Managing Pediatric Pain in Acute Care Settings
PAMI learning module content will sometimes overlap due to similar topics. 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/

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Citation for Presentation

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Module Adaptation and Illinois EMSC Citation

• Portions of this pediatric module were adapted from Illinois Emergency Medical Services for Children 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.

• Suggested Citation: Pediatric Pain Management in the Emergency Setting, Illinois Emergency Medical Services for Children, 2013.
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Learning Objectives

1. Discuss methods of recognizing and assessing pediatric pain
2. Review a developmental and behavioral approach to assessing and treating pain in children of all ages
3. Describe non-pharmacologic and pharmacologic options for pediatric pain management
4. Determine a stepwise approach to pediatric procedural sedation and analgesia (PSA)
5. Understand the importance of discharge planning and transition of care
6. Review patient safety aspects of pediatric pain management
Learning Objectives

1. Describe a stepwise approach for managing pediatric pain and sedation based on setting, situation, development and family.
2. Identify factors affecting the individual child’s response to pain.
3. Discuss advantages of using nonpharmacologic pain management techniques and distraction to decrease opioid dosage, save time and improve patient safety.
4. Describe current societal trends and challenges in pain management.
5. Identify pediatric pain management resources and tools.
Module Outline

1. Learning Objectives
2. Background Information
3. Pain Pathophysiology
4. Recognition and Assessment of Pediatric Pain
5. Identifying the Type of Pain
6. Treatment options
   1. Pharmacological Treatment
   2. Nonpharmacologic Interventions
7. Reassessment of Pain
8. Procedural Sedation and Analgesia (PSA)
9. Summary
10. Resources
Pediatric ED Pain Scenarios- Huge Spectrum

- A 6 yo sickle cell patient in Florida on vacation- presents in severe pain despite trying usual pain plan and medications
- A 14 yo presents with JRA and severe joint pain
- A 5 yo presents after fall off monkey bars with obvious deformity of arm
- An irritable 6 month old presents with a huge abscess and fever
- A 3 yo presents with burns after pulling pot of boiling water off the stove
Background Information
Background

• Pain is a common complaint in the ED, EMS and hospital settings and requires special considerations when dealing with children.

• One child suffering from a traumatic injury and two anxious family members can disrupt the flow of your entire ED.

• Recognizing and effectively managing your pediatric patient’s pain improves outcomes and enhances compassionate family-centered care.

• 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
Why Aren’t We Managing Children’s Pain? NY Times April 2016

“One of the best ways to address the epidemic of chronic pain in this country is to stop it before it starts…. If we could reduce painful experiences in childhood we might be able to reduce chronic pain in the next generation”

…..medical training in pain management is scant. Veterinary schools require “at least five times more education on how to handle pain” than medical schools, Nora D. Volkow, the director of the National Institute on Drug Abuse, said earlier this year in testimony before a Senate committee.
Why Is Pediatric Pain Management So Important?
Chronic Pain in Children: Important link between post-traumatic stress & sleep
Patrick Finan, PhD and Melanie Noel, PhD

• Sleep disturbances considered an underlying factor in the co-occurrence of chronic pain and PTSS.
• Chronic pain and sleep are intimately related, with strong evidence for a reciprocal association
• Beyond the influence of demographics and anxiety symptoms, sleep quality partially mediates relationships between PTSS and pain intensity and interference.
• Hyperarousal has been linked to increased pain sensitivity, pain-related anxiety, and pain-avoidant behaviors.
Energy
Coping with pain drains energy. Lack of energy makes it hard to be active and stay in shape.

Sleep
Pain and anxiety make it hard to sleep. Lack of sleep makes pain worse and lowers energy.

Activity
Pain and lack of energy make it hard to be active. Lack of exercise worsens pain.

Mood
Chronic pain and the limits it puts on your life can lead to depression, anger, and anxiety. These feelings make coping with pain harder.
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
Pain Pathophysiology

Anatomic Components of Pain Transmission

1. Noxious Stimulus
   - May be chemical, thermal or mechanical

2. Peripheral Transmission
   - Nociceptors

3. Release of Substance P in Dorsal Horn

4. Thalamus Axons Project to Other Areas of the Brain

5. Cortical Association Area
   - Interpretation of Pain

6. Primary Sensory Cortex
   - Location of Pain

7. Limbic Forebrain
   - Emotional Reaction to Pain

PERIPHERAL ACTIVITY
- Vasodilation
- Edema
- Hyperalgesia
- Release of chemicals

BRAINSTEM

ANTEROLATERAL TRACT
Pain 101- it’s complicated!

**Anatomic Components of Pain Transmission**

1. **Periophal Transmission**
   - **Noxious Stimulus**: May be chemical, thermal or mechanical

2. **Peripheral Activity**
   - Vasodilation
   - Edema
   - Hyperalgesia
   - Release of chemicals

3. **Release of Substance P**
   - Anterolateral tract in dorsal horn

4. **Thalamus Axons Project to Other Areas of the Brain**

**HOW YOU FEEL PAIN: THE PAIN PATHWAY**

1. Pain receptors (nociceptors) in the skin are activated by tissue damage.
2. A signal travels up the peripheral nerve to the spinal cord.
3. Within the spinal cord, chemical messengers (neurotransmitters) are released. These activate other nerves that pass signals to the brain.
4. The thalamus relays the signals on to the somatosensory cortex (sensation), frontal cortex (thinking) and limbic system (emotional response).

