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Clinical Pathways

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7-2022

### Cardiac Surgery: Bypass and Thoracotomy Enhanced Recovery After Surgery (ERAS)

Children's Mercy Kansas City

These guidelines 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 guidelines for each. Accordingly, these guidelines should guide care with the understanding that departures from them may be required at times.

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## Cardiac Surgery (ERAS) – Bypass/Thoracotomy: Enhanced Recovery After Surgery

**Abbreviations (laboratory & radiology excluded):**  
 ACE = Angiotensin-converting enzyme  
 ARBs = Angiotensin II receptor blockers  
 ASA = American Society of Anesthesiologists  
 EP = Electrophysiology  
 PLT = Platelet  
 pts = patients

**Inclusion Criteria:**

- Bypass cases
- Coarctation of aorta cases
- Vascular ring cases
- Patients > 6 months of age
- Patients with ASA Status I, II, or III

**Exclusion Criteria:**

- Repeat sternotomy cases
- Single ventricle physiology
- Pre-op inpatients

**Medication/Diet Instructions received**

**Medication:**

- **HOLD** ACE inhibitors and ARBs for 24 hours prior to surgery
- **HOLD** AM diuretics
- **Give** beta-blockers, anti-arrhythmics, other cardiac medications (unless being held by the EP service)
- **Anticoagulants and NSAIDs**- consider what's appropriate for normalization of coagulation and PLT function. Minimum PLT count of 50k.
- **Give** indicated oral medications before NPO time
  - Pulmonary vasodilators
  - Anti-hypertensive medications (not ACE inhibitors or ARBs)
  - Anti-rejection medications
  - Seizure medications
  - Reflux medications
  - Thyroid replacement
  - Anxiety/ADHD/behavioral medications
  - Statins

**Diabetics:**

- **HOLD** Metformin for 24 hours prior to surgery
- **OK** to continue long-acting insulin (Ex: Lantus)
- **HOLD** AM short acting insulin and oral anti-diabetic agents
- **OK** to keep insulin pump at basal rate

**Diet:**

- Standard NPO guidelines
- **2-3 hrs prior to surgery:** Carbohydrate - rich drink

**Arrival time/location**

**Prior to surgery day**

Patient scheduled for cardiac bypass or thoracotomy procedure

**Pre-Admission Testing (PAT) Evaluation:**

- Introduction to ERAS principles- early extubation, multimodal analgesia, encouraging PO intake, etc
- Pain management and regional anesthesia- obtaining consent
- Carbohydrate - rich drink up to 2 hours prior to surgery
- **Medication/Diet Instructions**
- Discuss anesthesia risks and plan (including mitigation of pre-op anxiety)
- [Pre-op Cardiac Surgery ERAS checklist](#)
- [Cardiac Surgery ERAS pathway](#)

**Labs:**

- CBC with differential
- BMP
- Urinalysis
- Coagulation studies
- Thyroid studies (TSH and Free T4)
- Type and screen

