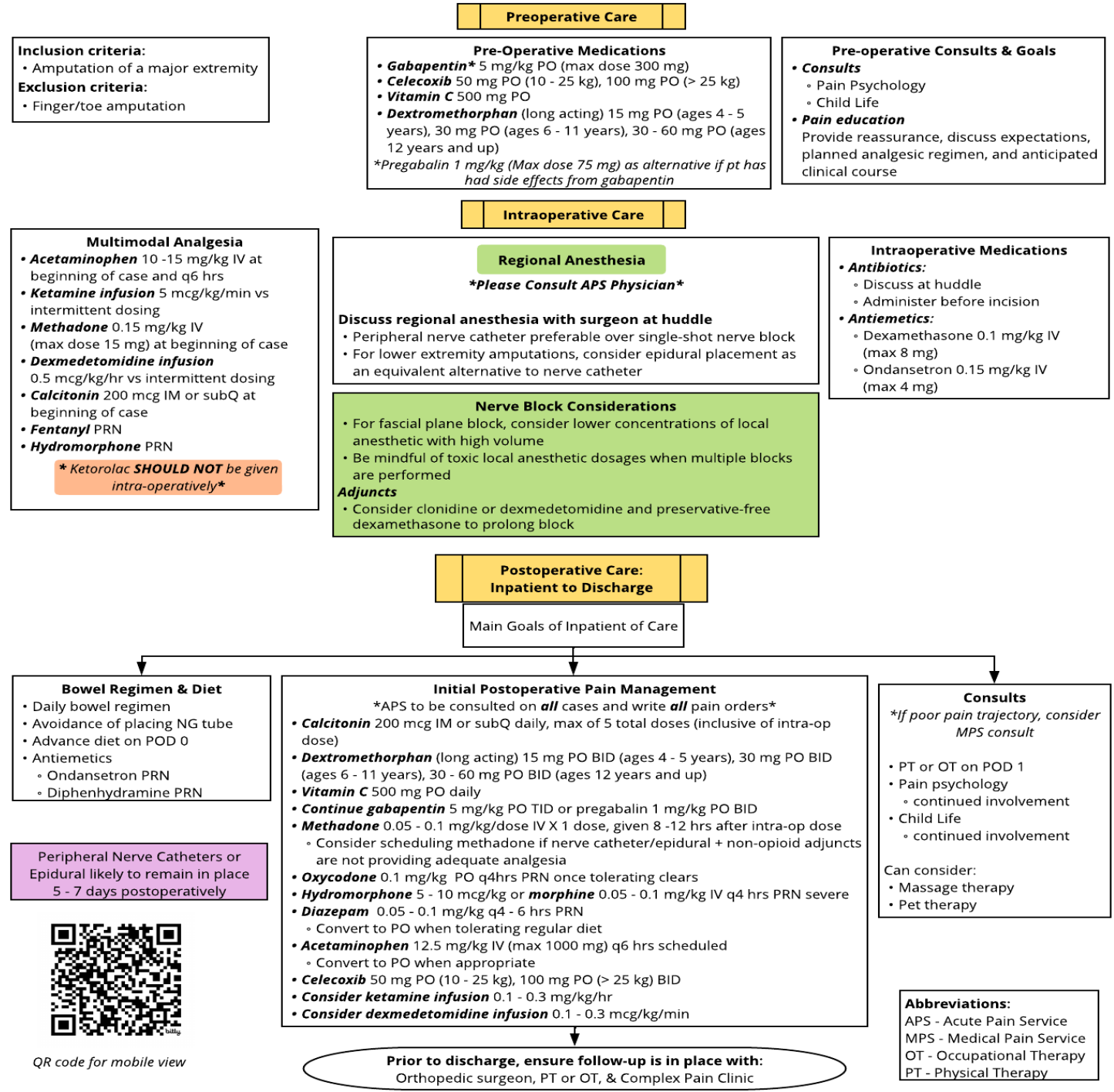


Amputation

Enhanced Recovery After Surgery Pathway Synopsis

Amputation ERAS Algorithm



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Objective of ERAS Pathway

To minimize the variation of care for patients undergoing amputation surgery while improving outcomes, starting with pre-operative care through hospital discharge. The Amputation Enhanced Recovery After Surgery (ERAS) pathway assists the surgical team with a standardized approach to surgical care and promotes optimal patient outcomes.

