Children are not just little adults: Importance differences to know when treating acute pediatric pain

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Objectives

The learner will be able to describe analgesics used for treating acute pain in pediatric patients and differences in dosing and metabolism in specific analgesics and side effects.

The learner will be able to list non-opioid analgesics and non-pharmacological modalities for acute pain in pediatrics and how they can decrease the opioids needed to treat acute pain.

The learner will be able to list ways for screening for potential substance and opioid misuse in teens, how this information can be beneficial for managing acute pain, and ways to improve education on opioid safety in the home.

Nothing to disclose for speaker

Some content discussed is off label use

Pharmacological treatment options for acute pain

Opioid Analgesics used for treating acute pain

IV

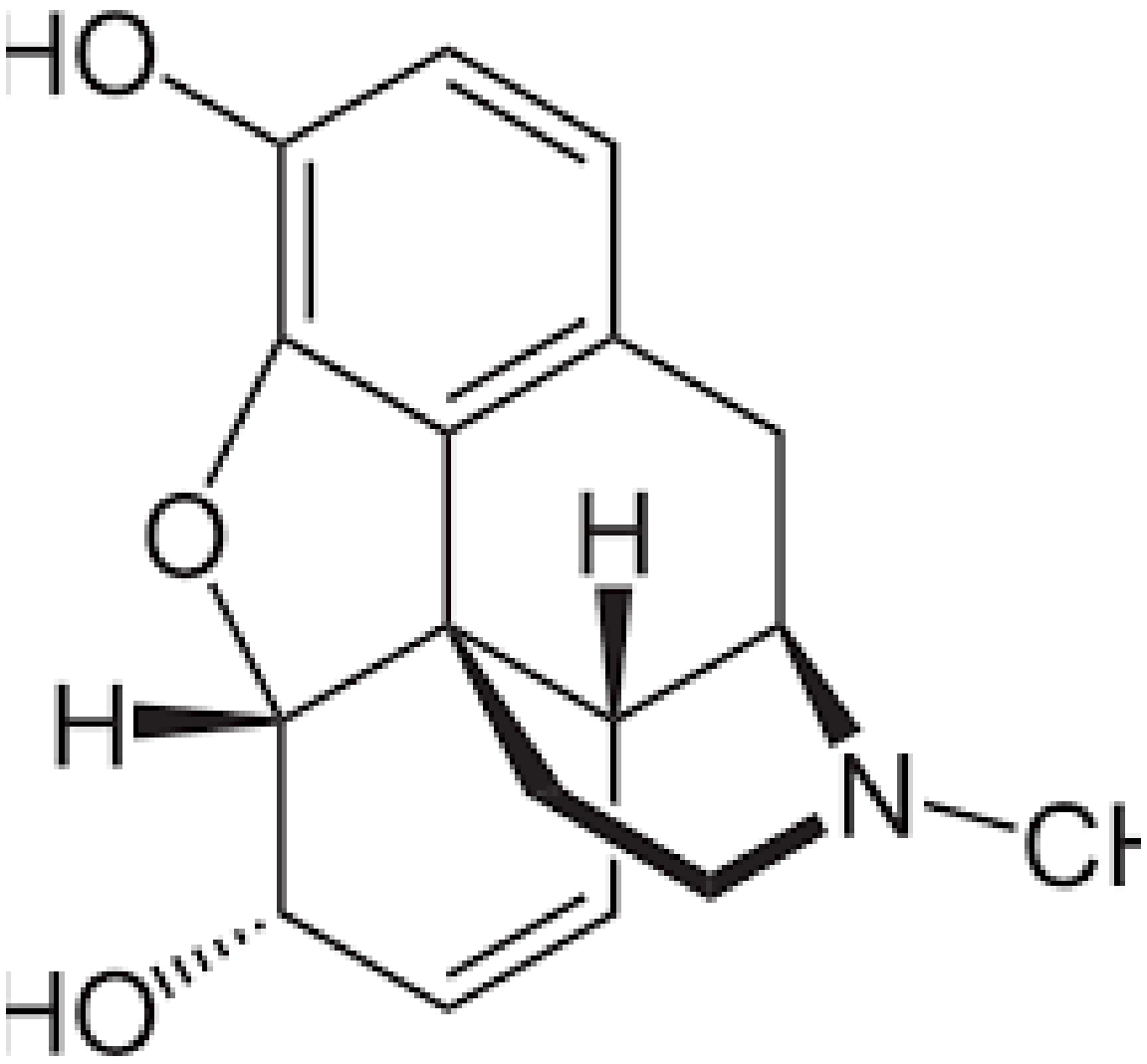
- Morphine
- Hydromorphone
- Fentanyl
- Methadone