\*May differ for thoracotomy patients

**Radiology:**

- Chest x-ray (AP and lateral)
- EKG
- ECHO
- UE/LE ultrasound

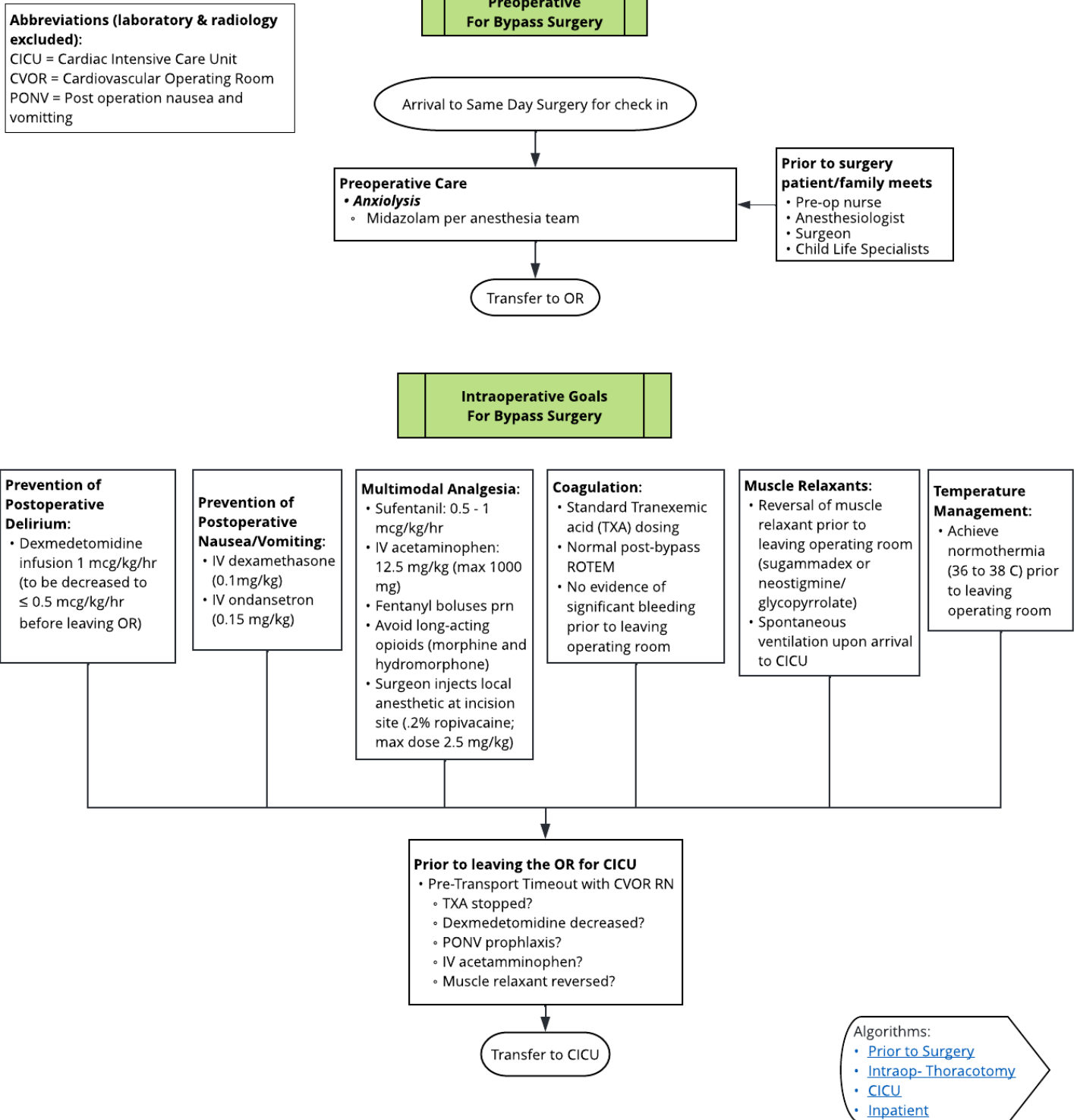
\*May differ for thoracotomy patients

Instruct caregivers/parents to call Heart Center APRN if they have any questions prior to surgery

**Algorithms:**

- [Intraop- Bypass](#)
- [Intraop- Thoracotomy](#)
- [CICU](#)
- [Inpatient](#)

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**Abbreviations (laboratory & radiology excluded):**  
 CICU = Cardiac Intensive Care Unit  
 CVOR = Cardiovascular Operating Room  
 PONV = Post operation nausea and vomiting

**Preoperative For Thoracotomy Surgery**

Arrival to Same Day Surgery for check in

**Preoperative Care**  
 • **Anxiolysis**  
 • Midazolam per anesthesia team

**Prior to surgery patient/family meets**  
 • Pre-op nurse  
 • Anesthesiologist  
 • Surgeon  
 • Child Life Specialists

Transfer to OR

**Intraoperative Goals For Thoracotomy Surgery**

**Prevention of Postoperative Delirium:**  
 • Dexmedetomidine infusion 1 mcg/kg/hr (to be decreased to ≤ 0.5 mcg/kg/hr before leaving OR)

**Prevention of Postoperative Nausea/Vomiting:**  
 • IV dexamethasone (0.1mg/kg)  
 • IV ondansetron (0.15 mg/kg)

**Multimodal Analgesia:**  
 • Fentanyl boluses prn  
 • Avoid long-acting opioids (morphine and hydromorphone)  
 • IV acetaminophen: 12.5 mg/kg (max 1000 mg)  
 • Erector spinae plane (ESP) block  
 • Single shot vs catheter in older (>5 yo) patients

**Muscle Relaxants:**  
 • Reversal of muscle relaxant prior to leaving operating room (sugammadex or neostigmine/glycopyrrolate)  
 • Spontaneous ventilation upon arrival to CICU