**Limbic Forebrain**
- Emotional reaction to pain

**Primary Sensory Cortex**
- Location of pain

**Cortical Association Area**
- Interpretation of pain

**BRAINSTEM**
- Anterolateral tract in dorsal horn

**Spinal Cord**
- Peripheral Transmission

**Peripheral Nerve**
- Pain receptor

**Epidermis**
- Dermis
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
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>Decreased oxygen saturation, atelectasis</td>
</tr>
<tr>
<td>Inadequate cough</td>
<td>Retention of secretions</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></td>
<td>Increased cortisol and blood glucose levels</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 in the ED during a child’s first painful experience has lasting effects!

- Recurrent pain
- Under-treated pain
- Developmental factors

Factors:
- Past experience
- Temperament
- Coping
- Developmental age

Result:
- Pain memory
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.
- Assessing pediatric pain can be difficult especially in those who are preverbal.

- Additionally, procedures and treatments used to manage the disease or injury may induce pain.
- The next section will review the **elements of pain assessment**
  - Assess physiologic parameters
  - Perform behavioral observation
  - Question the child
  - Use a standardized assessment tool
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

• Heart rate, blood pressure, and respirations may provide clues, especially in acute pain settings.
Elements of Pain Assessment: Perform Behavioral Observation

- Assess physiologic parameters
- Perform behavioral observation
- Question the child
- Use standardized assessment tool
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.
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Factors Affecting Pediatric Response to Painful Stimuli

• Age, gender, ethnicity
• Socioeconomic and psychiatric factors
• Culture and religion
• Genetics
• Previous experiences
• Patient/family perceptions
Learn How to Observe Pain by Development

Infant

Toddler

Preschooler

School-age and Adolescent
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

The next section will review how to “Question the Child”
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
Explore:
• Location of pain
• Duration of pain
• Quality of pain
• Precipitating factors
• Effect on daily activities
• Pain relief measures
• Previous pain experiences

Consider:
• The child’s primary language
• Words or phrases suggested by the parent/caregiver
• The child’s developmental level
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 hospital experience
  - Document the use of a differing scale, if changed
  - Educate the child/parent/caregiver about the use of the scale
Pain Assessment Scales

- Pain scales fall into 2 general categories:
  - Observational behavioral scales require provider to assess multiple behaviors and rank them.
  - Self-report scales include selection of a face or color or number to represent pain.

- There are different validated pain scales available for a variety of patient populations.
# Pediatric Pain Assessment Scale Descriptions

<table>
<thead>
<tr>
<th>Measurement Scale</th>
<th>Age Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birth - 6 months</strong></td>
<td></td>
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<tr>
<td>Neonatal Infant Pain Scale (NIPS)</td>
<td>Preterm and full term neonates</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 and physiologic 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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infant and older (non-verbal children)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised Faces, Legs, Activity, Cry, and Consolability (r-FLACC)</td>
</tr>
<tr>
<td>Non Communicating Children’s Pain Checklist (NCCPC-R)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 years and older</th>
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</thead>
<tbody>
<tr>
<td>Wong Baker Faces</td>
</tr>
<tr>
<td>Oucher</td>
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<table>
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<tr>
<th>8 years and older</th>
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</thead>
<tbody>
<tr>
<td>Visual Analogue Scale (VAS)</td>
</tr>
<tr>
<td>Verbal Numeric Scale (VNS)/ Numeric Rating Scale (NRS)</td>
</tr>
</tbody>
</table>
Pediatric: Non-verbal, GCS <15 or Cognitive Impairment

<table>
<thead>
<tr>
<th>FLACC Scale</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Face</td>
<td>No particular expression or smile.</td>
<td>Occasional grimace or frown, withdrawn, disinterested.</td>
<td>Frequent to constant frown, clenched jaw, quivering chin.</td>
</tr>
<tr>
<td><strong>2</strong> Legs</td>
<td>Normal position or relaxed.</td>
<td>Uneasy, restless, tense.</td>
<td>Kicking, or legs drawn up.</td>
</tr>
<tr>
<td><strong>3</strong> Activity</td>
<td>Lying quietly, normal position, moves easily.</td>
<td>Squirming, shifting back and forth, tense.</td>
<td>Arched, rigid or jerking.</td>
</tr>
<tr>
<td><strong>4</strong> Cry</td>
<td>No crying (awake or asleep).</td>
<td>Moans or whimper; occasional complaint.</td>
<td>Crying steadily, screams or sobs, frequent complaints.</td>
</tr>
<tr>
<td><strong>5</strong> Consolability</td>
<td>Content, relaxed.</td>
<td>Reassured by occasional touching, hugging or being talked to, distractible.</td>
<td>Difficult to console or comfort.</td>
</tr>
</tbody>
</table>
Pediatric: Verbal, Alert and Oriented

**Wong-Baker FACES Pain Rating Scale**

- **0 = VERY HAPPY, NO HURT**
- **1 = HURTS JUST A LITTLE BIT**
- **2 = HURTS A LITTLE MORE**
- **3 = HURTS EVEN MORE**
- **4 = HURTS A WHOLE LOT**
- **5 = HURTS AS MUCH AS YOU CAN IMAGINE**
  
  (Don’t have to be crying to feel this much pain)

Explain to the person that each face is for a person who feels happy because he has no pain (no hurt) or sad because he has some or a lot of pain. Face 0 is very happy because he doesn’t hurt at all. Face 1 hurts just a little bit. Face 2 hurts a little more. Face 3 hurts even more. Face 4 hurts a whole lot. Face 5 hurts as much as you can imagine, although you don’t have to be crying to feel this bad. Ask the person to choose the face that best describes how he is feeling.

