It Doesn't Have to Hurt:
Innovative Pain Strategies for Pediatric Patients Undergoing Surgery

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Speaker Introduction

Dr. Beth Paton has nearly 30 years of experience in acute care pediatric nursing in both the emergency department and pediatric surgery. She received her BSN in 1992, MSN in 1999 and DNP in 2017. She is certified as a pediatric nurse practitioner (PNP) in primary and acute care. Dr. Paton is a certified pediatric and pediatric emergency nurse. She worked in a pediatric emergency department for 16 years in various roles, including as a PNP and has given lectures on various pediatric topics both locally and nationally for more than 15 years. Dr. Paton is active in local and national organizations including the Emergency Nurses Association, American Pediatric Surgical Nurses Association and NAPNAP. Her current employment is director of advanced practice nursing, a PNP with pediatric surgery at a free-standing children's hospital, and an assistant professor at the University of Tennessee College of Nursing. She has published articles related to pediatric emergency medicine and surgery in peer-reviewed journals, participates in clinical research projects, and is active in bringing evidence-based practice to the bedside. Dr. Paton recently completed a study on post-operative pain control for patients undergoing the Nuss procedure for correction of pectus excavatum and has initiated a second-tier project that will ideally minimize opioid use. As an assistant professor, she teaches PNP acute care students about general pediatric surgery and pain management. In addition, she is active in employing the early recovery after surgery guidelines at her institution with a special interest in pain control components.

Disclosures

I have no disclosures

Learning Objectives

• List various modalities to employ to manage pain in the surgical pediatric patient.
• Recite current literature to support best practice as it relates to pain control.
• Recognize modifications that can be made to a pain management strategy to address individual needs.

Shocking Facts

• Postoperative acute pain is pain present in surgical patients following the procedure
• Pain is inadequately treated in children
• It is difficult to assess pain in children
• Poor pain control = prolonged recovery times = increased morbidity

Pain Assessment

Boric, Dosenovic, & Kadic, et al., 2017
Measuring Pain

- PIPPS
- CRIES
- NIPS
- FLACC
- FACES
- Oucher
- Numeric Pain Rating Scale
- Other

PIPPS (Premature Infant Pain Profile Scale)
- Neonates with gestational age 28-36 weeks
- Gestational age
- Behavioral state
- Heart rate
- Oxygen saturation
- Brow bulge
- Eye squeeze

CRIES
- Infants 0-6 months
- Crying
- Required O2 for SaO2
- Increased blood pressure
- Expression
- Sleepless

NIPS (Neonatal Infant Pain Scale)
- Children <1 year
- Facial expression
- Cry
- Breathing patterns
- Arms
- Legs
- State of arousal

FLACC
- For Children 2 months - 7 years
- Faces
- Legs
- Activity
- Cry
- Consolability

FACES
- For Children >3 Years
- 5 faces representing pain levels
13 Numeric Pain Rating Scale

For Children >8 years

0 1 2 3 4 5 6 7 8 9 10

No pain  Moderate pain  Worst possible pain

14 Other Pain Scales

CHEOPS
Oucher scale
COMFORT scale
Noncommunicating Children’s Pain Checklist

15 Physiology of Pain

16

17 Does your facility have a pain team?

Yes  No

18 Non-pharmacological Pain Management
What Do Kids Fear?

**Infants**
- Separation
- Strangers

**Toddler**
- Separation
- Stranger
- Unfamiliar environment
- Loss of control
- Pain

**Preschool**
- Separation
- Mutilation
- Hospitalization as punishment
- Loss of control
- Body image concerns
- Showing emotions
- Death

**School-age**
- Mutilation and pain
- Hospitalization as punishment
- Loss of control
- Body image concerns
- Showing emotions
- Death

**Adolescent**
- Loss of control and independence
- Body image concerns
- Reluctant to inform about pain
- Fear of death

Non-pharmacological Interventions

- Therapeutic play
- Pet therapy
- Music therapy
- Non-nutritive sucking
- Swaddling

Age Specific Interventions

**Infant**
- Swaddle
- Pacifier
- Breastfeed
- Hold infant in position of comfort

**Toddler**
- Limit staff
- Soft approach
- Security objects

**Preschool**
- Limit number of staff
- Therapeutic touch
- Preparation and explanation
- Pet therapy
- Child life

**School-age**
- Distraction
- Breathing exercises
- Preparing and explanation
- Ice packs, warm compresses, repositioning
- Permission to express emotions
- Pet therapy
- Child life

**Adolescent**
- Parental presence
- Distraction
- Child life
- Pet therapy
- Provide choices and independence
- Respect privacy

Pharmacological Pain Management
## Pharmacologic Agents

- **Oral Sucrose**
- **Topical agents**
- **Ibuprofen or Acetaminophen**
- **Injected Lidocaine**
- **Intranasal Fentanyl and midazolam**
- **Opioids**
- **Other agents**

### Oral Sucrose

- Provides pain control for newborn babies
- Effective pain control for brief procedures
- Venipuncture
- Heel stick
- IM injections
- Does not provide effective pain control for circumcisions

### Topical Agents

- **EMLA cream** - 2.5% Lidocaine/2.4% Prilocaine
  - Analgesia achieved in 60-90 minutes
  - Apply to intact skin
  - Contraindicated in infants <1 month - methemoglobinemia
- **LET gel (Lidocaine-Epinephrine-Tetracaine)**
  - Analgesia achieved in 20-30 minutes
  - Apply to open wounds
  - Avoid on digits, pinna, tip of nose, penis
- **Viscous Lidocaine**
  - Topical analgesia for mucosal sores
  - Use with caution - overdose may lead to seizures
- **Lidocaine jelly**
  - May be used for urethral catheterizations or nasogastric tube insertion