Oral

- Oxycodone
- Hydrocodone w/acetaminophen
- Others

Morphine

- Common and widely used
- Works on Mu receptor
- Safe in infants and children
- Common side effects
  - Pruritus
  - Nausea
- Use caution with liver disease &/or kidney disease
  - Metabolized liver
  - Excreted by the kidneys

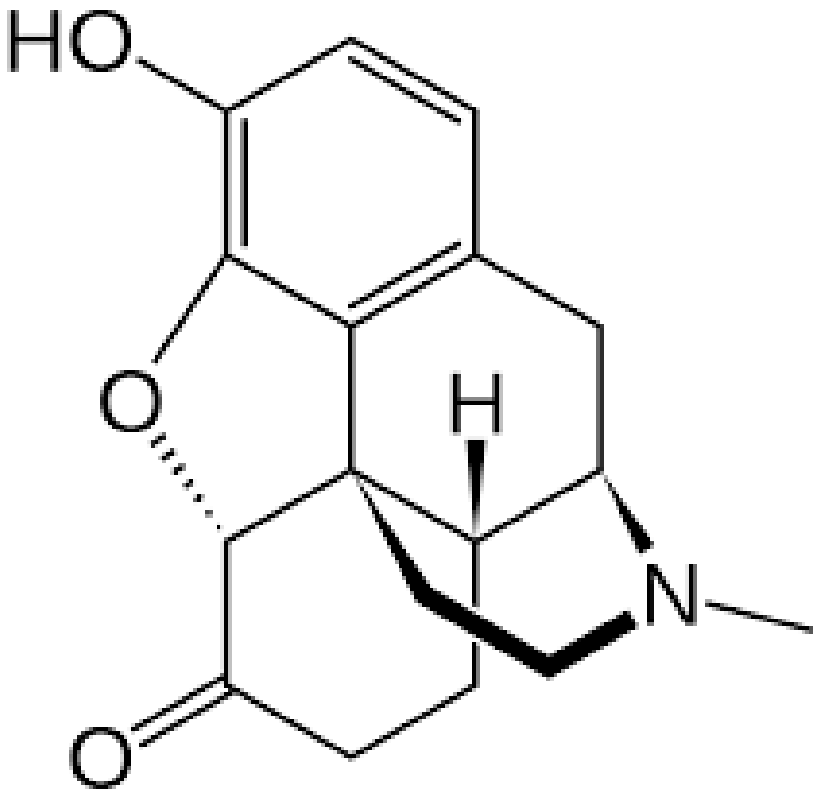


Morphine & Newborns

- higher brain concentrations
- maturational changes in receptor pool- more low affinity receptors (resp depression), fewer high affinity receptors (analgesia)
- ↑ permeability of blood-brain barrier
- prolonged elimination half life
- ↑ gestational age
- ↑ drug clearance, ↓ distribution, & ↓ half-life