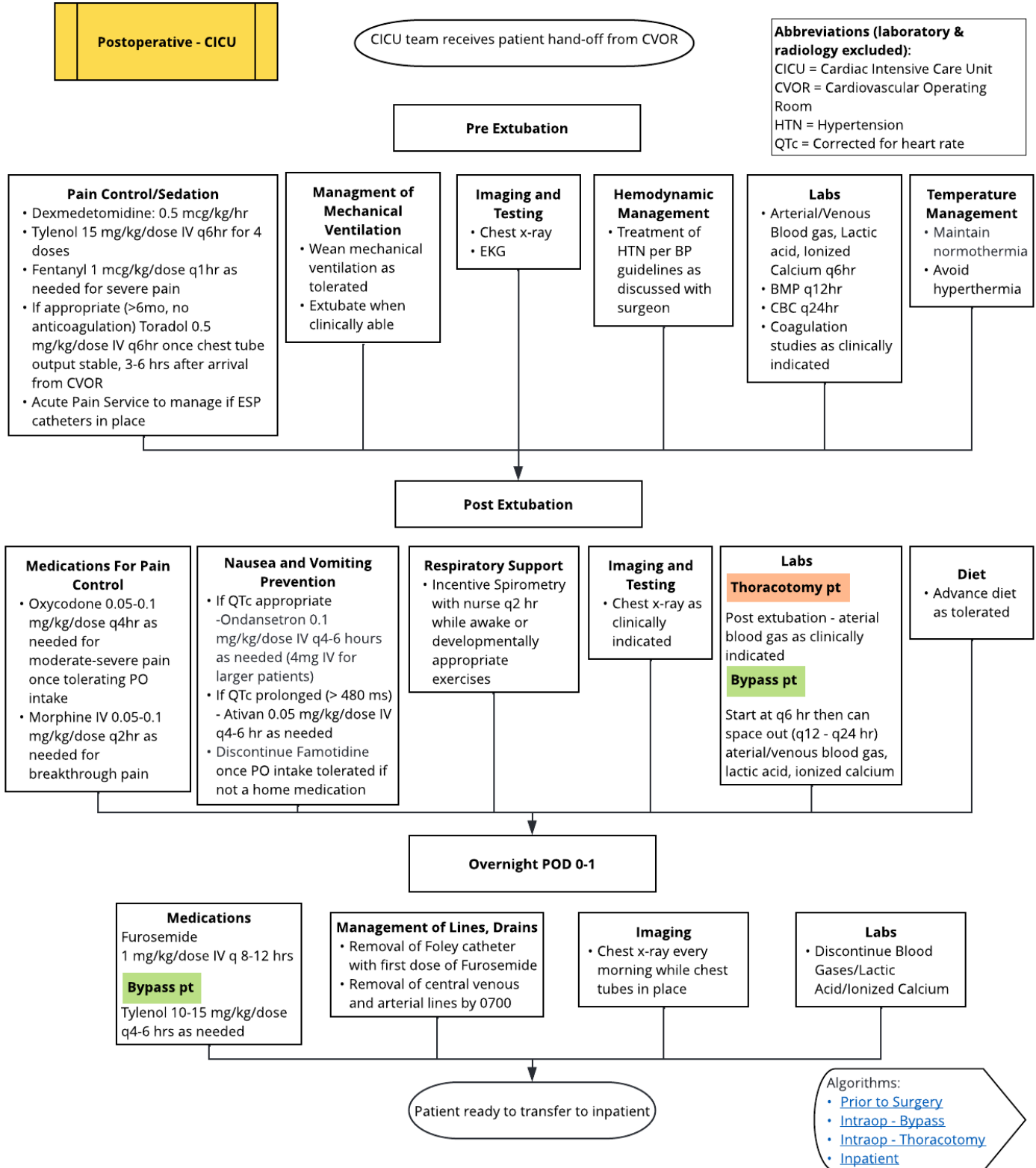
**Temperature Management:**  
 • Achieve normothermia (36 to 38 C) prior to leaving operating room

**Prior to leaving the OR for CICU**  
 • Pre-Transport Timeout with CVOR RN  
 • Dexmedetomidine decreased?  
 • PONV prophylaxis?  
 • IV acetaminophen?  
 • Muscle relaxant reversed?

Transfer to CICU

Algorithms:  
 • [Prior to Surgery](#)  
 • [Intraop - Bypass](#)  
 • [CICU](#)  
 • [Inpatient](#)

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**Abbreviations (laboratory & radiology excluded):**  
 APRN = Advance Practice Registered Nurse  
 CICU = Cardiac Intensive Care Unit  
 CV = cardiovascular  
 WNLs = Within normal limits

**Inpatient to discharge**

Patient ready for transfer from CICU to 4 Sutherland

- Blue Team receives hand-off from CICU
- Patient assessed by Blue Team in CICU and meets family

Patient is transferred to 4 Sutherland

**Vitals**  
**Wean oxygen**  
 • Room air or home O<sub>2</sub>  
**Chest tube**  
 • Monitor output  
 • Remove chest tubes  
**Heart rhythm**  
 • Monitor and remove pacing wires

**Diet**  
**Encourage PO intake** - advance as tolerated  
**Initiate bowel regimen**  
**PRN ondansetron for nausea/vomiting**  
 • 0.1 mg/kg/dose, max dose 4 mg

**Pain Management**  
**Ketorolac**  
 • q6hr > 6 months  
 • Transition to PO ibuprofen 5-10 mg/kg/dose  
**Acetaminophen PO PRN**  
 • 10-15 mg/kg/dose  
 • Scheduled for 48hrs  
**Opioids**  
 • First line: PO oxycodone  
 • Second line: IV morphine  
**Erector Spinae Plane Catheter**

**Physical Activity**  
**Holding**  
 • Caregivers to hold infants  
**Ambulation**  
 • In patients that can walk  
**Physical Therapy**  
 • Consult for older patients if needed

**Diuretics**  
**IV Initially**  
 • Transition to enteral once chest tubes removed  
**BMPs**  
 • Trended  
 • Replace electrolytes as needed  
 • Monitored daily while on IV diuretics; when on oral diuretics and WNLs- stop monitoring  
**Kidney Function**  
 • Monitored (same as BMPs)

**Chest Tube Removal Criteria**  
 (determined at 7am rounds by surgeon)  
 < 10 ml/kg in 24hrs  
 < 5 ml/kg in 12 hrs  
 < 200 ml for older children/teens/young adults

**Pacing wires** unlikely to be on Thoracotomy patients

**Erector Spinae Plane Catheter**  
 Pain team to follow if catheter in place

**Discharge Readiness**  
**Discharge Testing**  
 • Post-op EKG and ECHO  
 • CXR s/p removal of chest tubes  
**Discharge Teaching**  
 • Post-op care instructions reviewed by APRN w/family  
 • Provided hand-out and Get Well Network video  
**Incision Care**  
 • APRN completes chest tube site care w/family

D/C day determined day before discharge  
 Anticipate to d/c by noon the following day

**Discharge home**  
 Follow-up appointments arranged with:  
 • CV surgery  
 • Outpatient cardiologist

Algorithms:  
 • [Prior to Surgery](#)  
 • [Intraop - Bypass](#)  
 • [Intraop - Thoracotomy](#)  
 • [CICU](#)

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## Objective of ERAS Model

The objectives for the Cardiac Surgery Enhanced Recovery After Surgery (ERAS) pathway are to minimize the variation of care for specific patients undergoing cardiac surgery starting with the pre-admission testing visit up until discharge.