Rating scale is recommended for persons age 3 years and older.

**Brief word instructions:** Point to each face using the words to describe the pain intensity. Ask the child to choose face that best describes own pain and record the appropriate number.

Pediatric or Adult: Verbal, Alert and Oriented

0–10 Numeric Pain Rating Scale

- 0: No pain
- 1–3: Mild pain
- 4–6: Moderate pain
- 7–10: Severe pain

Worst possible pain
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.

Refer to the [Basics Principle's of Pain Module](#) for further information.
Treatment Options

Pharmacological

Nonpharmacologic
Pain Interventions That Alter *Peripheral* Transmission of Pain

<table>
<thead>
<tr>
<th>Transmission Point</th>
<th>Nonpharmacologic Interventions</th>
<th>Pharmacologic Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduce tissue injury</td>
<td>• Splinting</td>
<td>• Administer non-steroidal anti-inflammatory drugs (NSAIDs)</td>
</tr>
<tr>
<td>• Alter blood flow to area</td>
<td>• Immobilization</td>
<td>• Administer local anesthetic agent</td>
</tr>
<tr>
<td>• Reduce swelling</td>
<td>• Skin stimulation</td>
<td></td>
</tr>
<tr>
<td>• Inhibit prostaglandin production</td>
<td>• Application of heat and cold</td>
<td></td>
</tr>
</tbody>
</table>
Pain Interventions That Alter *Spinal Cord* Transmission of Pain

<table>
<thead>
<tr>
<th>Transmission Point</th>
<th>Nonpharmacologic Interventions</th>
<th>Pharmacologic Interventions</th>
</tr>
</thead>
</table>
| • Block by activating large fibers and preventing nociceptive transmission  
• Block by binding opioid receptors in spinal cord  
• Decrease release of neurotransmitters  
• Interrupt descending input from brain. | • Skin stimulation  
• Massage  
• Acupuncture  
• Application of heat and cold  
• Touch | • Epidural analgesia  
• Intrathecal analgesia  
• Opioids |
# Pain Interventions That Alter Receptor Site Transmission of Pain

<table>
<thead>
<tr>
<th>Transmission Point</th>
<th>Nonpharmacologic Interventions</th>
<th>Pharmacologic Interventions</th>
</tr>
</thead>
</table>
| • Increase stimuli to the brain  
• Increase blood flow to targeted areas, decreases pain chemicals  
• Increase endorphins | • Distraction  
• Imagery  
• Relaxation  
• Biofeedback | • Systemic opioids |
Pharmacologic Interventions
Pain Management: Putting it All Together

• No Perfect Recipe or “Cookbook”
• No Universal Kid Recipe
Pharmacologic Pain Management Strategies

**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

For more information refer to module on Pharmacologic Treatment of Pain
The PAMI Pain Management and Dosing Guide is a free tool for use by health care providers in hospital, EMS or acute care settings and should be used as general guide when managing pain in pediatric and adult populations.

The guide provides treatment options for opioids, non-opioids, procedural sedation, nerve blocks, and IV/IM/IN/topical administration. It includes a step-wise approach to pain, patient safety considerations as well as nonpharmacologic interventions. To take a tour of the dosing guide, click here!

A free downloadable pdf of the dosing guide can be accessed on the PAMI website. http://pami.emergency.med.jax.ufl.edu/resources/dosing-guide/
Topical Anesthetic Overview

<table>
<thead>
<tr>
<th>Type</th>
<th>Onset</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMLA®</td>
<td>60 min</td>
<td>lidocaine 2.5% and prilocaine 2%</td>
</tr>
<tr>
<td>LMX4®</td>
<td>40 min</td>
<td>liposomal lidocaine 4%</td>
</tr>
<tr>
<td>LET</td>
<td>20 min</td>
<td>lidocaine, epinephrine, and tetracaine (A gel form of TAC can be made by adding 150 mg of methylcellulose 4000 cps to 3 mL of LET solution)</td>
</tr>
<tr>
<td>Synera®</td>
<td>20 min</td>
<td>lidocaine and tetracaine patch</td>
</tr>
<tr>
<td>Topical Anesthetic Skin Refrigerant (Pain Ease®):</td>
<td>&lt; 5 min</td>
<td></td>
</tr>
</tbody>
</table>