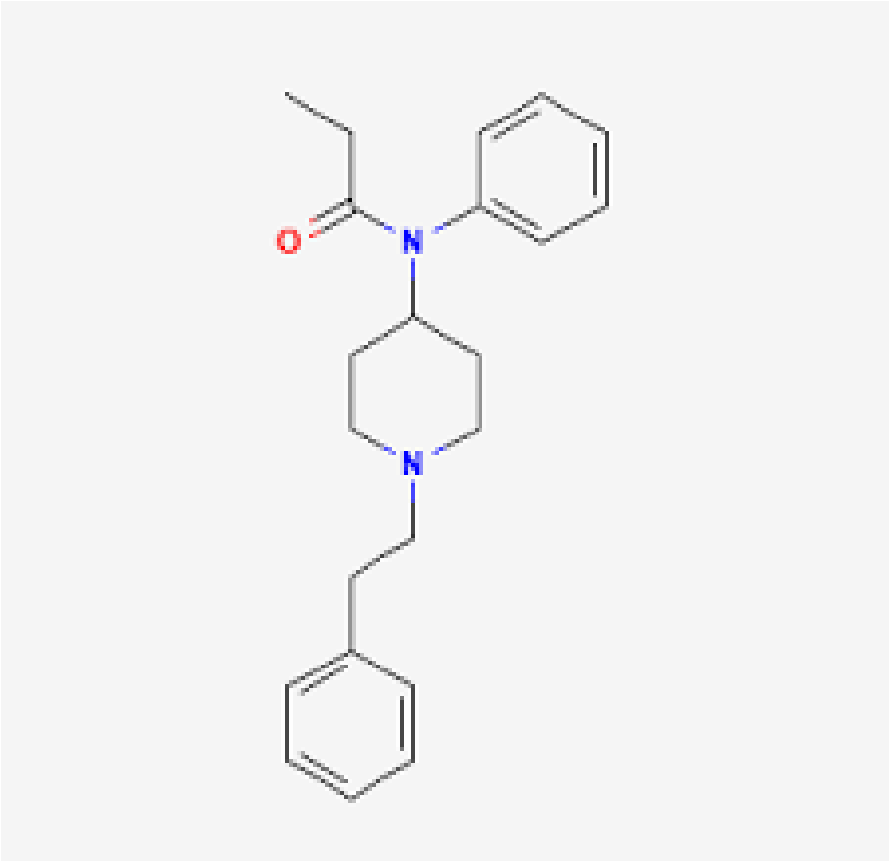
Hydromorphone

- Works on Mu receptors
- Formulation
  - IV, oral, epidural
- Possibly less side effects than morphine
- Common side effects
  - Pruritus
  - Nausea
- Concomitant use of other CNS or respiratory depressants
- No active metabolites
  - Safer to use in patients with liver &/or kidney disease

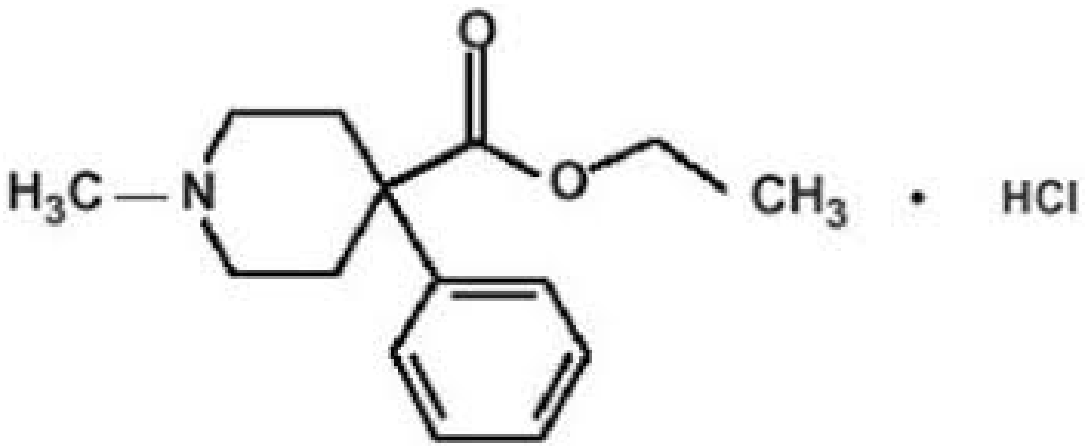


Fentanyl

- Quick acting and short acting
- Synthetic opioid – works on Mu receptor
- Frequently used for painful procedures and infusions
- Formulation - Dosed in Mcg
  - IV, epidural, patch – long acting
- Respiratory depression related to concentration
- Minimal hemodynamic, cardiovascular effects
- Markedly reduced clearance in preemies
- Administer over 3-5 minutes; rapid administration may result in chest wall rigidity, respiratory paralysis, or apnea.



