



Pectus Excavatum Repair with Bar Placement Enhanced Recovery After Surgery Pathway Synopsis

Objective of ERAS Pathway

The Pectus Excavatum Repair with Bar Placement Enhanced Recovery After Surgery (ERAS) pathway aims to minimize variation in care for patients undergoing pectus excavatum repair with bar placement, from the Center for Pectus Excavatum and Pectus Carinatum Clinic visit through hospital discharge. This includes optimizing preoperative nutrition/metabolism, reducing adverse medication side effects, promoting earlier bowel function recovery, and reducing overall hospital length of stay. In the last several decades, the application of ERAS principles has shown significant improvements in various surgeries regarding length of stay, opioid use, pain control, and return to diet (Liu et al., 2017).

Background

Pectus excavatum is the most common pediatric chest wall deformity and can become apparent at any time from infancy through puberty. It occurs in approximately 1/1,000 children and is four times more common in males than in females. Options for surgically correcting this deformity began in the early 1900s with the development of a less invasive approach in the 1980s. Children's Mercy Kansas City (CMKC) further modified the procedure by using a central incision to pass a steel bar across the chest. The bar helps reshape the child's chest as they grow. As this surgery continues to evolve, Children's Mercy has adopted the Enhanced Recovery After Surgery pathway, developed to standardize perioperative care and accelerate recovery for patients undergoing pectus excavatum surgery.

Target Users

- Anesthesiologists
- Pediatric surgeons
- Nurse practitioners
- OR nurses

Target Population

Inclusion Criteria

- Patients presenting for pectus excavatum repair with bar placement surgery

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 Goals:

Pre-Operative Care

- Review of ERAS principles
- Emphasis on clear carb liquid 2 hours before surgery
- Scopolamine patch is applied in the Same Day Surgery Clinic prior to surgery
- Anxiolysis is determined by the anesthesia team, and midazolam is used as needed

Intra-Operative Care

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- Multimodal approach to pain management
 - IV acetaminophen at the beginning of the case
 - IV ketamine bolus X 1 at the beginning of the case
 - IV ketorolac at the end of the case
 - IV hydromorphone X 1 at the end of the case
 - Cryoablation of intercostal nerves performed by the surgical team

Post-Operative Care

- Transition from IV to oral medications as soon as possible
- Achieve good pain control utilizing a combination of medications to treat pain
- Prevention of nausea
- Getting out of bed as soon as possible after surgery
- Tolerate oral intake
- Review postoperative instructions, including recommended pain and bowel medication regimen
- Stable respiratory status; no oxygen requirement
- Focus on early discharge from the hospital with individualized home instructions.

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	PACU PONV score
	PONV prophylaxis	Average pain score
	ABX prior to incision	Long-acting opioids
	Ketorolac	Length of stay
	Ketamine	
	Normothermia	

Value Implications

The following improvements may increase value by reducing healthcare and non-monetary costs (e.g., missed school/work, lost 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

Organizational Barriers and Facilitators

Potential Barriers

- Challenges with follow-up faced by some families

Potential Facilitators

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

Order Sets

- There are no associated order sets with this 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](#)

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ERAS Pathway Preparation

This pathway was prepared by the EBP Department in collaboration with the Pectus Excavatum Repair with Bar Placement 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.

ERAS Pathway Representation

This clinical pathway was originally created with representation from Pediatric General Surgery, Anesthesiology, and Evidence Based Practice.

Pectus Excavatum Repair with Bar Placement ERAS Revision Representation

- Tolulope Oyetunji, MD, MPH | Surgery | Committee Co-Chair
- Emily Weisberg, MD, FASA | Anesthesiology | Committee Co-Chair
- Christian Taylor, MD | Anesthesiology | Committee Member
- Amy Pierce, MSN, APRN, PPCNP-BC | Surgery | Committee Member
- Beth Orrick, APRN, FNP-BC | Surgery | Committee Member
- Diane Rash, MSN, RN, CPNP-AC, PC | Surgery | Committee Member
- Azita Roberson, MSN, RN, CPN, APRN, FNP-C | Department of Anesthesiology | Committee Member

EBP Committee Members

- Todd Glenski, MD, MSHA, FASA | Anesthesiology, Evidence Based Practice
- Andrea Melanson, OTD, OTR/L | Evidence Based Practice
- Megan Gripka, MPH, MLS (ASCP) SM | Evidence Based Practice

ERAS Development Funding

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

Conflict of Interest

The contributors to the Pectus Excavatum Repair with Bar Placement ERAS 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 Pectus Excavatum Repair with Bar Placement Committee, after the committee members garnered feedback from their respective divisions/departments.

Review Requested

Department/Unit	Date Obtained
Anesthesiology	August 2022
Surgery	August 2022
Evidence Based Practice	August 2022

Version History

Date	Comments
September 2022	Version one – algorithm, synopsis, and educational material developed
January 2023	Version two – Updates to pre-operative care discussed and approved by committee, incorporated into documents, with webpage updated
February 2026	Version three – Minor updates to formatting
March 2026	Version four – Minor updates to algorithms and synopsis to align with naming conventions associated with the new EMR (EPIC).

Date for Next Review:

- **February 2029**

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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 CMKC. 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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References

- Liu, V.X., Rosas, E., Hwang, J., Cain, E., Foss-Durant, A., Clopp, M., et al. (2017). Enhanced recovery after surgery program implementation in 2 surgical populations in an integrated health care delivery system. *JAMA Surg*, 152, e171032. <https://doi.org/10.1001/jamasurg.2017.1032>
- Melnyk, M., Casey, R. G., Black, P., & Koupparis, A. J. (2011). Enhanced recovery after surgery (ERAS) protocols: time to change practice? *Canadian Urological Association Journal = Journal de l'Association des urologues du Canada*, 5(5), 342–348. <https://doi.org/10.5489/cuaj.11002>

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