**Safety Tip:** agents are cardiac depressants; maximum allowable safe dosage should be calculated *before* administration to avoid overdose in pediatric cases.
# 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>
| L.M.X.4® (Lidocaine 4%) | For external use for pain relief of minor cuts, scrapes, burns, sunburn, insect bites, and minor skin irritations | Apply externally | Onset 20-30 minutes | Externally 3-4 times per day | **Advantages**  
For use in children 2 years and older  
Over-the-counter (OTC) availability  
**Risks**  
Use discretion in children < 2 years old. |
| LET Lidocaine Epinephrine Tetracaine (gel or liquid) | Wound repair (non-mucosal) | 4% Lidocaine 1:2,000 Epinephrine 0.5% Tetracaine | Onset 10 minute | 3 ml (not to exceed maximal Lidocaine dosage of 3-5 mg/kg) | **Advantages**  
No physical wound distortion, painless application, decreased repair time, non-cocaine containing anesthetic  
**Risks**  
Not for use over end arteriole locations |
# 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) (for children &gt; 3 months age)</td>
<td>Dermal analgesic (intact skin)</td>
<td>3-12 months (and &gt;5 kg) maximum area covered 20 cm² 1-6 years (and &gt;10 kg) maximum area covered 100 cm² 7-12 years (and &gt;20 kg) maximum area covered 200 cm² topical/transdermal (cover area with occlusive dressing)</td>
<td>Onset 45-60 minutes Duration 3-4 hour</td>
<td>2 gm 10 gm 20 gm</td>
<td>Maximum application time not to exceed 4 hours</td>
</tr>
</tbody>
</table>

**Advantages**
Painless application, patient compliance, decreased repair time

**Risks**
Methemoglobinemia Contact dermatitis
# 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 hypopigmentation especially in dark skin |
| Lidocaine | Foley catheter and NG tube insertion; Intubation; Gingivostomatitis painful lesions | 2% topical gel/jelly oropharyngeal viscous topical solution | 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>
<tbody>
<tr>
<td>Infiltrative Lidocaine</td>
<td>Vascular access; needle insertion procedures</td>
<td>Subcutaneous</td>
<td>Onset 4-10 min</td>
<td>4.5 mg/kg maximum dose or 300 mg</td>
<td><strong>Advantages</strong> Rapid onset, longer duration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1% Lidocaine without epinephrine</td>
<td>Duration 90-120 min</td>
<td>7 mg/kg maximum dose</td>
<td><strong>Risks</strong> Hematoma, bleeding at site; absorption can cause systemic toxicity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5%= 5mg/ml</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1% = 10mg/ml</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2% = 20 mg/ml</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1% Lidocaine with epinephrine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J-Tip® Jet injector of 1% buffered Lidocaine</td>
<td>Vascular access, needle insertion procedures</td>
<td>0.2 ml subcutaneous</td>
<td>Immediate</td>
<td>One application per site</td>
<td><strong>Advantages</strong> Needleless</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Risks</strong> Not for preterm infants; neonates; patients with blood disorders; or in children receiving chemotherapy or blood thinners.</td>
</tr>
</tbody>
</table>
## 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><strong>Acetaminophen (APAP)</strong>‡</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</td>
<td><strong>Advantages</strong>&lt;br&gt;Minimal adverse effects on GI tract or renal function</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60 mg/kg/day for neonates</td>
<td><strong>Risks</strong>&lt;br&gt;Liver toxicity</td>
</tr>
<tr>
<td><strong>Ibuprofen</strong> (Motrin®, Advil*)</td>
<td>Mild pain</td>
<td>5 - 10 mg/kg Every 6-8 hr PO</td>
<td>40 mg/kg/day Adults 3200 mg/day</td>
<td><strong>Advantages</strong>&lt;br&gt;Inhibits prostaglandin-induced nociception</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Risks</strong>&lt;br&gt;Nausea, vomiting, ulcers, platelet dysfunction, liver toxicity</td>
</tr>
</tbody>
</table>

**NOTE**: ‡ All doses of combination products limited by APAP content to 75 mg/kg/day
## 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*</td>
<td>30 mg/IM every 6 hr</td>
<td><strong>Advantages</strong>&lt;br&gt;Effective alternative to opioids for treatment of moderate to severe pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO for patients &gt; 50 kg</td>
<td>Adult dose: 60 mg IM or 30 mg IV. If &lt; 50 kg use 30 mg IM and 15 mg IV.</td>
<td><strong>Risks</strong>&lt;br&gt;Bleeding diathesis; hyperkalemia; depression of renal function; and hepatotoxicity</td>
</tr>
</tbody>
</table>

*IM routes not recommended as first line treatment.

**NOTE:** Do not use with other NSAIDs.
**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>
</table>
| Codeine/APAP with Codeine | Mild - moderate pain | 0.5 - 1 mg/kg of Codeine or 12 mg for 3-6 yo and 15-30 mg for 7-12 yo Every 4-6 hr PO Oral solution: 12 mg codeine/5 ml | 1-2 hr | 4-6 hr | 60 mg/dose | **Advantages** Rapid onset action  
**Risks** Nausea, vomiting, constipation, respiratory depression, hypotension, bradycardia, CNS depression See current FDA warnings |

**NOTE:** Codeine is often ineffective. Use for cough and cold is contraindicated in children. Not recommended for < 12 yo or 12-18 yo with respiratory condition or nursing mothers.
# 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>
</table>
| **Hydrocodone** (+ APAP: NORCO, Hycet, Lortab®, Vicodin®) | Mild - moderate pain       | 0.1 - 0.2 mg/kg of Hydrocodone Every 4-6 hr PO 2.5 mg hydrocodone/5 ml | 30 min  | 3 - 4 hr  | Limited by APAP component | Advantages: Oral medication, moderately rapid onset  
Risks: Dizziness, sedation, nausea, vomiting, constipation |
| **Oxycodone** (+APAP: Percocet®) | Moderate - severe pain    | 0.05 - 0.15 mg/kg of Oxycodone Every 4-6 hr PO (immediate release formula) | 15 min  | 3 - 4 hr  | 10 mg every 4-6 hr | 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.
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 IV</td>
<td>30-60 min IV</td>
<td>1-3 mcg/kg/dose</td>
<td><strong>Advantages</strong> 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><strong>Risks</strong> Respiratory depression, apnea may precede alteration of consciousness chest wall rigidity if given too rapidly</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.*