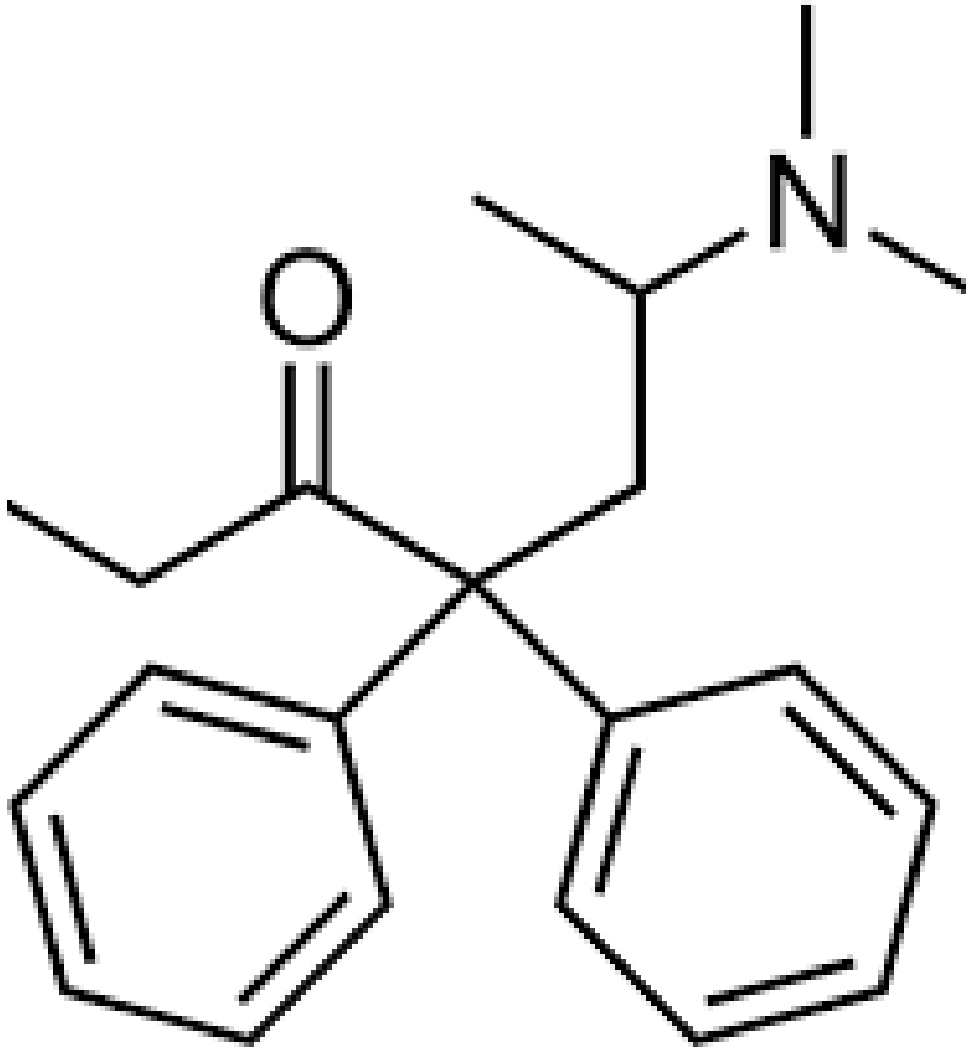
Meperidine



- Should not use for pain management unless allergic to other opiates
- Treat rigors (amphotericin, post op)
- Avoid use of multiple doses
- **Normeperidine CNS toxicity; can cause seizures**

Methadone

- Opioid Agonist at Delta receptor and Antagonist at the NMDA receptors
  - helps with neuropathic pain
- Slow elimination, very long duration of effective analgesia and may build up over time
- Sometimes used intra op and for select post op off label
- Decrease DOSE or FREQUENCY for renal or hepatic insufficiency
- May be used for weaning off long term opioid in the hospital in pediatric setting
- Can cause QTc interval prolongation



