Pediatric Pain Management and Sedation

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KidCare December 2015

Learning Objectives

- Discuss methods of recognizing and assessing pediatric pain
- Review a developmental and behavioral approach to assessing and treating pain in children of all ages
- Describe non-pharmacologic and pharmacologic options for pediatric pain management
- Determine a stepwise approach to pediatric procedural sedation and analgesia (PSA)
- Understand the importance of discharge planning and transition of care
- Review patient safety aspects of pediatric pain management
## PAMI Modules

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<th>PAMI Introduction and Basics of Pain Management and Assessment</th>
<th>Pharmacological Treatment of Pain (Acute &amp; Chronic)</th>
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<td>Non-pharmacological Treatment</td>
<td>Management of Acute Pain</td>
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<td>Pediatric Pain Management</td>
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## PAMI Stakeholders

- [ENA](https://www.ena.org)
- [FENA](https://www.fena.org)
- [FCEP](https://www.fcep.org)
- [PAMI](https://www.pami.org)
- [Florida Society for Healthcare Risk Management & Patient Safety](https://www.flhsrisk.org)
- [American Pain Society](https://www.americanpainsociety.org)
- [Florida Hospital Association](https://www.fhaflorida.org)
Citation for Presentation

• An electronic version of this module is available on the PAMI website http://pami.emergency.med.jax.ufl.edu/.

• All PAMI created materials are free access and can be utilized for educational programs or adapted to institutional needs.

• Suggested Citation: Managing Pediatric Pain in Acute Care Settings. University of Florida College of Medicine - Jacksonville Department of Emergency Medicine, Pain Management and Assessment Initiative (PAMI): A Patient Safety Project, [date retrieved]. Retrieved from http://pami.emergency.med.jax.ufl.edu/.

• Portions of this presentation were adapted from Illinois EMSC materials. Per Illinois EMSC, all training materials are considered under public domain and can be utilized to conduct similar educational programs provided there is appropriate acknowledgement of the source of these materials. Pediatric Pain Management in the Emergency Setting, Illinois Emergency Medical Services for Children, 2013.

Pain Scenarios- Huge Spectrum

• A 6 yo BF with neuroblastoma is in Florida on vacation. She presents in severe pain despite trying break thru medications
• A 14 yo WF presents with RA and severe hip pain
• A 16 yo WM with Ewing's sarcoma presents with a fracture after falling
• A hysterical 2 yo BF presents with a fishing hook stuck in ear lobe after fishing with Dad
• A 12 yo BM sickle cell patient presents with 10/10 pain
• A 5 yo presents after falling off monkey bars with obvious deformity of arm
• An irritable 6 month old presents with a huge abscess and fever
• A 3 yo WM presents with burns after pulling a pot of boiling water off the stove
there is always more to the story

• 14 yo male who collided with another player during “football frisbee” presents with obvious deformity and swelling of his lower leg. He is cooperative and polite during exam but his facial expressions indicate he is severe pain. His father is at the bedside wringing his hands. The patient’s mother arrives and begins yelling at the father saying “I knew I couldn’t leave him with you for even one weekend much less the whole summer”. The patient begins crying and asking why no one is helping him…family meltdown!

• 5 year old female with 2 cm cut to her eyelid arrives via EMS from school. She is crying hysterically and saying “please don’t tell my momma I was a bad girl”. Father arrives ten minutes later and appears quiet and exhausted. ED staff is concerned that he doesn’t seem to be doing anything to comfort his daughter. During your evaluation you ask if he has notified the child’s mother of the accident. The child’s eyes light up but he shakes his head. Finally you ask why he has not called the girl’s mother- he responds “she died 3 months ago”…

and more

• 9 year old male hit by a car while playing in a parking lot. The driver fled the scene and a neighbor drove him to your ED. He is covered in blood and has a severe degloving injury of his lower extremity. There are no other injuries and he is alert and oriented. He is given morphine twice and is now cooperative, talking, and calm but alert. Several anxious family members have arrived and are now at bedside. Patient tries to sit up during his radiographs to see his leg. Nursing staff/radiology tech….is asking for a Versed order for “anxiety” and to make him be still during x-rays. You decline to order since you have already given 0.2 mg/kg of morphine. After x-rays are completed the patient becomes lethargic with shallow breathing and decreased sats even though he was screaming five minutes ago while being forced to lay down. What happened?
Background Information

Background

• Pain is a common complaint in the ED, EMS and hospital settings and requires special considerations when dealing with children. (78% of ED visits)
• One child suffering from a painful traumatic injury and two anxious family members can disrupt the flow of your entire ED.

• Several studies have shown medical providers underestimate pain. This is especially true in the pediatric population as many of these patients have not developed the verbal and cognitive skills needed to fully understand and express their pain.
Background

There is a new emphasis on pain management due to:

• Joint Commission standards
• Patient satisfaction (HCHAPS) scores
• Focus on medication errors and patient safety
• Readmission penalties
• New evidence that inadequately treated acute pain may lead to chronic pain
• Concerns regarding opioid addiction
• New discoveries in clinical and basic science pain related research
• Sedation services

Examples of Common Painful Pediatric Procedures Include:

- Fracture reduction & orthopedic procedures
- Burn & wound debridement
- Cardioversion, endoscopy or bronchoscopy
- IV or blood draw
- Lumbar puncture
- Chest tube insertion
- Radiographic studies in agitated or uncooperative patients
- Abscess incision & drainage
- Laceration repair
- Foreign body removal
Other Pediatric Scenarios Requiring Sedation, Analgesia, and/or Anxiolysis

**Chronic Pain Conditions**
- Cancer
- Rheumatologic disorders
- Migraine headaches

**Adolescents posing a threat to themselves or staff**

**Chronic disorders with an exacerbation or new painful condition**
- Autism plus foreign body or fracture
- Oncology patient on baseline pain medications with a fracture

**Post-operative pain**
- Tonsillectomy
- Orthopedic procedures

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**Pain Pathophysiology**

- Anatomic components related to pain transmission are complex and include:
  - Chemical mediators
  - Nociceptors
  - A delta fibers
  - C fibers
  - Dorsal horn of the spinal cord
  - Thalamus
  - Limbic system
  - Cerebral cortex
  - Endorphins

- Metabolic effects of pain include:
  - Increased release of catecholamines, glucagon and corticosteroids

* Catabolic states induced by acute pain may be more damaging to infants and young children due to their higher metabolic rates and lower nutritional reserves compared to adults.

*All of these components are usually present by 24 weeks gestation*
The Physiology of Pain Transmission

**Step 1:** An injury occurs, nerve endings or nociceptors respond to painful stimuli.

**Step 2:** Pain impulse is transmitted via peripheral nerve fibers to spinal cord.

**Step 3:** In the spinal cord and brain, neurotransmitters are released.

**Step 4:** Pain stimulus is transmitted through thalamus and out through limbic system and cerebral cortex.

### Review of Physiologic Consequences of Unrelieved Pain in Children

<table>
<thead>
<tr>
<th>Responses to Pain</th>
<th>Potential Physiologic Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiratory Changes</strong></td>
<td></td>
</tr>
<tr>
<td>Rapid shallow breathing</td>
<td>Alkalosis</td>
</tr>
<tr>
<td>Inadequate lung expansion</td>
<td></td>
</tr>
<tr>
<td>Inadequate cough</td>
<td></td>
</tr>
<tr>
<td><strong>Neurological Changes</strong></td>
<td></td>
</tr>
<tr>
<td>Increased sympathetic nervous system activity and release of catecholamines</td>
<td>Tachycardia, elevated BP, change in sleep patterns, irritability</td>
</tr>
<tr>
<td><strong>Metabolic Changes</strong></td>
<td></td>
</tr>
<tr>
<td>Increased metabolic rate with increased perspiration; Increased cortisol production</td>
<td>Increased fluid and electrolyte losses</td>
</tr>
<tr>
<td><strong>Immune System Changes</strong></td>
<td></td>
</tr>
<tr>
<td>Depressed immune and inflammatory responses</td>
<td>Increased risk of infection, delayed wound healing</td>
</tr>
<tr>
<td><strong>Gastrointestinal Changes</strong></td>
<td></td>
</tr>
<tr>
<td>Increased intestinal secretions and smooth muscle sphincter tone, nausea, anorexia</td>
<td>Impaired gastrointestinal functioning, poor nutritional intake, ileus</td>
</tr>
<tr>
<td><strong>Altered Pain Response</strong></td>
<td></td>
</tr>
<tr>
<td>Increased pain sensitivity</td>
<td>Hyperalgesia, decreased pain threshold, exaggerated memory of painful experiences</td>
</tr>
</tbody>
</table>
Factors Affecting Pediatric Response to Painful Stimuli