## Background/Epidemiology

Over the past several decades, cardiac surgery among the pediatric population has significantly improved the quality of life and survivability of congenital heart disease. ERAS pathways have become mainstream in the adult surgical world and now are gaining recognition and use in the pediatric surgical arena. Implementation of ERAS principles have shown significant improvements in various surgeries regarding length of stay, opioid use, pain control, and return to diet (Fearon 2005, Thiele 2014, Liu 2017). Key elements to ERAS include:

- Preoperative education of patients and family with an introduction to ERAS
- Oral carbohydrate load 2-3 hours before surgery
- Avoidance of prolonged fasting
- No additional bowel preparation
- Standardized anesthesia protocol including regional or neuraxial anesthesia when possible
- Goal-directed strict intraoperative intravenous fluid therapy guidelines to avoid hypo- or hypervolemia
- Minimize the use of long-acting opioids
- Minimize use of drains and NG tubes when possible
- Initiate early feeding and ambulation

The most important aspect of ERAS is compliance. Although specific elements may need tailoring to patient needs, ERAS has been shown to be safe and improve outcomes in a wide variety of patients and will be an important part of helping patients and families through recovery.

## Target Users

Anesthesiologists, Cardiovascular surgeons, Cardiac Intensivists, Cardiologists, Cardiology nurse practitioners, PAT nurse practitioners

## Target Population

### **ERAS Inclusion Criteria**

- Bypass cases
- Coarctation of aorta cases
- Vascular ring cases
- Patients > 6 months of age
- Patients with American Society of Anesthesiologists (ASA) Physical Status I, II, or III

### **ERAS Exclusion Criteria**

- Repeat sternotomy cases
- Single ventricle physiology
- Pre-op inpatients

## Core Principles of ERAS (Melnyk et al., 2011)

- Preoperative education of patients and family 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 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 post-operative mobilization
- Early post-operative enteral feeding

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## ERAS Management Recommendations:

### Pre-Operative Care

- The beginning of this ERAS protocol begins well before the surgical date. The concept of ERAS is presented to the patient/family at the initial surgical appointment, pre-operative clinic visit, and then reinforced during the pre-admission testing (PAT) clinic visit.
- At PAT there are educational items discussed including pre-op diet restrictions, medication management, and the risks of anesthesia.
- Also discussed some of the core concepts of ERAS, including the emphasis early post-op PO intake and a multimodal pain management approach. Expectation management is crucial in the preoperative phase. A handout (Appendix A and B), approved by the Health Literacy Committee, is given to the family prior to departing PAT.
- On the morning of surgery, the patient drinks carbohydrate rich liquids two hours before surgery start time.

### Intra-Operative Care

- Pre-Incision Timeout
  - Discussion with surgeon and OR staff to determine if patient has been enrolled in ERAS pathway
- Prevention of Postoperative Nausea/Vomiting
  - Dexamethasone and ondansetron for patients > 2yrs old
  - Avoid placement of NG tube
- Prevention of Postoperative Delirium
  - Dexmedetomidine infusion during case with goal of < 0.5 mcg/kg/hr upon handoff in Cardiac Intensive Care Unit (CICU)
- Multimodal Analgesia
  - Sufentanil infusion during procedure with discontinuation prior to exiting operating room
  - IV acetaminophen 12.5 mg/kg (max 1000 mg)
  - Fentanyl boluses prn
  - Avoidance of long-acting opioids (morphine & hydromorphone)
  - Injection of local anesthetic at incision site by surgeon at end of procedure
- Coagulation
  - Standard tranexamic acid (TXA) bolus and infusion
  - Normal post-bypass ROTEM
  - No evidence of significant bleeding prior to leaving operating room
- Temperature Management
  - Achieve normothermia prior to leaving operating room
- Muscle Relaxants
  - Reversal of muscle relaxant prior to leaving operating room with sugammadex or neostigmine/glycopyrrolate
  - Goal of spontaneous ventilation upon arrival to CICU

### Post-Operative Care

#### CICU

- Upon arrival to CICU, anesthesiologist gives in-depth hand-off to CICU, including key ERAS components
- CICU team (attending intensivist, resident physicians, APRNs) and charge nurse assess patient after CICU handoff
- Goals of care from CICU admission to enable transfer to inpatient floor in the post-op period:
  - **Post CVOR Hand-off**
    - ✓ Pain Control
      - Continue dexmedetomidine: < 0.5 mcg/kg/hr, discontinue if unable to wean ventilator support
      - Acetaminophen 15 mg/kg/dose IV every 6 hours for 4 doses
      - Fentanyl 1 mcg/kg/dose every 1 hour as needed for severe pain
      - If appropriate (> 6 months, no anticoagulation) ketorolac 0.5 mg/kg/dose IV every 6 hours once chest tube output stable, 3-6 hours after arrival from CVOR
      - Last line opioids: morphine and hydromorphone
    - ✓ Management of Mechanical Ventilation
      - Wean Mechanical Ventilation as Tolerated