Special Considerations for all Opioids

- Hemodynamically compromised patients may develop hypotension with long term use
- S.E. pruritus r/t histamine release
- Increases intracranial pressure possible due to decrease in arterial blood pressure
- Adverse effects may increase if used with other CNS or respiratory depression
  - i.e. phenothiazines, opioid analgesics, barbiturates, antidepressants, scopolamine, MAO inhibitors, & benzodiazepines)

Neonatal Considerations

- Percent total body water > children and adults
- Decreased concentration of proteins needed for binding
- Immature liver
- Decreased metabolism and clearance
- Immature response to hypoxia and hypercarbia – greater risk respiratory depression
- High dose and duration of opioids especially with sedatives may lead to adverse health and neurocognitive outcomes

Other Oral Opioids

- Hydrocodone w/acetaminophen
  - Need to watch acetaminophen dose
  - Available in pill and liquid
- Oxycodone
  - With and without acetaminophen
  - Available in pill and liquid
    - Available IR and ER
- Tramadol
  - Concerns for use with MAO inhibitors
  - Not frequently used in kids
- Tylenol with codeine
  - Black box waring not recommended in pediatrics

Opioid side effect management

GI

- Constipation
  - GI motility medications
  - PO fluids
  - Activity/ambulation
  - Osmotic laxatives, bulk-producing, stimulant, or stool softeners

Nausea and vomiting

- reduce dose
- HT3 receptor antagonist (ondansetron)
- Aprepitant – prevention of postoperative n/v
- Low dose naloxone drip
- change opioid
- Less frequently used
  - promethazine (Phenergan) – caution in children! (Do not use <2yo)
  - metoclopramide

Opioid side effect management

Pruritus

- Direct central effect – mu receptor, histamine release

Treatment

- Reduce dose
- Ondansetron
- Low dose Naloxone infusion
- Antihistamines (diphenhydramine, hydroxyzine)
- Mixed agonist/antagonist (nalbuphine)
- Change opioid

Opioid side effect management

Urinary retention

- Binding with opioid receptors in the spinal cord
  - Causes increased tone in ureters, bladder, and detrusor muscles in bladder
  - Leads to decreased urinary output and urinary retention

Treatment

- Decrease dose
- Low dose Naloxone drip
- Change opioid

Opioid side effect management

Central Nervous System

- Binding with opioid receptors in the brain.
- Sedation
- Respiratory depression
- Less common when on long term opioids at consistent dose

Treatment

- Monitor per protocol
- Decrease dose
- Low dose Naloxone drip

Reversal Agents

Should rarely need to used these agents if you are closely monitoring your patient

- If respiratory depression occurs during sedation, you should immediately open and clear the airway. Then provide assisted ventilation and 100% oxygen as needed.
- Beware of the adverse effects of reversal agents. Weigh the benefit of immediate reversal against provision of respiratory assistance until the adverse effects of the opioid or benzodiazepine dissipate. If you decide to give a reversal agent, consider the following agents.
    - For opioid reversal: **Naloxone (Narcan)**
    - For benzodiazepine reversal: **Flumazenil (Romazicon)**
- Note: the half-life of the reversal agent is frequently shorter than the half-life of the sedative agent.
    - **Observe for recurrence of sedation after the effects of the reversal agent dissipate**

Non-opioid for acute pain

Acetaminophen

NSAIDS

Muscle relaxants

Other

- Anticonvulsants
- Ketamine
- Lidocaine

Non-opioid for acute pain

Acetaminophen

- Oral, rectal and IV formulations
- Eliminated more slowly in newborns
- Max daily dosing recommendations
- Monitor hepatic function with longer term use

NSAIDS

- Oral and IV formulations
- Max daily dosing and length recommendations
- Use caution with compromised gastric mucosa, thrombocytopenia, or renal insufficiency.