- Age, gender, ethnicity
- Socioeconomic and psychiatric factors
- Culture and religion
- Genetics
- Previous experiences
- Patient/family perceptions
- Catastrophizing

Creation of Pain Memory in Children

*What we do during a child’s first painful experience has lasting effects!*

Recurrent pain + Under-treated pain + Developmental factors = Pain memory

- Past experience
- Temperament
- Coping
- Developmental age
Recognition and Assessment of Pediatric Pain

The First Step is to **Recognize or Anticipate** a Painful Condition

- **Recognition of pain** is the first step to effectively managing pain.
- Children often cannot differentiate between pain and anxiety.
- The child’s demonstration of pain and response to pain is multifactorial and related to age or developmental stage.
- Additionally, procedures and treatments used to manage the disease or injury may induce pain.
Elements of Pain Assessment

- Assess physiologic parameters
- Perform behavioral observation
- Question the child
- Use standardized assessment tool

• Perform a pain focused physical exam.
• Children with acute pain may have:
  • Tachycardia
  • Tachypnea
  • Hypertension
  • Oxygen desaturation
  • Dilated pupils
  • Flushing or pallor
Elements of Pain Assessment: Perform Behavioral Observation

- Perform behavioral observation
- Question the child
- Use standardized assessment tool
- Assess physiologic parameters

Behavioral Observation and Recognition of Pain

Non-verbal cues such as facial expressions and body language help assist in recognizing pain. Caregivers can also be used to help provide insight as they often are better at assessing their child’s behavior.
Perform Behavioral Observation in **Infant**

When performing an infant behavioral observation, be aware of:
- Facial expressions
- Extremity activity and tone
- Guarding, splinting
- Position and tone
- Irritability, crying
- Poor feeding
- Poor sleep quality

**Facial Expression**
- Bulged brow
- Tightly shut eyes
- Nasolabial furrow
- Stretched mouth
- Taut tongue

Perform Behavioral Observation in **Toddler**

When performing a toddler behavioral observation, be aware of:
- Anger
- Tantrums, regression
- Facial expression
- Extremity activity and tone
- Guarding, splinting
- Position of comfort
- Irritability, crying
- Poor eating and sleep quality
- Restless or unusually quiet
Perform Behavioral Observation in a Preschooler

When performing a preschooler behavioral observation, be aware of:

• Stalling/delaying
• Magical thinking explanations
• Behavioral regression
• Facial expression, grimacing
• Extremity activity and tone
• Guarding, splinting
• Position of comfort
• Irritability, anxiety
• Change in appetite or sleep quality

Perform Behavioral Observation in School-age and Adolescent

When performing a school-age and adolescent behavioral observation, be aware of:

• Stalling/delaying
• Flat affect
• Facial expression
• Extremity activity and tone
• Guarding, splinting
• Position of comfort
• Irritability, anxiety
• Change in appetite or sleep quality
Consider:
• The child’s primary language
• Words or phrases suggested by the parent/caregiver
• The child’s developmental level

Explore:
• Location of pain
• Duration of pain
• Quality of pain
• Precipitating factors
• Effect on daily activities
• Pain relief measures
• Previous pain experiences

There are numerous mnemonics on how to obtain pain history:
**OPQRST, SOCRATES and QISS TAPED:**

**OPQRST:**

**O – Onset of event**
• What was the patient doing when it started? Were they active, inactive, and or stressed?
• Did that specific activity prompt or start the onset of pain?
• Was onset of pain sudden, gradual or part of an ongoing chronic problem?

**P - Provocation and palliation of symptoms**
• Is the pain better or worse with:
  • **Activity.** Does walking, standing, lifting, twisting, reading, etc... have any effect of the pain?
  • **Position.** Which position causes or relieves pain? Provide examples to the patient-- sitting, standing, supine, lateral, etc...
  • **Adjuvant.** Which type of medication relieves the pain (Tylenol, Ibuprofen, etc.)? Does the use of heat or ice packs alleviate pain? What type of alternative therapy (massage, acupuncture) have you used before?
  • Does any movement, pressure (such as palpation) or other external factor make the problem better or worse? This can also include whether the symptoms relieve with rest.
OPQRST continued

Q – Quality
• Ask the patient to describe the quality of pain – is it throbbing, dull, aching, burning, sharp, crushing, shooting, etc...?
• Questions can be open ended "Can you describe it for me?" or leading
• Ideally, this will elicit descriptions of the patient's pain: whether it is sharp, dull, crushing, burning, tearing, or some other feeling, along with the pattern, such as intermittent, constant, or throbbing.

R - Region and radiation. Identify the location of pain
• Where pain is on the body and whether it radiates (extends) or moves to any other area? Referred pain can provide clues to underlying medical causes.
• Location: body diagrams may help patients illustrate the distribution of their pain.
• Dermatome map – may help determine the relationship between sensory location of pain and spinal nerve segment (see figure next slide).
• Referred vs Localized: referred pain (also known as reflective pain) is feeling pain in a location other than the original site of the painful stimulus. Localized pain is when pain typically stays in one location and does not spread.

OPQRST continued

S – Severity
• Ask the patient to describe the intensity of pain at baseline and during acute exacerbations.
• The pain score (usually on a scale of 0 to 10) where Zero is no pain and Ten is the worst possible pain. This can be comparative (such as "... compared to the worst pain you have ever experienced") or imaginative ("... compared to having your arm ripped off by a bear"). If the pain is compared to a prior event, the nature of that event may be a follow-up question.

T – Timing (history)
• Identify when the pain started, under what circumstances, duration, onset (sudden/gradual), frequency, whether acute/chronic.
• How long the condition has been going on and how it has changed since onset (better, worse, different symptoms)?
• Whether it has ever happened before, and how it may have changed since onset, and when the pain stopped if it is no longer currently being felt.
Pain Assessment: **SOCRATES**

The second pain history assessment that will be reviewed is **SOCRATES**:

**S**ite - Where is the pain? Or the maximal site of the pain.

**O**nset - When did the pain start, and was it sudden or gradual? Include also whether if it is progressive or regressive.

**C**haracter - What is the pain like? An *ache*? Stabbing?

**R**adiation - Does the pain radiate anywhere? (See also **Radiation**.)

**A**ssociations - Any other signs or symptoms associated with the pain?

**T**ime course - Does the pain follow any pattern?

**E**xacerbating/Relieving factors - Does anything change the pain?

**S**everity - How bad is the pain?

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**QISS TAPED:**

a mnemonic for pain history, assessment and exam

- **Q**uality - What were your first symptoms? What words would you use to describe the pain? (achy, sharp, burning, squeezing, dull, icy, etc.)
  - Besides sensations you consider to be "pain," are there other unusual sensations, such as numbness?