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- Extubate when clinically able
    - Goal extubation time from arrival in CICU is less than 6 hours
  - ✓ Imaging/Testing
    - Chest X-Ray
    - EKG
  - ✓ Hemodynamic Management
    - Treatment of hypertension per surgeon recommended parameters
  - ✓ Labs
    - Arterial/Venous Blood gas, Lactic Acid, Ionized Calcium q6h
    - BMP q12h
    - CBC q24h
    - Coagulation studies as clinically indicated
  - ✓ Temperature Management
    - Room Temperature, maintain normothermia
- **Post Extubation**
  - ✓ Medications
    - Pain Control
      - Oxycodone 0.05-0.1 mg/kg/dose every 4 hours as needed for moderate-severe pain once tolerating PO intake
      - Morphine IV 0.05-0.1 mg/kg/dose every 2 hours as needed for breakthrough pain
  - ✓ Nausea and Vomiting Prophylaxis
    - If QTc appropriate – ondansetron 0.1 mg/kg/dose IV every 4-6 hours as needed
    - If QTc prolonged (> 480 ms) – lorazepam 0.05 mg/kg/dose IV every 4-6 hours as needed
  - ✓ Discontinue famotidine upon resumption of normal diet
  - ✓ Respiratory Support
    - Incentive spirometry q2h while awake if developmentally appropriate
  - ✓ Imaging/Testing
    - Chest x-ray as clinically indicated
  - ✓ Labs
    - Thoracotomy patient - Post extubation Arterial Blood Gas as clinically indicated
    - Bypass patient - Can space out Arterial/Venous Blood gas, Lactic Acid, Ionized Calcium-
  - ✓ Diet
    - Advance diet as tolerated
- **Overnight POD 0-1**
  - ✓ Medications
    - Furosemide 1 mg/kg/dose IV every 8-12 hours
    - Bypass patient – Tylenol 10 – 15 mg/kg/dose every 4 –6 hours as needed
  - ✓ Management of Lines, Drains
    - Removal of Foley Catheter with first dose of Furosemide
    - Removal of Central Venous and Arterial Lines by 0700
  - ✓ Imaging
    - Chest X-ray every morning while chest tubes remain in place
  - ✓ Labs
    - Discontinue Blood Gases/Lactic Acid/Ionized Calcium

**Inpatient floor/Blue Team/4 Sutherland**

- In the ERAS patient population, the post CV surgery patient will likely meet criteria to transfer from the CICU to the floor on POD1-2
- Once patient meets criteria to transfer from CICU to 4Sutherland, CICU gives hand-off to Blue Team
- Blue Team providers (attending physician, resident physicians, APRNs) and charge nurse assess patient in CICU and meet family in CICU prior to transfer to the floor.
- Blue Team provides family with information regarding expected progression towards discharge to home, and explains difference in staffing/monitoring on the floor vs ICU setting
- Patient is transferred to the floor
- Goals of care on the floor to enable discharge to home in the post-operative period:

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- o **Wean oxygen** support to room air or home oxygen support. Consider the use of incentive spirometry if the patient qualifies.
- o **Monitoring of chest tube** output and removal of chest tubes once they meet criteria of less than 10 ml/kg in 24 hours, or 5 ml/kg in 12 hours, or less than 200 ml for older children/teens/young adults
- o **Monitoring of heart rhythm** and removal of temporary pacing wires if not removed in CICU prior to transfer to the floor
- o **Advancing to home diet** – treatment of nausea/vomiting as needed, initiation of bowel regimen to enable promote the return of bowel function in post-op period by POD1-2, typically no IV fluids past POD1-2 to encourage PO intake
- o **Pain management**
  - Scheduled ketorolac q6hr in patients greater than 6 months if age
  - Transition to PO ibuprofen once taking PO – usually POD2, for a total of 7 days of NSAIDs to pain management and anti-inflammatory to prevent pericardial effusion
  - Acetaminophen PRN
  - Oxycodone PRN
  - Morphine PRN but long-acting IV opioid use is discouraged over other PRN options once on the floor
- o **Physical Activity** – encourage holding of infants by caregivers, ambulation in patients who can walk by POD1-2; Physical therapy evaluation and intervention for older children/teens/young adults if needed
- o **Diuretics** – initially IV, transitioned to enteral once chest tubes are removed, BMPs trended and electrolytes replaced as needed, kidney function monitored
- o **Discharge Testing** – post-op EKG and echocardiogram usually the morning of discharge, and Chest X-ray after the removal of chest tubes (also likely AM of discharge)
- o **Discharge Teaching** for post-operative care provided via informational hand-out (Appendix C, D, and E) in discharge paperwork as well as through Get Well Network video, and reviewed by APRN with family
- o **Incision care** and chest tube site care and assessment
- o **Follow-up appointments** arranged with CV surgery and primary outpatient cardiologist – email/phone communication made at time of discharge to ensure smooth transition of care

**Additional Questions Posed by the CPM Committee**

No clinical questions were posed for this review

**Measures To Be Monitored:**

Pre-Op	Intra-Op	Post-Op	
		CICU	Inpatient
Carbohydrate-Rich Drink	Avoidance of long-acting opioids		
	Administration of PONV prophylaxis	Time until Extubation	Chest Tube Removal
	Neuraxial Block/Regional Block/Surgeon Injects Local	Avoidance of long-acting opioids	Avoidance of long-acting opioids
	Antibiotic given prior to Incision	Time to Transfer from CICU	Total Length of Stay
	Normothermia at time of transfer		
	IV Acetaminophen		
	Surgical Time		

**Potential Cost Implications**

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

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- Decreased inpatient length of stay
- Decreased unwarranted variation in care

## **Potential 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 pathways within the hospital setting

## **Power Plans**

- No specific power plans developed for this ERAS pathway

## **Associated Policies**

- There are no associated policies with the Cardiac Surgery ERAS pathway for bypass or thoracotomy procedures.

