

# Nuss Procedure Pathway

**Pathway Purpose:** To provide standardized perioperative multimodal pain management for patients undergoing Nuss procedure (endoscopic pectus excavatum repair) to decrease post-operative length of stay.

## Inclusion Criteria:

- Patients undergoing Nuss procedure

## Exclusion Criteria:

- Ravitch procedure (open pectus repair)
- Revisions or bar removal
- Cardiac population

## Pre-operative Pediatric Surgery Clinic Visit

- Provide patient and family with education about regional anesthesia catheters and multimodal pain control options
- Set expectations about post-operative pain and pain management
- Provide patient with pre-operative exercises (*see last page*)
- Provide patient with incentive spirometer (IS), demonstrate use, and obtain baseline reading
- Screen for pre-existing anxiety, depression, or issues with chronic pain
  - *If pain management concerns identified – peds surgery MD/APP to place pre-op referral to Pain Clinic*

## Day before surgery

### Patient instructions:

- Patient to eat normal breakfast and lunch (by noon)
- After lunch, patient to drink magnesium citrate (8oz bottle), then only a full liquid diet (includes smoothies, protein shakes) until midnight
- Afterwards, only clear carbohydrate-containing liquids (e.g. apple juice/Pedialyte®/Gatorade®) until 1 hr. prior to scheduled procedure time; see [NPO Guidelines Policy](#)

## Day of surgery

## Pre-op

### Peds Surgery MD/APP to order:

- Acetaminophen PO
  - 15mg/kg (max 1000mg) once
- Gabapentin PO
  - <40kg: 15mg/kg once
  - 40-60kg: 600mg once
  - >60kg: 900mg once

### *If intra-op ketorolac is contraindicated:*

- Celecoxib PO
  - <50kg: 100mg once
  - ≥50kg: 200mg once

### Anesthesia MD/APP to order:

- Midazolam IV
  - 2mg once

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**Associated Order Set:** Pectus Excavatum PostOp

**Associated Policies:**  
[NPO Guidelines for Inpatients and Outpatients](#)



Feedback?

Packard Clinical  
Pathway Program



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## Intra-operative

### AIRWAY MANAGEMENT

- If cryoablation **IS NOT** planned: anticipate double-lung ventilation with single lumen endotracheal tube (ETT)
- If cryoablation **IS** planned: anticipate need for single-lung ventilation requiring double-lumen ETT or bronchial blocker

### MONITORING

- Consider EEG monitoring (e.g. Sedline®, BIS®), especially if using a total intravenous anesthesia (TIVA) technique

### REGIONAL ANESTHESIA TECHNIQUE

- **1<sup>st</sup> choice:** paravertebral nerve block (PNB)
- **2<sup>nd</sup> choice:** erector spinae plane block catheter (ESPB)

### REGIONAL PAIN CONTROL

*If regional anesthesia catheters:*

- Initial dose prior to incision
- Ropivacaine 0.2% bolus: 0.3mL/kg q120 min alternating sides (max 20mL)

*If nerve cryoablation:*

- No regional anesthesia
- Exparel® intercostal blocks per surgeon preference. Place patient Exparel® wrist band prior to leaving OR

### IV PAIN CONTROL

*On induction:*

- Methadone 0.15-0.2mg/kg (max 20mg)\*

*Prior to extubation:*

- Ketorolac 30mg
- Acetaminophen 15mg/kg (max 1g given at noon if still in OR)

*\*Recommend against routine use of additional opioids intra-op*

### PONV MANAGEMENT

*On incision:*

- Dexamethasone 0.1mg/kg IV (max 10mg)

*Prior to extubation:*

- Ondansetron 0.1mg/kg IV (max 4mg)
- Fosaprepitant 4 mg/kg (max 150 mg) IV x 1

## Postoperative day 0

### MULTIMODAL PAIN CONTROL

Regional anesthesia catheters (if in place)

- Ropivacaine 0.2% bolus: 0.3mL/kg q120 min alternating sides (max 20mL)

Parenteral (IV)

- Hydromorphone PCA at ~3mcg/kg/dose (round to nearest 50mcg) q8 min lock-out
- Ketorolac 0.5mg/kg/dose (max 30mg) q6h
- Lorazepam 0.3mg (<50kg) or 0.5mg (≥50kg) q6h PRN if not tolerating PO and unable to take methocarbamol or diazepam (see below; may also use for nausea)

Oral (PO)

- Acetaminophen PO (or IV) 15mg/kg (max 650mg) q6hr
- Gabapentin 300mg TID
- Oxycodone 0.15mg/kg (max 10mg, round to nearest 2.5mg) q6hr
- Methocarbamol 15mg/kg PO TID
  - If significant anxiety: Diazepam 0.05-0.1mg/kg q6h (max 5mg)

### OTHER POST-OP NEEDS

- Polyethylene glycol 17gm PO at bedtime
- Out of bed (OOB) with PT/OT in afternoon
- Discontinue foley catheter after OOB with PT
- Incentive spirometry: goal 500mL

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# Nuss Procedure Pathway

## Postoperative day 1

### MULTIMODAL PAIN CONTROL

Regional (if in place)

- STOP regional anesthesia catheters at 0600 and remove at 1200

Parenteral (IV)

- STOP Hydromorphone PCA at 0600
- START hydromorphone 0.002-0.003mg/kg/dose (round to nearest 0.05mg) q2h PRN severe pain not controlled by PO oxycodone
- Ketorolac 0.5mg/kg/dose (max 30mg) q6h
- STOP Lorazepam 0.3mg (<50kg) or 0.5mg (≥50kg) q6h PRN (unless needed for nausea/vomiting control)

Oral (PO)