- **I**mpact - How does the pain affect you?
  - How does the pain impact your sleep, activity, mood, appetite (other - work, relationships, exercise, etc.)?
  - What does the pain prevent you from doing? (Depression screen) Do you feel sad or blue? Do you cry often? Is there loss of interest in life? Decreased or increased appetite? (Anxiety screen) Do you feel stressed or nervous? Have you been particularly anxious about anything? Do you startle easily?

- **S**ite - Show me where you feel the pain. Can you put your finger/hand on it?
  - Or show me on a body map?
  - Does the pain move/radiate anywhere? Has the location changed over time?

- **S**everity - On a 0-10 scale with 0 = no pain and 10 = the worst pain imaginable, how much pain are you in right now?
  - What is the least pain you have had in the past (24 hours, one week, month)?
  - What is the worst pain you have had in the past (24 hours, one week, month)?
  - How often are you in severe pain? (hours in a day, days a week you have pain)?
<table>
<thead>
<tr>
<th>T</th>
<th>Temporal Characteristics</th>
<th>When did the pain start? Was it sudden? Gradual? Was there a clear triggering event? Is the pain constant or intermittent? Does it come spontaneously or is it provoked? Is there a predictable pattern? (e.g., always worst in the morning or in the evening? Does it suddenly flare up?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Aggravating and Alleviating Factors</td>
<td>What makes the pain better? What makes the pain worse? When do you get the best relief? How much relief do you get? How long does it last?</td>
</tr>
<tr>
<td>P</td>
<td>Past Response, Preferences</td>
<td>How have you managed your pain in the past? (Ask about both drug and non-drug methods) What helped? What did not help? (Be specific about drug trials - how much and how long?) What medications have you tried? Was the dose increased until you had pain relief or side effects? How long did you take the drug? Are there any pain medicines that have caused you an allergic or other bad reaction? How do you feel about taking medications? Have you tried physical or occupational therapy? What was done? Was it helpful? Have you tried spinal or other injections for pain treatment? What was done? Was it helpful?</td>
</tr>
<tr>
<td>E</td>
<td>Expectations, Goals, Meaning</td>
<td>What do you think is causing the pain? How may we help you? What do you think we should do to treat your pain? What do you hope the treatment will accomplish? What do you want to do that the pain keeps you from doing? What are you most afraid of? (Uncovers specific fears, such as fear of cancer, which should be acknowledged and addressed.)</td>
</tr>
<tr>
<td>D</td>
<td>Diagnostics &amp; Physical Exam</td>
<td>Examine and inspect site Perform a systems assessment and examination as indicated Review imaging, laboratory and/or other test results as indicated</td>
</tr>
</tbody>
</table>

What are Some Reasons A Child or Adolescent Might Not Disclose Their Pain?
Why Children Might Not Disclose Pain

• Avoidance of painful treatments
• Fear of being sick
• Fear of healthcare professionals
• Protection of parents or caregiver
• Avoidance of hospitalization
• Desire to return to activities
  • Sports
  • Social events
  • School

Questioning the Special Needs Child

• Adapt questioning and communication to the child’s ability to understand and respond

• Ask the parent/caregiver to describe:
  • The child’s cognitive level and communication abilities
  • Pain-related behaviors
  • Effective calming and soothing measures
Choose an appropriate tool based on the child’s:

- Age
- Cognitive ability and language
- Condition
- Institutional preference

- Use the *same* pain scale throughout the EMS/ED/hospital experience
  - Document the use of a differing scale, if changed
  - Educate the child/parent/caregiver about the use of the scale

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**Pain Assessment Scales**

Essential to know and understand which pain assessment tools and scales are used at your institution/agency.

- Pain scales are typically applied to all pain types. However chronic and cancer related pain may require more complex evaluation tools. Although pain is multi-factorial, the majority of pain scales assess pain **intensity**.

- There are different validated pain scales available for a variety of patient populations such as:
  - adults
  - pediatrics
  - elderly
  - non-verbal
# Examples of Pain Scales

<table>
<thead>
<tr>
<th>Pain Scales</th>
<th>Verbal, Alert and Oriented</th>
<th>Non-verbal, GCS &lt;15 or Cognitive Impairment</th>
</tr>
</thead>
</table>
| Adult       | • Numerical Rating Scale (NRS)  
• Defense and Veterans Pain Rating Scale (DVPRS) | • Adult Non-Verbal Pain Scale (NVPS)  
• Assessment of Discomfort in Dementia (ADD)  
• Behavioral Pain Scale (BPS)  
• Critical-Care Observation Tool (CPOT) |
| Pediatric   | • Wong-Baker Faces scale (ages 4 to 17 years)  
• Numerical Rating Scale (ages 7 to 11 years) | • Neonatal Pain, Agitation, and Sedation Scale (N-PASS) (preterm and full term neonates)  
• Neonatal/Infant Pain Scale (NIPS) (newborn to age 1)  
• Faces, Legs, Activity, Cry and Consolability (FLACC) (ages 1 to 17 years)  
• Children’s Hospital of Eastern Ontario Pain Scale (CHEOPS) (ages 1-7) |

## Pediatric or Adult: Verbal, Alert and Oriented

![0-10 Numeric Pain Rating Scale](image)

This is a commonly used pain scale that employs a 0-10 rating system that can be used in alert oriented adult patients.
Pediatric: Verbal, Alert and Oriented


Pediatric: Non-verbal, GCS <15 or Cognitive Impairment

Adult: Verbal, Alert and Oriented

Pain Assessment Tools

<table>
<thead>
<tr>
<th>Measurement Scale</th>
<th>Age Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal Infant Pain Scale (NIPS)</td>
<td>Birth - 6 months</td>
<td>Behavioral scale.</td>
</tr>
<tr>
<td>Neonatal Pain Assessment and Sedation Scale (N-PASS)</td>
<td>Preterm and full term neonates</td>
<td>Behavioral scale.</td>
</tr>
<tr>
<td>Neonatal Facial Coding System (NFCS)</td>
<td>32 weeks gestation to 6 months</td>
<td>Facial muscle group movement, brow budge, eye squeeze, nasolabial furrow, open lips, stretch mouth lip purse, taut tongue, and chin quiver.</td>
</tr>
<tr>
<td>CRIES</td>
<td>32 weeks gestation to 6 months</td>
<td>Behavioral and physiologic scale.</td>
</tr>
<tr>
<td>Revised Faces, Legs, Activity, Cry, and Consolability (r-FLACC)</td>
<td>2 months to 3 years, critically ill, cognitively impaired, and older than three years of age unable to utilize a self-report scale.</td>
<td>Behavioral scale. Note: r-FLACC contains the same core components as the original FLACC therefore the revised scale is still appropriate for non-cognitively impaired children.</td>
</tr>
<tr>
<td>Non Communicating Children's Pain Checklist (NCCPC-R)</td>
<td>3-19 years (with cognitive impairment)</td>
<td>30 items that assess seven dimensions: vocal, eating/sleeping, social, facial, activity, body/limb, and physiologic signs.</td>
</tr>
<tr>
<td>Wong Baker Faces</td>
<td>3 years and older</td>
<td>Self-report scale. Please refer to specific references for those alternative face scales.</td>
</tr>
<tr>
<td>Oucher</td>
<td>3-12 years</td>
<td>Self-report tool consisting of a vertical numerical scale and a photo scale with expressions of “hurt” to “no hurt.”</td>
</tr>
<tr>
<td>Visual Analogue Scale (VAS)</td>
<td>8 years and older</td>
<td>Self-report scale. Consists of pre-measured vertical or horizontal line, where the ends of the line represent extreme limits of pain intensity. Requires understanding of numbers, addition and subtraction.</td>
</tr>
<tr>
<td>Verbal Numeric Scale (VNS)/ Numeric Rating Scale (NRS)</td>
<td>8 years and older</td>
<td>Self-report scale. Eleven point scale that requires understanding of numbers, addition and subtraction.</td>
</tr>
</tbody>
</table>
Pain Assessment Using Pain Scales

• Once a pain scale is chosen, interpretation of the score is not so straightforward. There is no defined score or threshold for what score correlates to actual pain and to what intensity the pain is felt by the patient. Even using the same scale for two different patients doesn’t allow for comparison of pain intensity.


