Free Flap
Enhanced Recovery After Surgery (ERAS) Pathway Synopsis

Objective of ERAS Pathway

The Free Flap ERAS Pathway aims to reduce care variation and improve outcomes by accelerating recovery, minimizing opioid use, and promoting early mobilization. This is achieved through standardized preoperative, intraoperative, and postoperative practices using a multimodal perioperative approach.

Background

Free flaps are most often used for traumatic injuries, congenital differences, and reconstruction after a concerning resection.[1,2] Also called free tissue transfer, this approach has become a reliable option in children due to advances in microsurgery, with reported success rates of 92-95%.[1,3,4] Critical intraoperative elements include precise microsurgical anastomosis, optimized anesthesia, prevention of vasospasm, and close postoperative monitoring in pediatric patients.[5-8] By integrating ERAS principles with current standards for free tissue transfers, the Free Flap ERAS Pathway Committee aims to optimize surgical outcomes (flap viability, tissue integration, restoration of function, reduction in pain) and health for patients undergoing this procedure.

Target Users

- Physicians (Anesthesiologists, Pediatric Orthopedic Surgeons, fellows, and residents)
- Advanced Practice Nurses (Anesthesiology and Orthopedic Surgery)
- Staff nurses
- Dietitians

Target Population

Inclusion Criteria

- Any patient undergoing major free flap surgery

Exclusion Criteria

- Patients < 12 months of age

Core Principles of ERAS

- Preoperative education of patients and their families with an introduction to ERAS
- Reduced pre-operative fasting, with clear liquid oral carbohydrate loading until 2 hours prior to surgery
- 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

- **Goals**
  - Discuss anesthesia plan and use of nerve catheters
  - Complete nutrition consultation to optimize surgical recovery and healing

Intra-Operative Care

- **Goals**
  - Involve the Anesthesia Pain Service physician for the regional anesthesia plan
  - Use of a peripheral nerve catheter unless contraindicated

** These pathways do not establish a standard of care to be followed in every case. It is recognized that each case is different, and those individuals involved in providing health care are expected to use their judgment in determining what is in the best interests of the patient based on the circumstances existing at the time. It is impossible to anticipate all possible situations that may exist and to prepare a pathway for each. Accordingly, these pathways should guide care with the understanding that departures from them may be required at times.*

- Avoidance of epidurals
- Use of heparin for anticoagulation management
- Monitor blood gas analysis

Post-Operative Care

- **Goals**
  - Transfer directly to PICU
  - For pain management, use of a peripheral nerve catheter for continuous infusion and NCA/PCA as needed
  - Initiate DVT prophylaxis
  - Patient monitoring by a nurse every hour
  - Flap monitoring by the surgeon hourly for the first 48-72 hours post op
  - Early involvement of PT/OT

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	Peripheral nerve catheter	Methocarbamol
Nutrition consultation	Multimodal Analgesia	DVT prophylaxis
		Flap monitoring q1 for 48-72 hours

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 by reducing costs and resource utilization for healthcare facilities.

- Decreased inpatient length of stay
- Decreased unwarranted variation in care
- Improved communication between patients and 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

Potential Facilitators

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

Order Sets

- There are no Order Sets associated with this ERAS pathway

Education Materials

- ERAS overview handout
  - Intended to be a general handout encompassing the key concepts and plan for an ERAS pathway
  - Found on the CM external website for each ERAS pathway
  - Available in English and Spanish

ERAS Pathway Preparation

This pathway was prepared by the EBP Department in collaboration with the Free Flap ERAS Pathway Committee, composed of content experts at Children's Mercy. If a conflict of interest is identified, the conflict will be disclosed next to the committee member's name.

Free Flap ERAS Committee Members and Representation

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- Emily Weisberg, MD, FASA | Pediatric Anesthesiology | Committee Co-Chair
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EBP Committee Members

- Todd Glenski, MD, MSHA, FASA | Anesthesiology, Evidence Based Practice
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ERAS Pathway 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 Free Flap ERAS Pathway have no conflicts of interest to disclose related to the subject matter or materials discussed.

Approval Process

- This pathway was reviewed and approved by the EBP Department and the Free Flap ERAS Pathway Committee after the committee members garnered feedback from their respective divisions/departments.

Review Requested

Department/Unit	Date
Anesthesiology	June 2026
Orthopedic Surgery	June 2026
Pediatric Intensive Care	June 2026
Evidence Based Practice	June 2026

Version History

Date	Comments
June 2026	Version one – algorithms and synopsis were created for this version

Date for Next Review:

- June 2029

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.
- Pathways are reviewed every 3 years (or sooner) and updated as necessary within the EBP Department at Children's Mercy. Pathway committees are involved with every review and update.

Disclaimer

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

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It is impossible to anticipate every possible situation and prepare ERAS pathways for each. Accordingly, these ERAS pathways should guide care, with the understanding that departures may be required at times.

References

1. Burns HR, Skochdopole AJ, Alfaro Zeledon R, Pederson WC. Pediatric Microsurgery and Free-Tissue Transfer. *Semin Plast Surg*. 2023;37(4):231-239. Published 2023 Nov 16. doi:10.1055/s-0043-1776698
2. Sydney Children's Hospital. Free Flap – Traumatic Limb Injuries – Patient Care Practice Guideline. *Sydney Children's Hospital Network*; 2025. Accessed June 5, 2026.
3. Momeni A, Lanni M, Levin LS, Kovach SJ. Microsurgical Reconstruction of Traumatic Lower Extremity Defects in the Pediatric Population. *Plast Reconstr Surg*. 2017;139(4):998-1004. doi:10.1097/PRS.0000000000003156
4. Mistry R, Khan U. A 10-year experience of paediatric lower limb free flap surgery: an evolution over time. *Injury*. 2025;56(3):112196. doi:10.1016/j.injury.2025.112196
5. Upton J, Guo L. Pediatric free tissue transfer: a 29-year experience with 433 transfers. *Plast Reconstr Surg*. 2008;121(5):1725-1737. doi:10.1097/PRS.0b013e31816c3b81
6. Fujisawa K, Miyamoto S, Okazaki M. Free Anterolateral Thigh Flap Reconstruction After Excision of Extensive Vascular Malformations in Toddlers: Report of Two Cases. *Microsurgery*. 2026;46(1):e70173. doi:10.1002/micr.70173
7. Cohen Z, Plotsker E, Graziano F, et al. The evolution of pediatric soft-tissue free flap reconstruction of the lower extremity after oncologic resection: A 30-year experience. *Microsurgery*. 2024;44(1):e31130. doi:10.1002/micr.31130
8. Uralov D, De Virgilio A, Canali L, et al. Postoperative Antithrombotic Strategies in Head and Neck Free Flap Reconstruction: A Systematic Review and Network Meta-Analysis. *Head Neck*. 2026;48(3):893-917. doi:10.1002/hed.70158