Background

Pediatric limb amputation is a significant surgical procedure often necessitated by trauma, congenital anomalies, or severe infections (Rafeeqi & Pearson, 2021). The Amputation ERAS pathway is a multimodal perioperative care approach designed to improve surgical outcomes and expedite recovery. ERAS protocols encompass preoperative, intraoperative, and postoperative strategies, including optimized pain management, early mobilization, and nutritional support. Implementing ERAS in pediatric limb amputation aims to minimize surgical stress, reduce postoperative complications, and enhance overall recovery. By integrating evidence-based practices, ERAS pathways have been shown to improve patient and family satisfaction, decrease hospital stays, and promote faster return to daily activities (Rafeeqi & Pearson, 2021; Roberts et al., 2020; Liu, 2017). The Amputation ERAS committee seeks to implement a comprehensive pain management strategy, incorporating regional anesthesia and nerve blocks, to enhance wound healing and expedite patient recovery.

Target Users

- Pediatric Anesthesiologists
- Pediatric Orthopedic Surgeons
- Fellows
- Residents
- Advanced Practice Nurses
- Nurses (Operating Room, Inpatient)

Target Population**Inclusion Criteria**

- Amputation of a major extremity

Exclusion Criteria

- Finger/toe amputation

Core Principles of ERAS

- Preoperative education of patients and families with an introduction to ERAS (in non-urgent situations).
- Reduced pre-operative fasting, with clear liquid oral carbohydrate loading until 2 hours prior to surgery (in non-urgent situations).
- Goal-directed strict intraoperative intravenous fluid therapy guidelines to avoid hypo- or hypervolemia
- Avoidance of pre-operative mechanical bowel preparation
- Avoidance of routine nasogastric tube use
- Minimizing long-acting opioid analgesia in favor of regional anesthesia with epidural and/or local anesthesia for intra-operative and postoperative pain control when appropriate and using alternative non-opioid medications when appropriate (e.g., non-steroidal anti-inflammatories or acetaminophen)
- Early postoperative mobilization
- Early postoperative enteral feeding

ERAS Management Recommendations:**Pre-Operative Care**

- In the Amputation ERAS protocol, the need for limb amputation can be urgent, so no pre-admission testing is conducted. When feasible, the ERAS protocol will be introduced to the patient and their family during surgery preparation.
- Key concepts of ERAS, such as early post-operative oral intake and a multimodal pain management approach, will be discussed when possible. Managing expectations is crucial in the preoperative phase.

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- Depending on the urgency and type of amputation, the patient will consume a carbohydrate-rich and clear fluid up to three hours before the procedure begins.
- Anxiolytics are provided in this population pre-operatively to help calm the patient

Intra-Operative Care

The primary goals during intraoperative care of these patients include:

- Multimodal approach to pain management
 - Discuss regional anesthesia options with the surgeon at huddle, including options for peripheral nerve catheter and/or epidural placement for lower extremity amputations
 - Minimize the use of long-acting opioids
- Prophylaxis for postoperative nausea and vomiting should be administered using dexamethasone and ondansetron
- Fluid management goals of clinical euvolemia and antibiotics must be given before the surgical incision
- Maintenance of normothermia throughout the entire procedure
- Discontinuation of urinary catheter prior to transfer to PACU
- No administration of Ketorolac intra-operatively

Post-Operative Care

The principal goals during the postoperative care of these patients are:

- Move toward oral intake as early as possible and avoid NG tube placement
- Advance diet on postoperative day zero
- Prevent/treat postoperative nausea and vomiting with diphenhydramine and ondansetron as needed
- Multimodal pain control- Consult acute pain service on all cases and write all pain orders on postoperative day zero
 - Ketamine infusion
 - Gabapentin
 - Calcitonin
 - Methadone
 - Dexmedetomidine infusion
 - Dextromethorphan
 - Diazepam
 - IV acetaminophen
 - Oxycodone prn once patient tolerates clears
 - IV hydromorphone or morphine prn for severe breakthrough pain or if not tolerating PO intake
- Consultation with Physical or Occupational Therapy
- Consider collaboration with Child Life, Massage Therapy, and Pet Therapy
- If there is a poor pain trajectory, a consult with the medical pain service can be written

Additional Questions Posed by the ERAS Committee

No clinical questions were posed for this review.