Tips

Select a scale and be consistent!

• Remember scales do not take into account:
  • patient genetics
  • past experiences
  • co-morbidities
  • other pain influencing factors

• In patients with preexisting pain determine baseline pain level.
• In a verbal adult it is best to ground the scale by providing context for the patient. For example, ask the patient at which level on the scale they would take an OTC pain medication? For those with chronic pain, what level of pain do they experience every day?

Identifying the Type of Pain
Classification of Pain

There are multiple ways in which pain may be classified. Pain is broadly classified by underlying etiology, anatomic location, the temporal nature, and intensity.

- **Underlying etiology** refers to the source of the experienced pain.
- **Anatomic location** refers to the site of pain within the body and can divided into somatic and visceral.
- **Temporal nature** refers to the duration of the pain.
- **Intensity** refers to how the pain experience hurts.

<table>
<thead>
<tr>
<th>Underlying Etiology</th>
<th>Anatomic Location</th>
<th>Temporal</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nociceptive</td>
<td>Somatic</td>
<td>Acute</td>
<td>Mild</td>
</tr>
<tr>
<td>Inflammatory</td>
<td>Visceral</td>
<td>Chronic</td>
<td>Moderate</td>
</tr>
<tr>
<td>Neuropathic</td>
<td></td>
<td>Acute on chronic</td>
<td>Severe</td>
</tr>
<tr>
<td>Psychogenic</td>
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</tbody>
</table>
Treatment Options
Pharmacological
Non-pharmacological

Pain Interventions That Alter *Peripheral* Transmission of Pain

**Transmission Point**
- Reduce tissue injury
- Alter blood flow to area
- Reduce swelling
- Inhibit prostaglandin production

**Non-pharmacologic Interventions**
- Splinting
- Immobilization
- Skin stimulation
- Application of heat and cold

**Pharmacologic Interventions**
- Administer non-steroidal anti-inflammatory drugs (NSAIDs)
- Administer local anesthetic agent
### Pain Interventions That Alter *Spinal Cord* Transmission of Pain

<table>
<thead>
<tr>
<th>Transmission Point</th>
<th>Non-pharmacologic Interventions</th>
<th>Pharmacologic Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Block by activating large fibers and preventing nociceptive transmission&lt;br&gt;• Block by binding opioid receptors in spinal cord&lt;br&gt;• Decrease release of neurotransmitters&lt;br&gt;• Interrupt descending input from brain.</td>
<td>• Skin stimulation&lt;br&gt;• Massage&lt;br&gt;• Acupuncture&lt;br&gt;• Application of heat and cold&lt;br&gt;• Touch</td>
<td>• Epidural analgesia&lt;br&gt;• Intrathecal analgesia&lt;br&gt;• Opioids</td>
</tr>
</tbody>
</table>

### Pain Interventions That Alter *Receptor Site* Transmission of Pain

<table>
<thead>
<tr>
<th>Transmission Point</th>
<th>Non-pharmacologic Interventions</th>
<th>Pharmacologic Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increase stimuli to the brain&lt;br&gt;• Increase blood flow to targeted areas, decreases pain chemicals&lt;br&gt;• Increase endorphins</td>
<td>• Distraction&lt;br&gt;• Imagery&lt;br&gt;• Relaxation&lt;br&gt;• Biofeedback</td>
<td>• Systemic opioids</td>
</tr>
</tbody>
</table>
Pharmacologic Interventions

By the Route
Promote use of least invasive, most effective agent
- Oral or nasal
- IV route reserved for moderate to severe pain
Avoid intramuscular and rectal routes if possible

By the Clock
Promote pain relief with timely and routine dosing
Start with dose that matches the pain assessment findings and pain score
Titrate dose upward if relief is inadequate
Modify intervals between doses in the presence of moderate and severe pain

By the Child
Incorporates the child’s
- Developmental status
- Cultural influences
- Religious beliefs
- Personal preferences
- Previous pain experiences

By the Ladder
Originally created for guiding cancer pain treatment
Uses a three-step ladder
Uses least invasive administration route to provide needed analgesic
Recommends use of adjuvants to manage side effects, minimize fear, and enhance pain relief
Pharmacologic Categories

Topical agents
Infiltrative local agents or nerve blocks
Mild oral agents
Moderate agents

See PAMI Pharmacologic Module and Dosing Card for Additional Information
**PainZone®**

**Vasopressor/Initiate Sedation and Analgesia Chart**

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Adult</th>
<th>Pediatric</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opioids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine (intravenous)</td>
<td>10-20 mcg/kg/h</td>
<td>0.5-2 mcg/kg/h</td>
<td>Analgesic; occasionally used for moderate to severe pain.</td>
</tr>
<tr>
<td><strong>Non-Opioids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ketorolac (intravenous)</td>
<td>30-60 mcg/kg/h</td>
<td>0.5-1 mcg/kg/h</td>
<td>Analgesic and anti-inflammatory; occasionally used for moderate to severe pain.</td>
</tr>
<tr>
<td><strong>Vasopressors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norepinephrine (intravenous)</td>
<td>0.001-0.1 mcg/kg/min</td>
<td>0.5-5 mcg/kg/min</td>
<td>Vasopressor; occasionally used for shock.</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood pressure</td>
<td></td>
<td></td>
<td>Vital signs; continuous monitoring for hemodynamic instability.</td>
</tr>
<tr>
<td>Heart rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV hydration</td>
<td></td>
<td></td>
<td>Administer fluids to maintain fluid balance.</td>
</tr>
<tr>
<td>IV antibiotics</td>
<td></td>
<td></td>
<td>Administration depends on patient’s condition.</td>
</tr>
<tr>
<td>NMT/PEEP</td>
<td></td>
<td></td>
<td>Non-invasive mechanical ventilation/positive end-expiratory pressure; used to maintain adequate ventilation.</td>
</tr>
</tbody>
</table>

**Procedural Sedation and Analgesia Chart**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Adult</th>
<th>Pediatric</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midazolam (intravenous)</td>
<td>0.1-0.5 mg/kg</td>
<td>0.1-0.25 mg/kg</td>
<td>Sedative; occasionally used for procedural sedation.</td>
</tr>
<tr>
<td>Propofol (intravenous)</td>
<td>5-10 mg/kg</td>
<td>2-5 mg/kg</td>
<td>Sedative; occasionally used for procedural sedation.</td>
</tr>
<tr>
<td><strong>Opioids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl (intravenous)</td>
<td>1-5 mcg/kg</td>
<td>0.1-2 mcg/kg</td>
<td>Analgesic; occasionally used for procedural sedation.</td>
</tr>
</tbody>
</table>

**Stepwise Approach to Pain Management and Procedural Sedation Analgesia (PSA)**

1. **Situational Checkpoint**
   - What are you trying to accomplish? (e.g., analgesia, anxiety, sedation, procedure, etc.)

2. **Developmental/Cognitive Checkpoint**
   - What is the patient’s development stage?

3. **Family Dynamic Checkpoint**
   - Who is caring for the patient? What are the family dynamics?

4. **Facility Checkpoint**
   - Type of staffing and setting, team experience, facility policies, etc.