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

**IM=Intramuscular**

**IN=Intranasal**
## Severe Pain

<table>
<thead>
<tr>
<th>OPIOIDS</th>
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<th>MAX DOSE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>Moderate - severe pain</td>
<td>IV, SC, IM*</td>
<td>5-15 min</td>
<td>3-4 hr</td>
<td>15 mg</td>
<td></td>
</tr>
<tr>
<td>(Roxanol®)</td>
<td></td>
<td>&lt;6mo: 0.05-0.1 mg/kg q4h prn; 6 mo-12yo: 0.1-0.2 mg/kg q2-4h prn; &gt;12yo: 3-10mg q2-6h prn</td>
<td></td>
<td></td>
<td></td>
<td></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</td>
<td>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>
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</tr>
</tbody>
</table>

**Advantages**
Moderately rapid predictable onset. Significant role for patients who need prolonged pain control (e.g., fracture reduction, multiple trauma, sickle cell disease)

**Risks**
Respiratory depression, hypotension, bradycardia, CNS depression

*IM routes not recommended as first line treatment.

**NOTE:** Avoid in children with renal failure.
# 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</td>
<td>Almost immediately</td>
<td>2-4 hr</td>
<td>0.015 mg/kg/dose</td>
<td><strong>Advantages</strong> Rapid onset; less pruritis than morphine</td>
</tr>
<tr>
<td>(Dilaudid®)</td>
<td></td>
<td>mg/kg IV</td>
<td></td>
<td></td>
<td>Adult dose=1-4 mg/dose</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Every 4 hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.03 - 0.06</td>
<td></td>
<td></td>
<td></td>
<td><strong>Risks</strong> Respiratory depression, CNS depression, sedation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mg/kg PO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Every 4 hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Intranasal Medications

• Use concentrated solution
  • Ketamine 50 mg/ml*
  • Fentanyl 50 mcg/ml*
  • Midazolam 5mg/ml

• Use an atomizer
  • If > 1ml divide between nares
  • Aim spray toward turbinates/pinna

*Rapid CSF levels
Ketamine Pharmacology

- Blockade of N-methyl D-aspartate (NMDA) receptors, peripheral Na+ channels and μ-opioid receptors providing sedation, amnesia, and analgesia.
- $R(-)$ vs $S(+)\$ ketamine
  - $S(+)\$ enantiomer provides better analgesia (4x potent) but more auditory/visual disturbances
- High lipid solubility
  - allows rapid crossing of the blood-brain barrier,
  - quick onset of action (peak concentration at 1 minute-IV)
- Rapid recovery to baseline
Ketamine Timeline

1960’s
- Ketamine first synthesized -- Calvin Stevens
- Patented in U.S. as an anesthetic & sedative in humans

1970’s
- FDA approved for human use—primarily in pediatrics and elderly
- Battlefield anesthetic during Vietnam War
- Sedative agent for children

1980’s
- Decline in use due to increased illicit use and emergence reactions
- Ketamine first used to treat pain-1989

1990’s
- Ketamine declared a Schedule III Drug, controlled substance in the U.S.

2000’s
- Increased use in treatment of acute & chronic pain
- Ketamine as treatment for depression
Consensus Guidelines on the Use of Intravenous Ketamine Infusions for Acute Pain Management

• From the American Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists (Reg Anesth Pain Med 2018;43: 456–466)

• Evidence supports the use of subanesthetic ketamine for acute pain in a variety of contexts, including as a stand-alone treatment, as an adjunct to opioids, and, to a lesser extent, as an intranasal formulation.
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.
Incorporate Current Evidence-based Pharmacologic Pain Interventions

- Provide analgesia for children with acute abdominal pain prior to the surgical consult
- Provide pain medication for children in triage with a pain rating greater than 6 out of 10
- Provide anesthetic ear drops for ear pain

- Apply topical anesthetics prior to IV insertions, blood draws and laceration repairs
- Provide pressure to IM site before giving injections
- Consider lidocaine as a diluent if giving IM ceftriaxone
- Consider buffered lidocaine for local anesthesia
Nonpharmacologic Interventions

- Child Life Specialist
- Comforting Positioning
- Distraction Techniques
- Guided Imagery
- Infant interventions
- Toddler interventions
- Preschooler interventions
- School-aged child interventions
- Adolescence interventions

For more information see Nonpharmacologic Treatment and Management module
New Emphasis on Nonpharmacologic Methods of Treating Pain

Painting Analogy

Think of nonpharmacologic management as your “base coat” or “primer” before applying additional coats of analgesic treatment. With the right base coat foundation, you have a better chance of painting a patient’s symptoms a more tolerable and long-lasting new color.