## **ERAS Model Preparation**

This care process was prepared by the Department of Evidence Based Practice in collaboration with content experts at Children's Mercy Kansas City. The development of this care process supports the Division of Service and Performance Excellence's initiative to promote care standardization that builds a culture of quality and safety that is evidenced by measured outcomes. If a conflict of interest is identified the conflict will be disclosed next to the committee member's name.

## **Implementation & Follow-Up**

Once approved, this ERAS pathway was shared to appropriate care teams and implemented. New handouts for patients and families were created for pre-surgery visits including a preparation checklist and an overview of the ERAS pathway. Care measurements will be assessed and shared with appropriate care teams to determine if changes need to occur. This ERAS pathway is scheduled to be revisited by all teams within six months of the release date.

## **Cardiac Surgery ERAS Committee Members and Representation**

- Joseph Huffman, MD, FASA | Anesthesiology | Committee Co-chair
- Christian Taylor, MD | Anesthesiology | Committee Co-chair
- William Douglas, MD | Cardiac Surgery | Committee Member
- Apurva Panchal, MD | Critical Care Medicine | Committee Member
- Lindsey Malloy Walton, DO, MPH | Cardiology | Committee Member
- Robin Hulse, MSN, APRN, PCNS, CPN | Anesthesiology | Committee Member
- Rebecca Juhl, DNP, APRN, CPNP-AC, CCRN | Heart Center | Committee Member
- Sarah Lagergren, APRN | Heart Center | Committee Member
- Melissa McGraw, MSN, RN, CPNP | Heart Center | 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 Evidence Based Practice, Anesthesiology, and Cardiac Surgery Departments.

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**Approval Obtained:**

Department/Unit	Date Approved
Anesthesiology	June 2022
Cardiology	July 2022
Cardiac Care	July 2022
Cardiac Surgery	June 2022
Evidence Based Practice	July 2022

**Version History**

Date	Comments
July 2022	Initial version

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APPENDIX A

# ERAS

Cardiac Enhanced Recovery  
After Surgery Pathway



BEFORE SURGERY	<ul style="list-style-type: none"> <li>✓ Education</li> <li>✓ Medical management of your child's heart condition</li> </ul> <hr/> <ul style="list-style-type: none"> <li>✓ Pre-operative surgery appointment</li> </ul>	 HOME   CARDIOLOGY CLINIC
DAY OF SURGERY	<ul style="list-style-type: none"> <li>✓ No solid food six hours before surgery</li> <li>✓ <i>Carbohydrate-rich drink two hours before surgery</i></li> <li>✓ Pre-operative medication for anxiety</li> </ul>	 PRE SURGICAL AREA
DURING SURGERY	<ul style="list-style-type: none"> <li>✓ Minimize blood transfusions</li> <li>✓ Multiple approaches to treat pain and reduce opioid need</li> <li>✓ Prevention of post-operative nausea</li> <li>✓ Prevention of post-operative delirium</li> <li>✓ Avoidance of hypothermia or hyperthermia</li> </ul>	 OPERATING ROOM
AFTER SURGERY	<ul style="list-style-type: none"> <li>✓ <i>Early transfer out of CICU</i></li> <li>✓ Early removal of breathing tube</li> <li>✓ Early removal of catheters, lines, and tubes</li> <li>✓ Transition from IV to oral medications as soon as possible</li> <li>✓ Combination of medications to treat pain</li> <li>✓ Prevention of nausea</li> <li>✓ Getting out of bed as soon as possible after surgery</li> <li>✓ Return to a normal diet</li> <li>✓ Continuous updates and communication from cardiac surgery nurse practitioner, including daily rounds with team</li> </ul>	 CARDIAC ICU and INPATIENT UNIT
FOLLOW UP	<ul style="list-style-type: none"> <li>✓ Monitor recovery</li> <li>✓ Satisfaction survey</li> </ul>	HOME

Developed by Departments of Anesthesiology and Evidence Based Practice  
7.18.22





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APPENDIX B



**ERAS**  
Enhanced Recovery  
After Surgery  
Patient Pre-Operative Checklist

ERAS program helps to:

-  Promote overall healing from surgery
-  Decrease opioid pain medicine use and side effects by using regional anesthesia
-  Promote return to normal diet faster
-  Decrease length of hospitalization