5. **Patient Assessment Checkpoint**
   - Review patient’s risk factors and history.

6. **Management Checkpoint**
   - Choose your “ingredients” for pharmacologic and non-pharmacologic “recipes.”

7. **Monitoring & Discharge Checkpoint**
   - Joint Commission standards, reassessment, facility policies, discharge and transportation considerations.
### Topical Anesthetics

<table>
<thead>
<tr>
<th>AGENT</th>
<th>INDICATION</th>
<th>DOSE/ROUTE</th>
<th>TIME ONSET/ DURATION</th>
<th>MAXIMUM DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.M.X.4® (Lidocaine 4%)</td>
<td>For external use for pain relief of minor cuts, scrapes, burns, sunburn, insect bites, and minor skin irritations</td>
<td>Apply externally</td>
<td>Onset 20-30 minutes</td>
<td>Externally 3-4 times per day</td>
<td>Advantages: For use in children 2 years and older. Over-the-counter (OTC) availability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Duration 60 minutes</td>
<td>Apply in area less than 100cm² for children less than 10 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Apply in area less than 600cm² for children between 10 and 20 kg</td>
<td></td>
</tr>
<tr>
<td>LET Lidocaine Epinephrine Tetracaine (gel or liquid)</td>
<td>Wound repair (non-mucosal)</td>
<td>4% Lidocaine 1:2,000 Epinephrine 0.5% Tetracaine</td>
<td>Onset 10 minute Duration 30-60 minute</td>
<td>3 ml (not to exceed maximal Lidocaine dosage of 3-5 mg/kg)</td>
<td>Advantages: Painless application, patient compliance, decreased repair time, non-cocaine containing anesthetic.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Risks: Not for use over end arteriole locations.</td>
</tr>
</tbody>
</table>

### Topical Anesthetics

<table>
<thead>
<tr>
<th>AGENT</th>
<th>INDICATION</th>
<th>AGE/DOSE/ROUTE</th>
<th>TIME ONSET/ DURATION</th>
<th>MAXIMUM DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMLA (2.5% Lidocaine 2.5% Prilocaine)</td>
<td>Dermal analgesic (intact skin)</td>
<td>3-12 months (and &gt;5 kg) maximum area covered 20 cm²</td>
<td>Onset 45-60 minutes</td>
<td>2 gm</td>
<td>Advantages: Painless application, patient compliance, decreased repair time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-6 years (and &gt;10 kg) maximum area covered 100 cm²</td>
<td>Duration 3-4 hour</td>
<td>10 gm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7-12 years (and &gt;20 kg) maximum area covered 200 cm²</td>
<td></td>
<td>20 gm</td>
<td>Risks: Methemoglobinemia. Contact dermatitis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>topical/transdermal (cover area with occlusive dressing)</td>
<td></td>
<td>Maximum application time not to exceed 4 hours</td>
<td></td>
</tr>
</tbody>
</table>
# Topical Anesthetics

<table>
<thead>
<tr>
<th>AGENT</th>
<th>INDICATION</th>
<th>DOSE/ROUTE</th>
<th>TIME ONSET/DURATION</th>
<th>MAXIMUM DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>
| Pain-Ease®  | Cooling intact skin and mucus membranes and minor open wounds | Spray for 4-10 seconds from a distance of 8-18 cm | Onset- immediate Duration- a few seconds, up to a minute | When skin turns white | Advantages Quick acting
|             |                                                      |                    |                      |              | Risks Skin freezing may create hypo-pigmentation especially in dark skin |
| Lidocaine   | Foley catheter and NG tube insertion; Intubation; Gingivostomatitis painful lesions | 2% topical gel/jelly 5% topical ointment | Onset 2-5 min Duration 30-60 min | 3-5 mg/kg | Advantages Comfort of insertion
|             |                                                      |                    |                      |              | Risks Hematoma, painful, bleeding at site, absorption can cause systemic toxicity |

*NOTE: Not recommended for teething children or young children who cannot expectorate- Do not give Rx for home.*

---

# Infiltrative Anesthetics

<table>
<thead>
<tr>
<th>AGENT</th>
<th>INDICATION</th>
<th>DOSE/ROUTE</th>
<th>TIME ONSET/DURATION</th>
<th>MAXIMUM DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>
| Infiltrative Lidocaine | Vascular access; needle insertion procedures | Subcutaneous 1% Lidocaine without epinephrine 0.5%= 5mg/ml 1%= 10mg/ml 2%= 20 mg/ml 1% Lidocaine with epinephrine | Onset 4-10 min Duration 90-120 min | 4.5 mg/kg maximum dose or 300 mg | Advantages Rapid onset, longer duration
|              |                                                      |                    |                      |              | Risks Hematoma, bleeding at site; absorption can cause systemic toxicity |
| J-Tip® Jet injector of 1% buffered Lidocaine | Vascular access, needle insertion procedures | 0.2 ml subcutaneous | Immediate | One application per site | Advantages Needleless
|              |                                                      |                    |                      |              | Risks Not for preterm infants; neonates; patients with blood disorders; or in children receiving chemotherapy or blood thinners. |
# Mild Pain Agents

<table>
<thead>
<tr>
<th>NON-OPIOID</th>
<th>INDICATION</th>
<th>DOSE/ROUTE*</th>
<th>MAX DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen (APAP)‡</td>
<td>Mild pain</td>
<td>10 - 15 mg/kg Every 4-6 hr PO, PR</td>
<td>75 mg/kg/day or 4 g/day 60mg/kg/day for neonates</td>
<td>Advantages: Minimal adverse effects on GI tract or renal function; Risks: Liver toxicity</td>
</tr>
<tr>
<td><strong>NOTE:</strong> ‡ All doses of combination products limited by APAP content to 75 mg/kg/day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ibuprofen (Motrin®, Advil®) &gt; 6 months of age</td>
<td>Mild pain</td>
<td>5 - 10mg/kg Every 6-8 hr PO</td>
<td>40 mg/kg/day Adults 3200 mg/day</td>
<td>Advantages: Inhibits prostaglandin-induced nociception; Risks: Nausea, vomiting, ulcers, platelet dysfunction, liver toxicity</td>
</tr>
</tbody>
</table>

# Moderate Pain Agents

<table>
<thead>
<tr>
<th>NON-OPIOID</th>
<th>INDICATION</th>
<th>DOSE/ROUTE*</th>
<th>MAX DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketorolac (Toradol®)</td>
<td>Moderate - severe pain</td>
<td>0.5 mg – 1 mg/kg every 6 hr IV, IM* PO for patients &gt; 50 kg</td>
<td>30 mg/IM every 6 hr Adult dose: 60 mg IM or 30 mg IV. If &lt; 50 kg use 30 mg IM and 15 mg IV.</td>
<td>Advantages: Effective alternative to opioids for treatment of moderate to severe pain; Risks: Bleeding diathesis; hyperkalemia; depression of renal function; and hepatotoxicity</td>
</tr>
<tr>
<td><strong>NOTE:</strong> Do not use with other NSAIDs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*IM routes not recommended as first line treatment.
Moderate Pain Agents