(PEM Playbook: http://pemplaybook.org/podcast/pediatric-pain/)
New Emphasis on Nonpharmacologic Methods of Treating Pain

- Nonpharmacologic pain management techniques should be considered along with pharmacologic techniques and may:
  - improve assessment
  - decrease or avoid the use of opioids or anxiolytics
  - decrease time and recovery for procedures
  - decrease adverse events

*Laceration example- distraction, wound glue, fan +/- nasal midazolam*
# Categorization of Nonpharmacologic Interventions

## Physical (Sensory) Interventions
- Positioning
- Cutaneous stimulation
- Nonnutritive sucking, sucrose
- Pressure
- Hot or cold treatments
- Others

## Cognitive-Behavioral Interventions
- Psychologic preparation, education, information
- Distraction (passive or active): Video games, TV, movies, phone, lighted or interactive toy, VR
- Relaxation techniques (breathing, meditation, etc.)
- Music
- Guided imagery
- Training and coaching
- Coping statements: “I can do this”

Nonpharmacologic Interventions

• Nonpharmacologic and pharmacologic methods can work together effectively

• Educate and encourage the parent/caregiver to participate in nonpharmacologic techniques

• There are multiple non-pharmacologic interventions for pediatric patients and their developmental stages.
Child Life Specialist are professionals who provide developmental, educational, and therapeutic interventions for children and their families.

- Only hospitals with significant pediatric volumes usually employ child life specialists.
- Consider having other staff members learn certain child life techniques.

Related services include:

- Provide psychosocial preparation for tests, surgeries, and other procedures
- Facilitate medical play using special dolls, stuffed animals and medical equipment to inform and prepare child for what he/she is going to hear, see, or feel
- Reduce overall anxiety to help prevent a negative medical experience
- Evaluate influence of previous negative experiences to help determine appropriate level of sedation

With appropriate support, preparation, and pain management (i.e., topical analgesic), a young child may be capable of remaining still for minor procedures with minimal sedation and/or restraint.
Comfort positioning are used by parents and caregivers to reduce stress and anxiety to infants and children undergoing invasive medical procedures.

- Why use positioning for comfort?
  - Fewer people are needed to complete a procedure (in turn, less overwhelming for child)
  - Sitting position promotes sense of control for the child
  - Reduces anxiety which promotes better cooperation
  - Puts child in a secure, comforting hold
  - Promotes close, physical contact with a caregiver
  - Provides caregiver with an active role in supporting child in a positive way

Consider using comfort positioning during premedication procedures (e.g., IV placement)
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

“Toolbox” of distraction toys or supplies- must be easy to disinfect or disposable with no small parts.

Distraction technique
- blowing bubbles

Distraction technique with parents
<table>
<thead>
<tr>
<th>Language to Avoid</th>
<th>Language to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>You will be fine; there is nothing to worry about (reassurance)</td>
<td>What did you do in school today? (distraction)</td>
</tr>
<tr>
<td>This is going to hurt/this won’t hurt (vague; negative focus)</td>
<td>It might feel like a pinch (sensory information)</td>
</tr>
<tr>
<td>The nurse is going to take some blood (vague information)</td>
<td>First, the nurse will clean your arm, you will feel the cold alcohol pad, and next... (sensory and procedural information)</td>
</tr>
<tr>
<td>You are acting like a baby (criticism)</td>
<td>Let’s get your mind off of it; tell me about that movie... (distraction)</td>
</tr>
<tr>
<td>It will feel like a bee sting (negative focus)</td>
<td>Tell me how it feels (information)</td>
</tr>
<tr>
<td>The procedure will last as long as... (negative focus)</td>
<td>The procedure will be shorter than... (television program or other familiar time for child); (procedural information; positive focus)</td>
</tr>
<tr>
<td>The medicine will burn (negative focus)</td>
<td>Some children say they feel a warm feeling (sensory information; positive focus)</td>
</tr>
<tr>
<td>Tell me when you are ready (too much control)</td>
<td>When I count to three, blow the feeling away from your body</td>
</tr>
<tr>
<td></td>
<td>(coaching to cope; distraction limited control)</td>
</tr>
<tr>
<td>I am sorry (apologizing)</td>
<td>You are being very brave (praise; encouragement)</td>
</tr>
<tr>
<td>Don’t cry (negative focus)</td>
<td>That was hard; I am proud of you (praise)</td>
</tr>
<tr>
<td>It is over (negative focus)</td>
<td>You did a great job doing the deep breathing, holding still... (labelled praise)</td>
</tr>
</tbody>
</table>

Conversation and Distraction

Conversation is a proven method of patient management and helps reduce anxiety and pain through distraction. Pain can be reduced by up to 25% by distraction alone.

Interactive distraction is better for managing pain and anxiety than passive distraction.

Conversation topic ideas: family, hobbies, vacation, sports

Distraction can change the physiological response of pain transmission in the spinal cord.

To learn more visit http://www.jems.com/articles/print/volume-38/issue-7/patient-care/10-conversation-starters-alternative-pai.html
Build a Distraction Toolkit!

• There are several ways you can use distraction in your clinical practice. Creating a ‘toolkit’ of carefully selected tools allows for easy access when needed.

For more ideas and resources on how to build a toolkit visit

http://pami.emergency.med.jax.ufl.edu/resources/new-approaches-to-pain-course/
Distraction & Nonpharmacologic Toolkit

- Reduces anxiety & pain
- Avoids or decreases dosages of pharmacologic treatments such as opioids and benzodiazepines
- ED, EMS, Trauma Center, Radiology suites, PICU, others
- Three hour pilot course, apps, and toolbox components available online
Distraction Toolbox Components

- LED keychains
- "Oink, Oink"
- Rubik’s cube
- Glitter iSpy wand
- Hot/cold packs
- DistrACTION Cards
- Pacifier & Sucrose Water
Distraction Toolbox Components

- Stress Balls
- Stickers
- Liquid-in-motion
- Lighted & motion toy
- Buzzy – cold, numbing, vibrating
- Wikki Stix
- Mad Libs
Announcing new Communication Cards for Children & Adults

Communication cards are used to assist EMS, emergency triage and other healthcare providers in communicating with scared, nonverbal or non-English speaking patients and families!