Non-opioid for acute pain

Muscle Relaxants

- Not many approved for use in pediatrics
- Can be a useful adjunct
- Can be sedating

Benzodiazepine

- No analgesic properties except for muscle spasms with diazepam
- Should not use long term use
- Can cause CNS depression

Non-opioid for acute pain

Anticonvulsants

- Can be a useful adjunct for surgical pain

Ketamine

- Low dose for analgesia
- Adverse effects – increased intracranial pressure, hallucinations

Lidocaine

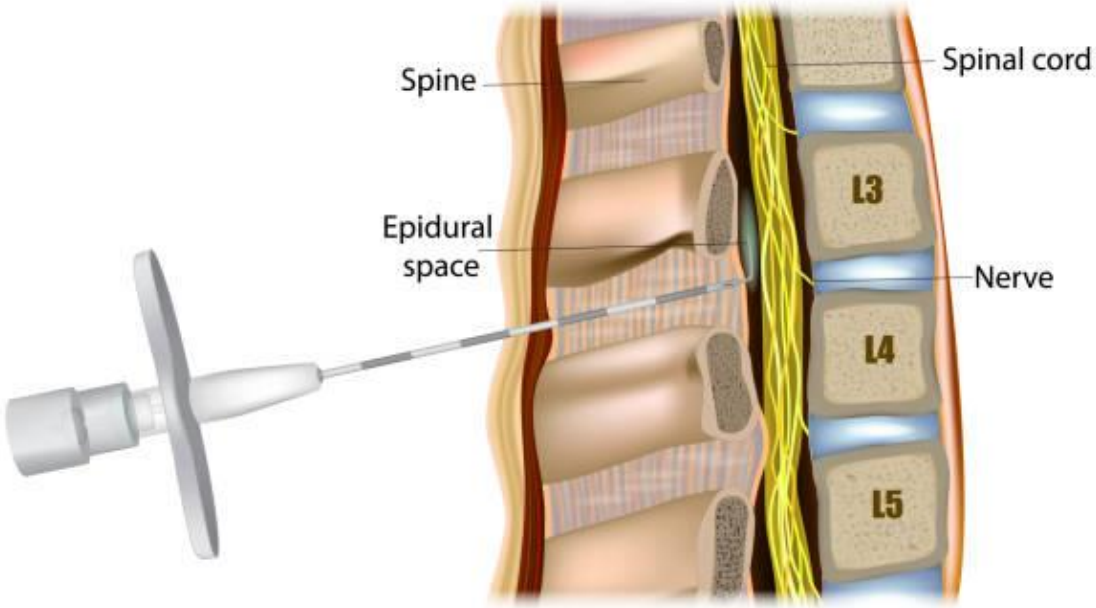
- Low dose analgesia
- Monitor for local anesthetic toxicity
- Should not be used in patients with history of seizures, arrythmias, hepatic failure, electrolyte disturbances.

Regional techniques for post operative pain

- Epidural catheter
- Intrathecal injection
- Spinal Anesthesia
- Nerve blocks
- Peripheral nerve catheter
- Wound catheter

Neuraxial Anesthesia

- Epidural catheter
  - Catheter tip is placed in the epidural space to deliver mediations to provide analgesia
    - Local anesthetic
      - Ropivacaine
      - Bupivacaine
      - Chloropropaine
    - Clonidine
    - ? Opioid
- Intrathecal injection
- Spinal Anesthesia
  - The provider injects medicine into the fluid around your spinal cord.