 <p>SURGERY</p>	<p>My child's heart surgery is scheduled on _____.</p> <p>Please be at the hospital and checked in to Same Day Surgery at - _____.</p>	<input type="checkbox"/>
 <p>FOOD</p>	<p>Your child should eat regular, healthy meals the day before surgery.</p> <p>Your child must stop eating or taking formula/fortified breastmilk at least 6 hours before surgery and plain breastmilk 4 hours before surgery starts.</p>	<input type="checkbox"/>
 <p>CARBO DRINK</p>	<p>Choose a clear, carbohydrate-rich drink like Gatorade or Pedialyte for your child to drink 2 hours before surgery.</p> <p>They must finish drinking it no later than 2 hours before the surgery time.</p>	<input type="checkbox"/>
 <p>MEDICINES</p>	<p>Give other medications on surgery day as instructed in PAT.</p>	<input type="checkbox"/>
 <p>QUESTIONS</p>	<p>We are here to help with your questions before surgery.</p> <p>If you have any questions, please call (816) 234- 3000, and ask for the Heart Center Procedural APN on call.</p>	<input type="checkbox"/>

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**APPENDIX C****Going Home after Cardiac Surgery – Infant****Care of Your Child's Incision:**

- Check the incision daily for signs of infection: redness, swelling, drainage and/or rash
- If concern for fever check your child's temperature. Contact on call Heart Center nurse practitioner for fever above 101°F (38.4°C)
- Sponge bathe your child for the first seven days after surgery
- Your child may begin taking tub baths or showers one week after their surgery, on \_\_\_\_\_
- When bathing your child, be sure to wash the incision and chest tube sites with soap and water. Dry thoroughly. Incision care will continue for 10 days post-operatively
- **DO NOT** put any lotion, cream, or powder on the incision area for at least one month
- The steri-strips will be removed after 7 days- this can be done at home or at follow-up if you are not comfortable removing yourself. If they fall off prior to removal this is okay
- Blake drain stitches will be removed at your follow-up doctor visit. This should be done one week after removal but should not remain in place greater than 14 days. If sutures fall out prematurely, they do not need to be replaced. Please have your provider call Children's Mercy at (816) 234-3880 and ask for Heart Center APRN if they have questions regarding the removal
- Once healed, be sure to use sunscreen on the scar as it is more likely to burn from UV exposure

**Diet:**

- Your baby can take as much breast milk or formula as he/she wants, unless otherwise instructed
- He/she may need extra calories because his/her heart may be working harder than most babies
- If your child needs higher caloric breast milk or formula, the nutritionist will talk with you before going home
- To make feeding time easier for your baby:
  - Hold your baby in a semi-upright position
  - Feed your baby smaller amounts more often
  - Limit feeding time to 30 minutes
  - Burp your baby frequently (after an ounce or 5 minutes of breast feeding)

**Activity:**

- Your child may resume normal activity after his/her cardiology follow-up appointment. Until then, follow these recommendations:
  - Long bouts of crying may tire your infant – Tend to your infant's needs quickly to prevent long periods of crying
  - When lifting your infant, **do not lift under the arms** for one month following surgery – "Scoop" to lift your baby and support his/her bottom with your hand
  - Your infant may do tummy time, as well as ride in his/her car seat with chest clip positioned across incision

**Day Care:**

Your child should not attend daycare until after their follow-up appointment. This may mean that you (parent) may have to arrange to be off work or provide other at home care.

**Dental Care:**

- Many children with heart defects require antibiotics prior to dental procedures to prevent infection
- Good tooth brushing and regular visits to the dentist are important since tooth decay can lead to heart infection
- Your cardiologist will advise you regarding precautions you may need to take with dental procedures

**Immunizations:**

- Let your child's primary care provider know your child had open heart surgery and blood transfusions before he/she receives his/her scheduled immunizations
- Please avoid non-live vaccines for 2 weeks and live vaccines for 7 months following surgery unless medically necessary. This does **NOT** include Synagis

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**Questions/Concerns:**

Call if your child has:

- Fever > 101°F
- Rapid, heavy breathing
- Excessive sweating
- Unable to drink bottle or breast feed for 2 feedings in a row
- Puffiness of the eyes or face
- Extreme irritability
- Vomiting more than 3 times a day
- Decreased bowel movements or concern for constipation
- Less than 6 wet diapers in one day

**Important Phone Numbers:**

**In case of a medical emergency, please call 911.** Notify healthcare providers in ER that your child has recently had heart surgery.

The Heart Center Nurse Practitioners are available 24 hours a day. Call (816) 234-3000 and ask the operator to page the Heart Center Nurse Practitioner on call.

Cardiology Clinic: (816) 234-3880

**Video Discharge:**

Please visit the following link for video discharge instructions: <https://youtu.be/TRFmXzz9ujQ>

This information is provided as a public education service. The information does not replace instructions your primary care provider gives you. If you have questions about your child's care, please call your primary care provider or cardiologist's office.