- History taking and assessment
- Pain, mechanism of injury
- Explanation of treatments
- Procedures and testing
- Discharge instructions

The 17 cards use emojis to explain a particular topic or aspect of medical care.

Great for EMS, clinical settings and hospitals!

Cards are attached on a ring clip and made of durable material that can be cleaned and used with a dry erase marker.

For more information visit:
http://nami-emergency.med.fsu.edu/
http://www.sesac.org/BeReady/
Download your own copy by visiting:
https://goo.gl/wrReis or call 606-284-8117 to request a complimentary set!

Funding provided by Fortis Medical Education Inc. University of Florida, UF/Nursing, UF/EMedicine Dept. of Emergency Medicine, and the Florida Children’s Medical Network, Inc., a Florida 501c3 Program.

#PECST
#PediatricEmergencyCareSociety
#PediatricEmergencyCommunicationSociety
#PediatricEmergencyCareSocietyOfNorthAmerica
#PediatricEmergencyCareSocietyOfEurope
#PediatricEmergencyCareSocietyOfAfrica
#PediatricEmergencyCareSocietyOfAsia
#PediatricEmergencyCareSocietyOfLatinAmerica
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#PediatricEmergencyCareSocietyOfAustralia
#PediatricEmergencyCareSocietyOfOceania
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)
Guided Imagery

• Helps patients use imagination to divert thoughts from the pain or procedure to a more pleasant experience.

• Helps patients use their imagination to create a descriptive story.

• Guided Imagery Options
Option 1- Visit a “relaxing” place and change image of pain or turn off pain with a “pain switch” in the brain. Ask patient to locate the pain switch and turn down level of pain to a more comfortable level.

Option 2- Identify a “pain” color and a “comfort” color. Ask patient to breathe in the “comfort” color and breathe out “pain” color OR ask patient to associate their pain with a color then view the painful part of their body in that color. Imagine shrinking, fading, or dispersing the painful color, or even sending it away in a balloon.

Option 3- Symbolic imagery can be used in adults and adolescents. If a patient with severe arthritis pain complains of pain in one joint, ask them to think about how the pain feels. Does it feel like a knife? Imagine pulling the knife out and throwing it away. Focusing on an affirmation can also help. “I am removing the knife and throwing it away”.
Music Therapy

Beneficial in reducing pain, anxiety and stress in EDs, waiting rooms, procedure rooms, and during transport.

- Additionally benefits parents and health care providers caring for the anxious patient
- Many larger hospitals have music therapists or volunteers

**Ways to implement:**
- Have patient select music from available electronic devices or their own - keep supply of disposable headphones or earbuds
Developmentally Specific Nonpharmacologic Therapies

• In the next few slides nonpharmacologic therapies will be reviewed by developmental stages.
  • Infants
  • Toddlers
  • Preschoolers
  • School Age Child
  • Adolescence
Virtual Reality Viewer 101

STEP 1: Download and open 'Google Cardboard' app.

STEP 2: Insert phone/iPad into the viewer as shown. (May not fit with certain cases.)

STEP 3: Use on-screen cursor to choose one of the options (Tutorial, Explore, Exhibit, Urban Hike, Kaleidoscope, or Art: Journey).

NOTE: To select the chosen option, press the button at the top right corner of the viewer.

STEP 4: If the image is not clear, adjust lenses by gently pulling on the tabs on either side.

STEP 5: To return to the main menu, tilt the viewer vertically.
Virtual Reality

- Engages the patient in a 360 degree visual and auditory experience which removes primary focus from the pain or anxiety
- Headsets range from high tech, expensive options, such as appliedVR to inexpensive cardboard viewers.
- Type of viewer could depend on area used in i.e. a inpatient floor or outpatient clinic is more controlled than an ED or Trauma setting.
- Wound care, infusions, procedures, labor and delivery!
Virtual Reality for Pain Management & Distraction

Virtual Reality (VR) Viewer Assembly Instructions:
1. Slide VR viewer out of cardboard sleeve.
2. Pop up the viewer into a rectangle & using lens mask into tabs.
3. Swing down nose column into tab.
4. Insert and secure mobile device or iPad.
5. Scan the QR code on the viewer or download one of the free suggested apps.

PAMI’s Distraction Toolkit focuses on nonpharmacologic pain management. The free, downloadable toolkit includes topics such as a stepwise approach to pain management that incorporates pharmacologic and nonpharmacologic measures, therapeutic language, comfort positioning, coaching, distraction, guided imagery, and other physical/psychosocial modalities.

VR (virtual reality) has proven to be effective in reducing pain and anxiety before, during, and after procedures such as burn injuries, wound management, suturing, and even patients experiencing chronic pain.

Possible benefits include:
- Decreased pain and anxiety without medication.
- Reduced drug-related side effects.
- Enhanced treatment experience.
- Reduced perception of procedure/wait times.
- Shorter recovery times.
- Increased patient satisfaction scores.