<table>
<thead>
<tr>
<th>OPIOIDS</th>
<th>INDICATION</th>
<th>DOSE/ROUTE</th>
<th>ONSET</th>
<th>DURATION</th>
<th>MAX DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codeine/APAP with Codeine</td>
<td>Mild - moderate pain</td>
<td>0.5 - 1 mg/kg of Codeine or 12 mg for 3-6 yo and 15-30 mg for 7-12 yo PO</td>
<td>1-2 hr</td>
<td>4-6 hr</td>
<td>60 mg/dose</td>
<td>Advantages: Rapid onset action. Risks: Nausea, vomiting, constipation, respiratory depression, hypotension, bradycardia, CNS depression. See current FDA warnings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NOTE: Codeine is often ineffective. Use for cough and cold is contraindicated in children. Not recommended for &lt; 12 yo or 12-18 yo with respiratory condition or nursing mothers.</td>
</tr>
<tr>
<td>Hydrocodone (+ APAP: NORCO, Hycet, Lortab®, Vicodin®)</td>
<td>Mild - moderate pain</td>
<td>0.1 - 0.2 mg/kg of Hydrocodone Every 4-6 hr PO</td>
<td>30 min</td>
<td>3 - 4 hr</td>
<td>Limited by APAP component</td>
<td>Advantages: Oral medication, moderately rapid onset. Risks: Dizziness, sedation, nausea, vomiting, constipation</td>
</tr>
<tr>
<td>Oxycodeone (+APAP: Percocet®)</td>
<td>Moderate - severe pain</td>
<td>0.05 - 0.15 mg/kg of Oxycodeone Every 4-6 hr PO (immediate release formula)</td>
<td>15 min</td>
<td>3 - 4 hr</td>
<td>10 mg every 4-6 hr</td>
<td>Advantages: Oral medication, moderately rapid onset. Risks: CNS depression, respiratory depression, hypotension, bradycardia, nausea. NOTE: Generally not recommended in children less than 6 years of age.</td>
</tr>
</tbody>
</table>
NSAIDS versus Opioids - Update

• Numerous studies have shown the benefit of NSAIDS as equal to oral morphine and usually with less side effects and risks in mild pain management of children.
  • Found no significant difference in analgesic efficacy between orally administered morphine and ibuprofen. Morphine was associated with a significantly greater number of adverse effects. (Poonai N. Oral administration of morphine versus ibuprofen to manage postfracture pain in children: a randomized trial. CMAJ. 2014 Dec 9;186(18):1358-63).
  • Randomized controlled trial of 91 healthy children aged 1 to 10 years with diagnosis of sleep disordered breathing and scheduled for tonsillectomy. Given acetaminophen and either morphine or ibuprofen. Concluded that ibuprofen is as effective as and safer than morphine for post-tonsillectomy analgesia in children, without a higher risk of postoperative hemorrhage. (Kelly LE, Sommer DD, Ramakrishna J, et al. Morphine or ibuprofen for post-tonsillectomy analgesia: a randomized trial. Pediatrics. 2015;135(2):307-313).

Severe pain

• Use high potency analgesics
  • Morphine
  • Fentanyl
  • Hydromorphone

• Intractable pain may require:
  • Nerve block, epidural or patient controlled analgesia (PCA)
### Severe Pain

<table>
<thead>
<tr>
<th>OPIOIDS</th>
<th>INDICATION</th>
<th>DOSE/ROUTE*</th>
<th>ONSET</th>
<th>DURATION</th>
<th>MAX DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>Moderate - severe pain</td>
<td>1-2 mcg/kg/dose IV (over 3-5 min)</td>
<td>1-2 min</td>
<td>30-60 min IV</td>
<td>1-3 mcg/kg/dose</td>
<td>Advantages Rapid onset, short duration, potent analgesic; preferred for renal patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IN 1.5-2 mcg/kg (divide dose equally between each nostril)</td>
<td>10 min IN</td>
<td>60 min IN</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IM*</td>
<td>7-15 min IM</td>
<td>1-2 hr IM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*IM routes not recommended as first line treatment. IM=Intramuscular IN=Intranasal

**NOTE:** IN route should not be used in patients with facial trauma.

### Severe Pain

<table>
<thead>
<tr>
<th>OPIOIDS</th>
<th>INDICATION</th>
<th>DOSE/ROUTE*</th>
<th>ONSET</th>
<th>DURATION</th>
<th>MAX DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>Moderate - severe pain</td>
<td>IV, SC, IM* &lt;6mo: 0.05-0.1 mg/kg q4h prn; 6mo-12yo: 0.1-0.2 mg/kg q2-4h prn; &gt;12yo: 3-10mg q2-6h prn</td>
<td>5-15 min</td>
<td>3-4 hr</td>
<td>15 mg</td>
<td>Advantages Moderately rapid predictable onset. Significant role for patients who need prolonged pain control (e.g., fracture reduction, multiple trauma, sickle cell disease)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO &lt;6mo: 0.1 mg/kg q3-4H prn; 6mo-12yo: 0.2-0.5 mg/kg PO q4-6h prn; &gt;12yo: 10-30 mg q3-4h prn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chronic Pain PCA route &lt;50kg: 0.01-0.03 mg/kg IV q6-20 min prn; &gt;50kg: 0.5-2.5mg IV q6-20min prn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Avoid in children with renal failure.

*IM routes not recommended as first line treatment.

Risks Respiratory depression, hypotension, bradycardia, CNS depression
## Severe Pain

<table>
<thead>
<tr>
<th>OPIOIDS</th>
<th>INDICATION</th>
<th>DOSE/ROUTE*</th>
<th>ONSET</th>
<th>DURATION</th>
<th>MAX DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro-morphone</td>
<td>Severe pain</td>
<td>0.01-0.015 mg/kg IV Every 4 hr 0.03 - 0.06 mg/kg PO Every 4 hr</td>
<td>Almost immediately Up to 30 min</td>
<td>2-4 hr</td>
<td>0.015 mg/kg/dose Adult dose=1-4 mg/dose</td>
<td>Advantages Rapid onset; less pruritis than morphine</td>
</tr>
</tbody>
</table>

**Risks**
- Respiratory depression, CNS depression, sedation

---

## Intranasal Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Max Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine+</td>
<td>0.5-1.0 mg/kg</td>
<td>Limited data</td>
<td>Use with caution until further studied</td>
</tr>
<tr>
<td></td>
<td>Large range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td>1.5-2 mcg/kg q 1-2 h</td>
<td>3 mcg/kg or 100 mcg</td>
<td>Divide dose equally between each nostril</td>
</tr>
<tr>
<td>Midazolam (Versed)</td>
<td>0.3 mg/kg</td>
<td>10 mg or 1 ml per nostril (total 2 ml)</td>
<td>Divide dose equally between each nostril</td>
</tr>
</tbody>
</table>
Intranasal Medications

- Use an atomizer, if > 1ml divide into nares
- Ketamine ??? dosage
  - Reports of 0.5-10 mg/kg; 50 mg/ml
- Dexmedetomidine IN
  - Not well studied in ED setting

Pharmacologic Safety in Pediatric Patients

- Many medications are metabolized in the liver via cytochrome P450 subtypes which are not fully developed in newborns
  - Hepatic enzymes reach full maturity at varying rates but generally at 1-6 months of age
  - Newborns have a higher percentage of body water compared to adults resulting in a higher volume of distribution for water soluble drugs
- Newborns also have reduced albumin which may alter drug binding in the plasma, or increased drug levels
- Glomerular filtration rates typically do not reach normal clearance rates until 2 weeks of age leading to decreased elimination of medications
- Due to immature respiratory symptoms infants may develop apnea or periodic breathing when given even small opioid doses.
Non-pharmacologic Interventions

- Child Life Specialist
- Comforting Positioning
- Distraction Techniques
- Guided Imagery

Non-pharmacologic Interventions

- Non-pharmacologic and pharmacologic methods can work together effectively
- Educate and encourage the parent/caregiver to participate in non-pharmacologic techniques
- There are multiple non-pharmacologic interventions for pediatric patients and their developmental stages.
Distraction Techniques

- This technique is most effective when a child’s pain is mild to moderate (it is difficult to concentrate when pain is severe)

- Why Distraction?
  - Child does not require training
  - Works with infants and older children
  - Involvement of parents
  - Minimal training for staff