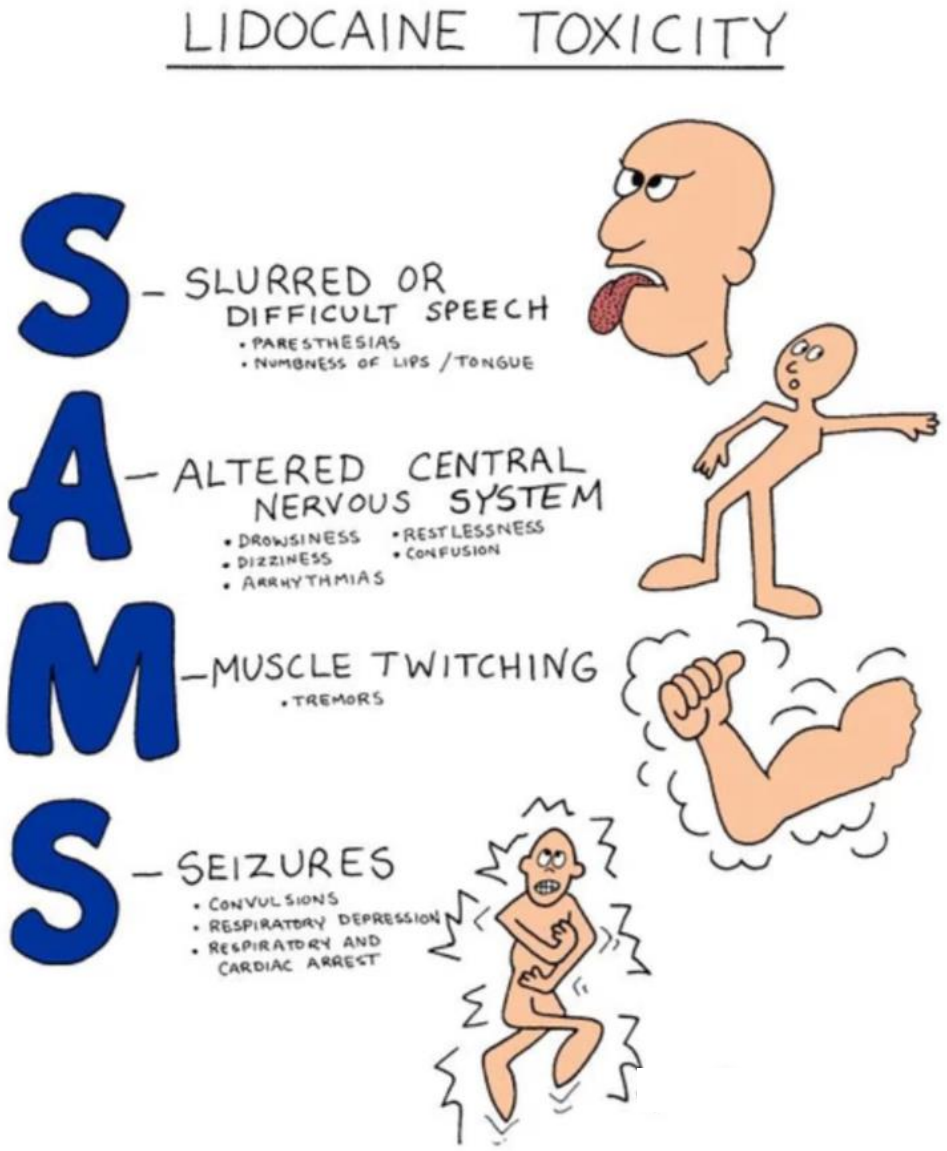
Peripheral nerve blocks & catheter

- Injection or Infusion of local anesthetics used to help control pain after surgery
- Single shot
  - Local anesthetic injection
  - Lasts 12-24 hours
- Infusion
  - Flexible tube placed directly into the patient's surgical site or around the nerves innervating the surgical site that infuses local anesthetic medication

Wound catheter

- A wound catheter placed by a surgeon that infuses local anesthetic into a surgical site.
- Local anesthetics used
  - Ropivacaine
  - Chloroprocaine

Local Anesthetic Systemic Toxicity



Circumcision Procedures

- Recommend multimodal plan
  - Topical anesthetic
  - Nerve block
  - Sucrose and/or pacifier
  - Positioning for comfort
  - Non-opioid analgesic acetaminophen before and for 24 hours after.

Non-pharmacological treatment options

Comfort Plans for Pediatric Patients

- Needle pain
- Other procedure
- Patient anxiety and worry
- Parent anxiety and worry
- Creating a comfortable environment
- Promoting activity

Be sure to have a tool kit available

ICE

- Topical anesthetics
- Sucrose analgesia
- Use of comfort holds
- Distraction toys
- Child’s favorite comfort toy
- Music
- Virtual reality
- Aromatherapy
- Etc.

