.1007/s00120-011-2527-5
4. Ahn JJ, Martin LD, Low DK, Fernandez N, Cain MP, Merguerian PA. Enhanced recovery program in ambulatory pediatric urology: A quality improvement initiative. J Pediatr Urol. Published online May 3, 2024. doi:10.1016/j.jpuro.2024.04.015
5. Chan YY, Chu DI, Hirsch J, et al. Implementation and sustainability of an enhanced recovery pathway in pediatric bladder reconstruction: Flexibility, commitment, teamwork. J Pediatr Urol. 2021;17(6):782-789. doi:10.1016/j.jpuro.2021.08.023
6. Hecht S, Halstead NV, Boxley P, Brockel MA, Rove KO. Opioid prescribing patterns following implementation of Enhanced Recovery After Surgery (ERAS) protocol in pediatric patients undergoing lower tract urologic reconstruction. J Pediatr Urol. 2021;17(1):84.e1-84.e8. doi:10.1016/j.jpuro.2020.10.029
7. Rove KO, Strine AC, Wilcox DT, et al. Design and development of the Pediatric Urology Recovery After Surgery Endeavor (PURSUE) multicentre pilot and exploratory study. BMJ Open. 2020;10(11):e039035. Published 2020 Nov 23. doi:10.1136/bmjopen-2020-039035
8. Moore RP, Burjek NE, Brockel MA, Strine AC, Acks A, Boxley PJ, et al. Evaluating the role for regional analgesia in children with spina bifida: a retrospective observational study comparing the efficacy of regional versus systemic analgesia protocols following major urological surgery. Reg Anesth Pain Med. 2023 Jan;48(1):29–36.
9. Han DS, Brockel MA, Boxley PJ, Dönmez Mİ, Saltzman AF, Wilcox DT, et al. Enhanced recovery after surgery and anesthetic outcomes in pediatric reconstructive urologic surgery. Pediatr Surg Int. 2021 Jan 1;37(1):151–9.

Defining Pathway Compliance – Key Components

Pathway Phase	Key Process	Key Component	Completed/Received component?
<i>Preoperative</i>	Preoperative education/counseling	ERAS Handout given, preop checklist complete	✓
	Minimizing prolong fasting	Carbohydrate loading	✓
<i>Intraoperative</i>	Multimodal, opioid-sparing analgesia	<i>Pre-incisional</i> Regional Anesthesia (refer to page 1 of pathway) + ≥ 2 non-opioid analgesics given of different classes	✓
	PONV Prophylaxis	refer to page 1 of pathway	✓
<i>Postoperative</i>	Early Feeding	Clears by POD# 0, Regular by POD# 1	✓
	Minimizing IV fluids	DC IV fluids by POD# 1 (saline lock IV okay)	✓
	Early Drain Removal	DC all drains by POD# 4 (Except for bladder catheters)	✓
	Multimodal, opioid-sparing analgesia	≥ 2 non-opioid analgesics given of different classes + continued regional anesthesia	✓
	Early Mobilization	Out of bed by POD #1	✓

**Pathway Compliance Defined as completing/receiving ~80%
(and >1 per phase of care) of all pathway components**