Key Metrics to be Monitored:

Pre-Op	Intra-Op	Post-Op
Carbohydrate-rich drink	IV acetaminophen	Average pain score
Midazolam	Ketamine infusion	NSAID
Gabapentin	ABX prior to incision	Long-acting opioids
Pregabalin	Regional pain anesthesia	IV Dexamethasone
Celecoxib	Methadone	Diazepam
	Dexmedetomidine infusion	Length of stay
	Calcitonin	
	Fentanyl	
	Hydromorphone	
	Dexamethasone	
	Ondansetron	

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Value Implications

The following improvements may increase value by reducing healthcare and non-monetary costs (e.g., missed school/work, loss of wages, stress) for patients and families and reducing costs and resource utilization for healthcare facilities.

- Decreased inpatient length of stay
- Decreased unwarranted variation in care
- Improved communication between patients and the care team throughout the perioperative period
- Improved post-operative pain control

Organizational Barriers and Facilitators**Potential Barriers**

- Variability of acceptable level of risk among providers
- Challenges with follow-up faced by some families

Potential Facilitators

- Collaborative engagement across care continuum settings during ERAS development
- High rate of use of ERAS pathway

Power Plans

- There are no associated power plans with this surgical pathway

Associated Policies

- There are no associated policies with this surgical pathway

ERAS Pathway Preparation

This ERAS pathway was prepared by the Department of Evidence Based Practice (EBP) in collaboration with the Amputation ERAS committee composed of content experts at Children's Mercy Kansas City. If a conflict of interest is identified, the conflict will be disclosed next to the committee member's name.

Amputation ERAS Committee Members and Representation

- Emily Weisberg, MD | Anesthesiology | Committee Co-Chair
- Erin Adams, MD | Anesthesiology | Committee Co-Chair
- Nicole Dwyer, MD, FASA, FAAP | Anesthesiology | Committee Co-Chair
- Armand Morel, MD | Anesthesiology | Committee Member
- Kathryn Keeler, MD | Orthopedic Surgery | Committee Member

EBP Committee Members

- Todd Glenski, MD, MSHA, FASA | Anesthesiology, Evidence Based Practice
- Andrea Melanson, OTD, OTR/L | Evidence Based Practice

ERAS Development Funding

The development of this ERAS pathway was underwritten by the following departments/divisions: Anesthesiology, Orthopedic Surgery, and Evidence Based Practice.

Conflict of Interest

The contributors to the Amputation ERAS have no conflicts of interest to disclose related to the subject matter or materials discussed.

Approval Process

- This product was reviewed and approved by the Amputation ERAS Committee, content experts from departments/divisions, and the EBP Department.
- Pathways are reviewed and updated as necessary every 3 years within the EBP Department at CMKC. Content expert teams are involved with every review and update.

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Review Requested

Department/Unit	Date Obtained
Anesthesiology	February 2025
Orthopedic Surgery	February 2025
Evidence Based Practice	February 2025

Version History

Date	Comments
February 2025	Version one – Development of algorithm and synopsis

Date for Next Review:

- February 2028

Implementation & Follow-Up

- Once approved, the ERAS pathway was presented to appropriate care teams and implemented.
- Key metrics will be assessed and shared with the appropriate care teams to determine if changes are needed.
- Education tools for patients and families were created for pre-surgery visits to provide an overview of the ERAS pathway. Health literacy reviewed the tool.
- Education was provided to all stakeholders:
 - Departments of Anesthesiology and Orthopedic Surgery
 - Resident physicians

Disclaimer

When evidence is lacking or inconclusive, care options are provided in the supporting documents that accompany the ERAS pathway.

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