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**APPENDIX D****Going Home after Cardiac Surgery – Toddler/School Age****Care of Your Child's Incision:**

- Check the incision daily for signs of infection: redness, swelling, drainage and/or rash
- If concern for fever check your child's temperature. Contact on call Heart Center nurse practitioner for fever above 101°F (38.4°C)
- Sponge bathe your child for the first seven days after surgery
- Your child may begin taking tub baths or showers one week after their surgery, on \_\_\_\_\_
- When bathing your child, be sure to wash the incision and chest tube sites with soap and water. Dry thoroughly. Incision care will continue for 10 days post-operatively.
- **DO NOT** put any lotion, cream, or powder on the incision area for at least one month
- The steri-strips will be removed after 7 days- this can be done at home or at follow-up if you are not comfortable removing yourself. If they fall off prior to removal this is okay.
- Blake drain stitches will be removed at your follow-up doctor visit. This should be done one week after removal but should not remain in place greater than 14 days. If sutures fall out prematurely, they do not need to be replaced. Please have your provider call Children's Mercy at (816) 234-3880 and ask for Heart Center APRN if they have questions regarding the removal
- Once healed, be sure to use sunscreen on the scar as it is more likely to burn from UV exposure

**Diet:**

- Offer your child his/her regular diet unless otherwise instructed
- Encourage a balanced diet of foods that promote healing: meats, milk, bread products, fruits, and vegetables

**Activity:**

- Your child may resume normal activity after about a month or after his/her cardiology follow-up appointment. Until then, follow these recommendations:
  - Most young children will limit their own activity when they become tired
  - However, your child should not swim, jump on a trampoline, climb, ride tricycles or big wheels, or roller-skate for one month after surgery
  - When lifting your child, do not lift under the arms for one month following surgery

**Behavior:**

- Due to your child's hospitalization and surgery, it is not unusual for him or her to go back to earlier childhood behaviors such as:
  - Bedwetting
  - Awakening during the night
  - Fussiness
  - Nightmares
  - Clinging to parents, etc.

These behaviors usually go away within a short period of time. It is important to set limits for your child and discipline appropriately for his/her age.

**School/Day Care:**

Your child should not attend school or daycare until after his follow-up appointment. This may mean that you (parent) may have to arrange to be off work or provide other at home care.

**Dental Care:**

- Many children with heart defects require antibiotics prior to dental procedures to prevent infection
- Good tooth brushing and regular visits to the dentist are important since tooth decay can lead to heart infection
- Your cardiologist will advise you regarding precautions you may need to take with dental procedures

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**Immunizations:**

Let your child's primary care provider know your child had open heart surgery and blood transfusions before he/she receives his/her scheduled immunizations.

- Please avoid non-live vaccines for 2 weeks and live vaccines for 7 months following surgery unless medically necessary. This does **NOT** include Synagis

**Call if your child has the following:**

- Fever > 101°F
- Rapid, heavy breathing
- Excessive sweating
- Decreased Appetite
- Puffiness of the eyes or face
- New onset vomiting
- Decreased bowel movements or concern for constipation
- Urination less than 2 times in one day

**Important Phone Numbers:**

**In case of a medical emergency, please call 911.** Notify healthcare providers in ER that your child has recently had heart surgery.

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## APPENDIX E

### Going Home after Cardiac Surgery – Teenager/Young Adult

#### Care of Your Child's Incision:

- Check the incision daily for signs of infection: redness, swelling, drainage and/or rash
- If concern for fever check your child's temperature. Contact on call Heart Center nurse practitioner for fever above 101°F (38.4°C)
- Sponge bathe for the first seven days after surgery
- You may begin taking tub baths or showers one week after surgery, on \_\_\_\_\_
- When bathing your child, be sure to wash the incision and chest tube sites with soap and water. Dry thoroughly. Incision care will continue for 10 days post-operatively.
- **DO NOT** put any lotion, cream, or powder on the incision area for at least one month
- The steri-strips will be removed after 7 days- this can be done at home or at follow-up if you are not comfortable removing yourself. If they fall off prior to removal this is okay.
- Blake drain stitches will be removed at your follow-up doctor visit. This should be done one week after removal but should not remain in place greater than 14 days. If sutures fall out prematurely, they do not need to be replaced. Please have your provider call Children's Mercy at (816) 234-3880 and ask for Heart Center APRN if they have questions regarding the removal
- Once healed, be sure to use sunscreen on the scar as it is more likely to burn from UV exposure

#### Diet:

- You have no dietary restrictions
- We encourage a balanced diet of foods that promote healing: meats, milk, bread products, fruits and vegetables

#### Activity:

- You may resume normal activity after about a month or after your cardiology follow-up appointment. Until then, follow these recommendations:
  - You should avoid contact sports or activities such as bike riding, swimming, climbing, or rollerblading
  - You should ride in the back seat of vehicles and no driving for one month after surgery
  - You should not go to gym class for at least one month
  - You should not lift anything over 10 pounds

#### School:

You should not attend school until after your first follow-up appointment.

#### Dental Care:

- Many individuals with heart problems require antibiotics prior to dental procedures to prevent infection
- Good tooth brushing and regular visits to the dentist are important since tooth decay can lead to heart infection
- Your cardiologist will advise you regarding precautions you may need to take with dental procedures

#### Immunizations:

Let your primary care provider know you had open heart surgery and blood transfusions before you receive scheduled immunizations.

- Please avoid non-live vaccines for 2 weeks and live vaccines for 7 months following surgery unless medically necessary. This does **NOT** include Synagis

#### Call if you have the following:

- Fever > 101°F
- Rapid, heavy breathing
- Excessive sweating
- Decreased Appetite
- Puffiness of the eyes or face

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- New onset of vomiting
- Decreased bowel movements or concern for constipation
- Urination less than 2 times in one day

**Important Phone Numbers:**

**In case of a medical emergency, please call 911.** Notify healthcare providers in ER that you recently had heart surgery.

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