- What Works?
  - Music & humor
  - Non-procedural talk
  - Relaxation/breathing techniques (guided imagery)
  - Distraction boxes
  - Not having parent hold child down

Guided Imagery

*Guided imagery helps children use their imagination to divert thoughts from the procedure to a more pleasant experience.*

- Suggestions:
  - Help the child use his/her imagination to create a descriptive story
  - Ask questions about a favorite place, upcoming events, vacations to keep the child engaged in technique
  - Guide the child through an experience that will tell him/her what to imagine and what it will feel like (i.e., a magic carpet ride or a day at the beach)
Non-pharmacologic Therapies: Infants

- Swaddling
- Holding
- Rocking
- Sucking
  - Sucrose pacifier (Sweet-Ease 24% sucrose solution)
  - Non-nutritive sucking
- Dim lighting
- Music
- Picture reading
- Toys
  - Key chains
  - Rattles
  - Blocks

Non-pharmacologic Measures: Toddlers

- Provide distraction with music
- Provide a pacifier
- Provide light touch or massage
- Try repositioning, splinting
- Apply cold or hot pack
- Offer play with blocks
- Drawing with crayons and paper
- Encourage picture reading
- Encourage singing
- Blowing bubbles
Non-pharmacologic Measures: Preschoolers

- Provide a calm environment
- Apply cold or hot pack
- Provide a position of comfort
- Provide light touch or massage
- Suggest music or TV to entertain
- Coach child through the ED process and/or procedures
- Draw in coloring books
- Play with puzzles
- Look at or read storybooks
- Encourage singing or storytelling
- Hold cold or hot pack
- Engage in distracting conversation

Non-pharmacologic Measures: School Age Child

- Provide a calm environment
- Suggest new positions for comfort
- Suggest music, TV
- Read books
- Coach child through the ED process and/or procedures
- Share jokes
- Provide light touch or massage
- Hold cold or hot pack
- Demonstrate relaxation techniques such as breathing exercises
- Use squeeze balls
- Encourage conversation about favorite things
- Play with electronic tablet/wireless internet device
Non-pharmacologic Measures: Adolescent

- Apply cold or hot pack
- Suggest repositioning or positions of comfort
- Encourage talking about favorite places or activities
- Provide light touch or massage
- Listen to music
- Read
- Visit with friend
- Use telephone access
- Coach about ED processes and procedures
- Discuss preferred relaxation techniques
- Demonstrate relaxation techniques, if unfamiliar
- Use squeeze balls
- Encourage making choices
- Play with electronic games or tablets

Reassessment of Pain
Reassessment of Pain, Evaluation of Treatment Effectiveness, and Adjustment of Treatment Plan

- **One of the most common mistakes made in pain management is failure to reassess**
  - Reassess the patient to determine if your pharmacologic and non-pharmacologic interventions are making a difference (TJC)
  - Repeat the same pain score or assessment tool
  - Ask the patient, the caregiver and other members of the healthcare team if they believe the pain intensity and/or anxiety has diminished
  - Determine next steps in treatment

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Procedural Sedation and Analgesia (PSA)

PSA is a form of pain management that is often used in the ED setting. PSA is **defined** as the use of pharmacologic agents to provide anxiolysis, analgesia, sedation, or motor control during procedures or diagnostic tests.

- PSA reduces the discomfort, apprehension, and potential unpleasant memories associated with procedures and facilitates improved performance.
Definition of Procedural Sedation and Analgesia (PSA)

PSA has overlap with many terms and was previously synonymous with the term "conscious sedation"; however, effective sedation often alters consciousness so the preferred term in the ED and acute care setting is "procedural sedation and analgesia (PSA)."

Procedural Sedation and Analgesia on a Continuum

- Sedation levels exist along a continuum but it is clinically challenging to use discrete sedation stages or terminology, especially in children.
- The Joint Commission and American Society of Anesthesiologists (ASA) adopted definitions to define the continuum of levels that range from minimal sedation to general anesthesia:
  - Analgesia
  - Minimal sedation
  - Moderate sedation and analgesia
  - Deep sedation and analgesia
  - General anesthesia
  - Dissociative sedation
### Procedural Sedation Definitions

<table>
<thead>
<tr>
<th>Organization</th>
<th>Definition or Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACEP</strong></td>
<td>Technique of administering sedatives or dissociative agents with or without analgesics to induce an altered state of consciousness that allows the patient to tolerate painful or unpleasant procedures while preserving cardiorespiratory function. The intent of the sedation, not the agent itself, determines whether medication is being delivered to relieve anxiety or to facilitate a specific procedure as with procedural sedation.</td>
</tr>
<tr>
<td><strong>ASA</strong></td>
<td>Administration of sedatives or dissociative agents with or without analgesics to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function.</td>
</tr>
<tr>
<td><strong>AAP</strong></td>
<td>The sedation of children is different from the sedation of adults. Sedation in children is often administered to control behavior to allow the safe completion of a procedure. A child’s ability to control his or her own behavior to cooperate for a procedure depends both on chronologic and developmental age. AAP uses the terms minimal, moderate and deep sedation.</td>
</tr>
</tbody>
</table>

### PSA Continuum Tips

- Sedation is *unpredictable* and levels may rapidly change to unanticipated and deeper levels of sedation than intended.
- Providers of PSA must be able to rescue the patient from deeper levels of sedation and require PALS training or knowledge equivalency.
- Providers must also take into account the patient’s unique makeup including age, body habitus, comorbidities, medications, and allergies to determine if PSA is a safe and effective option and to determine medication selection.
- *Dissociative sedation is unique and commonly used in the pediatric and ED settings, but does not fall neatly within the continuum.*
PC.03.01.07: The hospital provides care to the patient after operative or other high-risk procedures and/or the administration of moderate or deep sedation or anesthesia.

1 The hospital assesses the patient's physiological status immediately after the as the patient recovers from moderate or deep sedation. (See also RC.02.01.03, EP 8)

2 The hospital monitors the patient's physiological status, mental status, and pain level at a frequency and intensity consistent with the potential effect of the sedation administered.

4 A qualified licensed independent practitioner (LIP) discharges the patient from the recovery area or from the hospital. In the absence of a qualified LIP, patients are discharged according to criteria approved by clinical leaders. (See also RC.02.01.03, EPs 9 and 10)

6 Discharged patients who have received sedation has a guardian who accepts responsibility for the patient.

7 For hospitals that use Joint Commission accreditation for deemed status purposes: A post-anesthesia evaluation is completed and documented by an individual qualified to administer anesthesia no later than 48 hours after surgery or a procedure requiring anesthesia services.

8 For hospitals that use Joint Commission accreditation for deemed status purposes: The post-anesthesia evaluation for anesthesia recovery is completed in accordance with law and regulation and policies and procedures that have been approved by the medical staff.

Fasting Time: ASA Guidelines

ASA guidelines recommend patients undergoing procedural sedation for "elective procedures" fast according to the standards used for general anesthesia. This requires patients not eat or drink for two hours after drinking clear liquids and six hours after ingesting solid foods or cow's milk. If these standards cannot be met, the guidelines recommend that the clinician consider delaying the procedure, reducing the level of sedation, or protecting the airway with endotracheal intubation.