- Acetaminophen PO 15mg/kg (max 650mg) q6hr
- Gabapentin 300mg TID (If ≥ 50kg increase to 600mg TID if not limited by sedation)
- Oxycodone 0.15mg/kg (max 10mg, round to nearest 2.5mg) q6hr
- START Oxycodone 0.05mg/kg (max 5mg, round to nearest 2.5mg) q4hr PRN moderate to severe pain
- Methocarbamol 15mg/kg PO TID
  - If significant anxiety: Diazepam 0.05-0.1mg/kg PO q6hr

### OTHER POST-OP NEEDS

- Polyethylene glycol 17gm PO at bedtime
- Ambulate with PT/OT out of room at least once
- All meals in bedside chair
- Incentive spirometry: goal 750mL

## Postoperative day 2 – Goal discharge @ 1100

### MULTIMODAL PAIN CONTROL

Peds Surgery MD/APP to:

- Assess pain and review use of opioid and benzo PRNs
- Assess for side effects
- Assess function for daily activities

Parenteral (IV)

- Ketorolac 0.5mg/kg/dose (max 30mg) q6h (continue until discharge, maximum of 5 days)

Oral (PO) – adjust for discharge based on assessment above

- Acetaminophen 15mg/kg (max 650mg) q6hr
- Gabapentin 300mg TID (<50kg) or 600mg TID (≥ 50kg)
- Oxycodone 0.15mg/kg (max 10mg, round to nearest 2.5mg) q6hr
- Oxycodone 0.05mg/kg (max 5mg, round to nearest 2.5mg) q4hr PRN moderate to severe pain
- Methocarbamol 15mg/kg PO TID
- Discharge Teaching
  - Weaning of medications
  - Maximum doses
  - Disposal of extra medications

### DISCHARGE NEEDS

- Education about mobility goals
- Precautions for home

See next page for expected discharge medication regimen

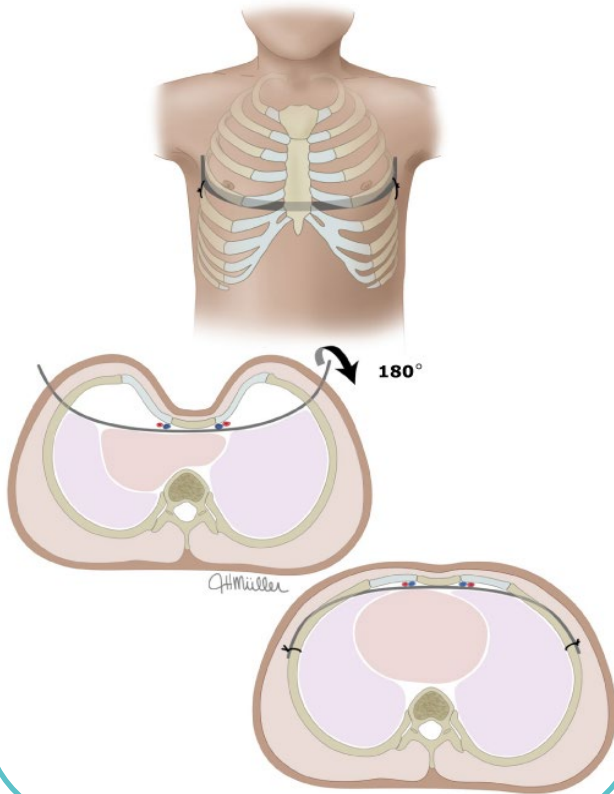
## Discharge medication regimen

### Subject to change based on pediatric surgery's final assessment

- Oxycodone 0.15mg/kg (max 10mg, round to nearest 2.5mg) – pharmacy to dispense 20 doses
  - Up to POD 3: q6hr ATC (6a/12p/6p/12a)
  - POD 3-5: q6hr PRN
  - POD 5+: Stop
  
- Acetaminophen 15mg/kg (max 650mg)
  - Up to POD 14: q6hr ATC (6a/12p/6a/12a)
  - POD 14+: PRN
  
- Methocarbamol 15mg/kg
  - Up to POD 4: TID ATC
  - POD 4-7: TID PRN
  - POD 7+: Stop
  
- Gabapentin 300mg (<50kg) or 600mg (≥50kg)
  - Up to POD 14: TID (9a/2p/9p)
  - POD 14-20
    - If 300mg TID: wean to 300mg BID
    - If 600mg TID: wean to 300mg TID
  - POD 21-27
    - If 300mg BID: wean to 300mg daily
    - If 300mg TID: wean to 300mg BID
  - POD 28-34
    - If 300mg daily: STOP (4 calendar weeks after starting gabapentin)
    - If 300mg BID: wean to 300mg daily
  - POD 35+
    - If 300mg daily: STOP (5 calendar weeks after starting gabapentin)
  
- Ibuprofen 10mg/kg (max 600mg, round to nearest 200mg)
  - Up to POD 14: q6hr ATC
  - POD 14+: PRN
  
- Polyethylene glycol 17gm daily while on opioids
  - Can add BID prn no stool

# Nuss Procedure Pathway

## Nuss Procedure



### Patient Pre-operative Exercises:

1. It is important to do this exercise for 10 min each morning and evening. The goal of this exercise is to straighten the back and pull the shoulders back.
  - Place your hands behind the head and interlock your fingers
  - Pull your elbows back as much as possible while keeping your head and neck straight
  - Bend from the hips, forward and down, to a horizontal position. Hold this position for 2–3 s.
  - Remember to keep the elbows, head, and neck straight during the exercise
2. During the day, your child should be active and do aerobic activities (such as: hiking, bicycling, basketball, baseball, running, and brisk walking)

### References:

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