### Oral Agents

- **Acetaminophen**
  - May be given pr, po, or IV
  - Several forms
  - Dose - 10-15mg/kg every 4-6 hours
  - Maximum dose 90 mg/kg/day
  - Avoid with hepatic impairment/liver disease
**Ibuprofen**
- Very effective analgesic for pediatrics
- Several forms
- Dose: 5-10 mg/kg every 6-8 hours, max dose 40 mg/kg/day
- Caution in patients with renal impairment, bleeding disorders, GI ulcers

**Hydrocodone and Oxycodone**
- Opioid analgesic
- Typically a combined agent with acetaminophen
- Forms
- Caution not to exceed daily acetaminophen dose
- Hydrocodone
  - Dose 0.15 mg/kg/dose every 4-6 hours
- Oxycodone
  - Dose 0.1 mg/kg/dose every 4-6 hours

**Gabapentin**
- Good for neuropathic pain
- Exact mechanism of action unknown
- Studies have documented some improved pain, decreased nausea, and less opioid use when administered in the perioperative period
- Typical dose for children >12 years: 300 mg 1-3 times per day

**Injectable Agents**

**Ketorolac**
- NSAID
- May be given IM or IV
- Dose 0.5 mg/kg every 6 hours, max dose 30 mg every 6 hours
- Same precautions as ibuprofen
- Limit duration of use
- If needed for prolonged period of time, consider GI prophylaxis

**Morphine**
- Opioid analgesic
- Dose 0.05-0.1 mg/kg IV every 2-4 hours
- Typical adult dose 2-4 mg IV
- Side effects include nausea, vertigo, pruritus, respiratory depression
Patient Controlled Analgesia

- Best in patients ≥ 8 years of age
- Keeps pain at a steadier level
- Easily titrated/weaned
- Programmable pumps
- Use with antiemetics, antipruritics, stool softeners

Other Medications

Dexamethasone
- Prophylaxis for postoperative nausea and vomiting (PONV)
- Effective if given before induction
- Dose 0.2-0.5 mg/kg IV
- Lower pain scores post-operatively

Ketamine
- May decrease postoperative pain
- Does not appear to be opioid-sparing

Clonidine
- Alpha-2 adrenergic agonist
- Adjunct to multimodal analgesia
- Routes include oral, transdermal, and neuraxially
- Other effects include sedation and anxiolysis

Dexmedetomidine (Precedex)
- Alpha-2 adrenergic agonist
- Adjunct to multimodal analgesia
- Typically used intraoperatively and in Critical Care
What is Multimodal Analgesia

Targets multiple components of the pain pathway

Components may include:
- Acetaminophen and NSAIDs
- Oral opioids
- Intravenous opioids
- Gabapentin
- Dexamethasone
- Regional anesthesia

A Snippet About ERAS

• Enhanced Recovery after Surgery

Preoperative:
- Counseling about ERAS
- Carbohydrate load
- Avoid prolonged fasting
- Bowel prep
- Non-opioid prophylaxis

Intraoperative:
- Regional anesthesia
- No NG tube
- Euvolemia
- Normothermia
- Minimizing opioids
- Minimally-invasive approach
- DVT prophylaxis
- Closing protocol

Postoperative:
- Nausea prevention
- Early feeding
- Early mobilization
- Multi-modal pain control
- Early removal of IV fluids
- Early colostomy teaching

Case Scenarios

Scenario 1

5 year old female presents for an umbilical hernia repair
What pain medications would you recommend?

- Acetaminophen
- Ibuprofen
- Hydrocodone
- Other

How would you give the medications?

- Scheduled
- As Needed

The child’s mother calls 2 days later and reports that her child’s pain is uncontrolled with the ibuprofen and demands a prescription for a stronger pain medication.

A 2 year old male is postoperative day 1 from a laparoscopic appendectomy for perforated appendicitis. The child’s nurse reports the child’s pain was uncontrolled overnight.

General Information

- Weight: 12kg
- PO status: NPO
- UOP: 1.5 cc/kg/hr
- Current medications:
  - Morphine: 0.5mg IV q4 hours prn severe pain
  - Acetaminophen: 120mg pr q 4 hours prn mild pain
What would you do next?

- Change morphine to 1mg IV q2 hours prn severe pain
- Add ketorolac 6mg IV q6 hours scheduled
- Change acetaminophen to 120mg IV q4 hours scheduled
- Add ketorolac 6mg IV q6 hours prn moderate pain

What non-pharmacological interventions would you consider?

Six hours later, the nurse calls stating the patient’s pain is still poorly controlled.

Scenario 3

Would you give any pain medications preoperatively?

- [ ] Yes
- [ ] No

A 14 year old male presents for minimally invasive repair of pectus excavatum
What medications would you administer?

- ACETAMINOPHEN
- GABAPENTIN
- BOTH

What would your postoperative pain regimen consist of?

- CRYOABLATION
- MULTIMODAL ANALGESIA
- THORACIC EPIDURAL

So What Works?

Preoperative
- Gabapentin
- Acetaminophen
- Child Life

Intraoperative
- Ketamine
- Corticosteroids
- Dexmedetomidine
- Regional anesthesia
- Diclofenac
- Paracetamol or NSAIDs

Postoperative
- NSAIDs
- Multimodal Analgesia
- Live music therapy
- Therapeutic play

Consider multimodal analgesia
Ensure adequate dose and frequency of medications
Consider duration of pain

Final Points

- Good pain control improves outcomes and patient and family satisfaction
- Pain interventions must be individualized and frequently reassessed
- Education at all points is key

“The alleviation of suffering is universally acknowledged as a cardinal goal of medical care”

Doyle, et al
References