Implementing these guidelines in the ED presents several problems:

- It is rare that patients requiring emergent PSA meet these fasting criteria.
- Emergent procedures cannot be delayed.
- Although fasting to reduce the risk of aspiration during procedural sedation or elective surgery makes intuitive sense, there is little evidence to support this approach.
Last Meal: ACEP 2014 Guidelines

The American College of Emergency Physicians (ACEP) 2014 clinical policy on procedural sedation reviews the critical question: **In patients undergoing PSA in the ED, does pre-procedural fasting demonstrate a reduction in the risk of emesis or aspiration?**

**Answer:** Do not delay procedural sedation in adults or pediatrics in the ED based on fasting time. Pre-procedural fasting for any duration has not demonstrated a reduction in the risk of emesis or aspiration when administering procedural sedation and analgesia. (Level B recommendation)

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No Perfect Recipe or “Cookbook” - No universal *kid* recipe

- What do you want to cook?
- Know your ingredients
- Recipe options
- Use careful measurements
- Follow the steps
- Bake and observe
- Don’t leave the kitchen!
Overview of Stepwise Approach to Pediatric Pain Management or Procedural Sedation Analgesia (PSA)

Children bring unique challenges to the use of PSA. The choice of whether or not to use PSA and what agents to use are determined by using a stepwise approach that is outlined next.

These same steps can be used in assessing and treating any type of pain scenario in the pediatric setting.

Step 1: Determine the Situation: What are you trying to accomplish or treat?

- Pain only
- Pain and anxiety or agitation
- Anxiety only
- Agitation only
- Sedation only plus topical, local, or other intervention
- Procedure that will induce pain or anxiety
- Chronic pain condition exacerbation

Determination accomplished after a brief history and PE or triage
Step 2: Perform a Developmental Checkpoint

Step 2. Perform a Developmental or Cognitive Checkpoint

- What is the developmental stage
- Is development normal for age
  - Developmental delay
  - Autism
  - Special health care needs
  - Mental health
  - Recent traumatic events

- What are characteristics of this developmental stage in response to pain?
- How do you adapt your approach based on developmental level?
- Kids and teens don’t always follow the charts!

Step 3: Family Dynamic Checkpoint

Step 3. Family Dynamic Checkpoint

- Who is there with the child?- parents, siblings.....
- Who is the legal guardian?
- Who actually cares for the child?
- Who do you want at the bedside?
- Culture, past experience
- What can they tolerate
- Time commitments
- Family personality
- Family stress level
A quick visual or peek in the door is invaluable.
What is child's personality?
What is caregiver's personality?
Is caregiver going to be a help or hindrance?

Step 4: Facility Checkpoint

Step 4. Facility Checkpoint

- Staffing and setting
  - Community, rural, children’s hospital
- Experience
  - Pediatric
  - Sedation
  - Team capabilities and expertise
- Hospital policies on Pain and PSA
- Acuity and overcrowding of the ED
- Other priorities
- Equipment
- Monitoring
- Backup
Step 5: Patient Assessment Checkpoint

- Review risk factors from history and PE
- CSHCN, genetic syndromes,…
- Chronic illness
- History of failed sedation
- Psychiatric and mental considerations
- Injury severity
- Body habitus
  - Weight- ideal or real?

Step 6: Management Checkpoint: Choose Your “Recipe”

- No magic recipe, must individualize and adjust “Ingredients”
- Pharmacologic “ingredients”
  - Topical
  - Local anesthetics or blocks
  - Oral, nasal, IV
- Non-pharmacologic “ingredients”
  - Everyone in ED needs a little child life 101 course- music, swaddling, etc.
  - Engage caregivers, parents, volunteers, etc.
  - Lobby for child life specialist in your ED if ↑ pediatric volume

Usually need both pharmacological and non-pharmacological options
Step 7: Monitoring And Discharge Checkpoint

**Step 7. Monitoring & Discharge Checkpoint**

- Joint Commission standards
- Document reassessments
- Child should be back to baseline and tolerating fluids at discharge but difficult situation when after bedtime
- Falls prevention
- Transportation

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Step 7: Monitoring During PSA

- Monitor vital signs *frequently* and at regular intervals (document every 5 minutes during procedure):
  - blood pressure
  - heart rate
  - respiratory rate
- Monitor *continuously*:
  - oxygen saturation (SpO2)
  - end-tidal carbon dioxide level (EtCO2) if available
  - cardiac rhythm

**Patient safety tip:** Complications from sedation such as respiratory depression are most likely to occur within 5 to 10 minutes after administration of IV medication and immediately after the procedure when stimuli associated with the procedure are removed. Thus, monitoring should be especially close during these periods.
Step 7: Monitoring and Discharge of Pediatric Patients that are Transported to Another Facility or Area After PSA or Receiving Analgesics

- Have credentialed and skilled personnel accompany the child
- Monitor all vital signs and level of consciousness
- Transport on cardiac monitor and pulse oximeter
- Bring necessary supplies or emergency equipment bag with age appropriate sizes and oxygen tank
- Bring necessary emergency drugs (including reversal agents)
- Give report to receiving facility of last analgesic or PSA medication

Discharge Planning, Transition to Care, Patient Safety and Risk Considerations in Pain Management
Summary of the Approach to Effectively Managing Pediatric Pain-Shift Example

- Recognize and anticipate
- Identify type of pain
- Select appropriate treatment(s)- pharmacologic and non-pharmacologic
- Re-evaluate effectiveness of the selected treatment(s)
- Adjust accordingly based on clinical course

My Favorite “Recipes”

- Simple FB removal, abscess I&D or small wound repair- Nasal versed + LET + child life or member of my “ED dream team” + “my toys” + holder
- Pain management only- good old tried and true morphine or fentanyl
- PSA-Ketamine 1 mg/kg IV with extra 1 mg/kg drawn up and ready
  - Pretreatment with Zofran
  - No atropine or midazolam
Strike a Balance of Risks and Benefits

**MAXIMIZE** benefits while **minimizing** associated risks

- **RISK**
  - Hypoventilation
  - Laryngospasm
  - Airway obstruction
  - Death
  - Apnea
  - Cardiac depression

- **BENEFIT**
  - Minimize pain & discomfort
  - Maximize amnesia
  - Minimize psychological trauma/anxiety
  - Control movement

What’s New and on the Horizon in Pain Management

- New discoveries regarding pathophysiology of pain and effects of untreated acute pain
- Ketamine is “King” - current research focus on
  - Low sub-dissociative dose for pain syndromes
  - Nasal ketamine
  - Ketamine for adults
- Dexmedetomidine (Precedex®)
  - Most studies are not in ED setting, minimal analgesic effects
- Pharmaceutical companies working feverishly to find new non-opiod treatment alternatives
- Advances in palliative care and pain management of chronic pain
- Rapid growth of pediatric pain and sedation services
- Devices to measure level of pain via imaging of facial expressions
- What’s out- barbiturates and chloral hydrate
The PAMI website offers access to learning module handouts, pain tools, resources, websites, and recent pain news.

We welcome your feedback on all PAMI materials and are interested in how you use them to improve patient safety and clinical care. Please email emresearch@jax.ufl.edu.

For more information please visit http://pami.emergency.med.jax.ufl.edu/
What can you do to Improve Management of Pediatric Pain?
I need your cases and feedback! Questions?

Quiz Questions

• The way in which a child’s pain is first addressed in the ED may have long lasting effects. True or False
• The elements of pain assessment in children include all of the following, EXCEPT: Assess physiologic parameters
  • Perform behavioral observation
  • Provide acetaminophen immediately and reassess
  • Question the child
  • Use a standardized assessment tool
• Reasons children may not disclose their pain include. (slide 29)
  • Fear of healthcare professionals
  • Protection of parents or caregiver
  • Avoidance of hospitalization
  • Desire to return to activities
  • All of the above
Quiz Questions

• The way in which a child’s pain is first addressed in the ED may have long lasting effects. True

• The elements of pain assessment in children include all of the following, EXCEPT: (slides 20, 21, 28, 33-34)
  • Assess physiologic parameters
  • Perform behavioral observation
  • Provide acetaminophen immediately and reassess
  • Question the child
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