Non-pharmacological treatment approaches

- Child-life
  - Preoperative teaching
  - Distraction
  - Play therapy
  - Positions for Comfort
  - Parent involvement and coaching

Non-pharmacological treatment approaches

- Physical Therapy
- Occupational Therapy
- Therapeutic Recreation
- Psychology
- Massage Therapy
- Acupuncture
- Musica Therapy
- Art Therapy
- Hypnosis

Setting realistic expectation with child and parent

Surgical Pain

- Presurgical Psychological Predictors of Acute Postsurgical Pain and Quality of Life in Children Undergoing Major Surgery – Rabbitts, Groenewald, Tai, & Palermo (2015)
  - Health Related Quality of Life HRQOL
    - Higher levels of parental pain catastrophizing
    - Shorter child sleep duration
    - Higher child state anxiety

Rabbitts, Groenewald, Tai, & Palermo (2015). The Journal of Pain 16(3), 226-234

Surgical Pain

Inappropriately treated pain

News from *The Journal of Pain*

Study Assesses Long-term Impact of Post-surgical Pain in Children

CHICAGO, Jan. 21, 2016 --Children who still have moderate to severe post-operative pain one month after a surgical procedure are at risk for deterioration of their health-related quality of life, according to research reported in *The Journal of Pain,* the peer-review publication of the American Pain Society www.americanpainsociety.org.

In the United States, some 4 million surgical procedures are performed on children every year. Unfortunately, severe post-surgical pain is common and can govern the stress response after surgery, which can result in delayed recovery with significant post-surgical pain that may progress to chronic pain.

Rabbitts, Fischer, Rosenbloom, Palermo (2017). Prevalence and predictors of chronic postsurgical pain in children: a systemic review and met-analysis, *The Journal of Pain, 18(6),* 605-614

Important screening questions for kids and teens

how this information can be beneficial for managing acute pain, and ways to improve education on opioid safety in the home.

RESEARCH REPORT

Pediatric Anesthesia WILEY

Efficacy of an expanded preoperative survey during perioperative care to identify illicit substance use in teenagers and adolescents

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Abstract

Background: As illicit substance use can present several perioperative concerns, effective means to identify such practices are necessary to ensure patient safety. Identification of illicit substance use in pediatric patients may be problematic as patients may rely on parental reporting.

Aims: The current study compares answers regarding use of illicit substances between a survey completed by the patient and the preoperative survey completed by parents or guardians.

Methods: The study included patients presenting for surgery at Nationwide Children's Hospital, ranging in age from 12 to 21 years. After consent, patients completed a survey of six drop-down questions using an iPad. The six questions involved the patient's history of alcohol, tobacco, marijuana, vaping, and opioid use. The results were compared to the answers obtained from the parents during a preoperative phone call.

Results: The study cohort included surveys from 250 patients with a median age of 16 years. Survey data showed a statistically higher reporting of substance use or abuse from the patient study survey in comparison to the routine parental preoperative survey. Alcohol report rates were highest with 69 (27.6%) patients reporting use compared to only 5 parental reports (2%). There was a similar discrepancy in reported rates of vaping use (40 patient reports, 16.0% vs. 11 parental reports, 4.4%) and illicit substance use including marijuana (52 patient reports, 20.8% vs. 11 parental reports, 4.4%). Reported rates of tobacco use were lowest among the survey responses with 12 patient reports (4.8%) and 5 parental reports (2.0%).

Conclusions: Identifying illicit substance and tobacco use via a phone survey of parents is inaccurate and does not allow for proper identification of use of these substances in patients ≤21 years of age presenting for surgery. An anonymous 2-min survey completed by the patient more correctly identifies these issues.

Asking Risk Screening Questions

Why is screening so important?

Youth who start using any substance below the age of 15 are 5-times more likely to become addicted. The younger they start, the more likely they are to develop a substance use disorder.

Contemporary Pediatrics video interview, Angela Nash, PhD, APRN, CPNP-PC, PMHS, associate professor, Cizik School of Nursing Faculty, UT Health Houston; Substance use trends among youth and importance of screenings (contemporarypediatrics.com)

Screening tools for pediatric patients

Substance use

- CRAFFT
- Brief Screener for Tobacco, Alcohol, and other Drugs (BSTAD) and Screening to Brief Intervention (S2BI).

Mental Health History

What patients and families need to know before going home after surgery or acute pain

- How to use their home pain plan
- Home Opioid Safety Education
- When and who to call for questions or concerns

Important Facts to Know When Taking Any Opioids