For questions or comments, contact Dine research@csul.edu.

Welcome to Virtual Reality—Sit back and relax as you are whisked away on a guided journey, in which you will experience the key elements of virtual reality.

Dunk Tank VR—A new guided meditation experience in VR. In this app, you find a little possessed cup on a beautiful VR Milky while our narrator will lead you through a simple exercise in guided meditation.

Anatomysaurus—Using VR, you will be able to navigate along anatomical structures, becoming part of the human anatomy.

Syric Travel VR—The world’s largest database of virtual reality travel content in ALL DESTINATIONS section with more than 1,000 unique 360° travel videos and photos.

Fantastic Voyage VR—This VR medical animation guides you inside the human body where you fly through a beating heart, travel through the cerebral cortex, and float up the “giant aquarium” the abdominal vena.

Suggested FREE Virtual Reality Apps:
- VR Street Jump: A remake of the classic Frogger road jumping game. Simply press the Cardboard trigger to jump and cross the street. Look at the directions you want to go and hit the trigger.
- Fornicos Pop-Up Book: Unlike any other interactive book around. Discover the adventures of Fornicos, who can’t decide what he wants to be when he grows up and follow him on his journey to explore various exciting challenges and mini games along the way.
- Circle VR: Using Google Cardboard, enter a virtual reality doctor’s surgery where you search for your patient’s illness using x-ray vision.
- Lamp VR: In this VR horror game, you will find your way to survive through a series of tunnels through the eyes of a fiery bug named Lamp.
- Alphabet Driver: A fun interactive game for bedroom and kids. Aims at 6. The object of the game is to collect tokens along the way. It is designed to improve fine motor skills and hand-eye coordination by tapping the objects before they disappear.

Welcome to Virtual Reality! Sit back and relax as you are whisked away on a guided journey, in which you will experience the key elements of virtual reality.
Nonpharmacologic 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
Nonpharmacologic 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
Nonpharmacologic 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
Nonpharmacologic 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
Nonpharmacologic 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
  • 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


Procedural Sedation and Analgesia (PSA)

Definition
Stepwise Approach
Procedural Sedation and Analgesia (PSA)

PSA is a form of pain management that is often used in the ED setting for pediatric patients.

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.

The next portion of this module will give a brief overview of PSA. To learn more about Procedural Sedation and Analgesia click here.
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)."
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
<table>
<thead>
<tr>
<th>Organization</th>
<th>Definition or Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEP</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>ASA</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>AAP</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>
• 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.*
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?

Step 1. Situation Checkpoint

- 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

- 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 2: Child’s Understanding of Pain, Behavioral Responses, and Verbal Descriptions by Developmental Stage

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Understanding of Pain</th>
<th>Behavioral Response</th>
<th>Verbal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>No understanding of pain; is responsive to parental anxiety</td>
<td>Generalized body movements, chin quivering, facial grimacing, poor feeding</td>
<td>Cries</td>
</tr>
<tr>
<td>6–12 months</td>
<td>Has a pain memory; is responsive to parental anxiety</td>
<td>Reflex withdrawal to stimulus, facial grimacing, disturbed sleep, irritability, restlessness</td>
<td>Cries</td>
</tr>
<tr>
<td><strong>Toddlers</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1–3 years</td>
<td>Does not understand what causes pain and why they might be experiencing it</td>
<td>Localized withdrawal, resistance of entire body, aggressive behavior, disturbed sleep</td>
<td>Cries and screams, can’t describe intensity/type of pain; Use words for pain such as owie and boo-boo</td>
</tr>
<tr>
<td><strong>Preschoolers</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3–6 years</td>
<td>Pain is a hurt; Does not relate pain to illness; may relate pain to an injury; Often believes pain is punishment; Unable to understand why a painful procedure will help them feel better or why an injection takes the pain away</td>
<td>Active physical resistance, directed aggressive behavior, strikes out physically and verbally when hurt, low frustration level</td>
<td>Has language skills to express pain on a sensory level; Can identify location and intensity of pain, denies pain, may believe his or her pain is obvious to others</td>
</tr>
<tr>
<td><strong>School-Age Children</strong></td>
<td></td>
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</tr>
<tr>
<td>7–9 years (concrete operations)</td>
<td>Doesn’t understand cause of pain; Understands simple relationships between pain and disease and need for painful procedures to treat disease ; May associate pain with feeling bad or angry; recognize psychologic pain related to grief and hurt feelings</td>
<td>Passive resistance, clenches fists, holds body rigidly still, suffers emotional withdrawal, engages in plea bargaining</td>
<td>Can specify location and intensity of pain and describes pain physical characteristics in relation to body parts</td>
</tr>
<tr>
<td>10–12 years (transitional)</td>
<td>Better understanding of relationship between an event and pain; More complex awareness of physical and psychologic pain,(moral dilemmas , mental pain)</td>
<td>May pretend comfort to project bravery, may regress with stress and anxiety</td>
<td>Able to describe intensity and location with more characteristics, able to describe psychologic pain</td>
</tr>
<tr>
<td><strong>Adolescents</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13–18 years (formal operations)</td>
<td>Has a capacity for sophisticated and complex understanding of causes of physical and mental pain; Recognizes pain has qualitative and quantitative characteristics; Can relate to pain experienced by others</td>
<td>Want to behave in socially acceptable manner like adults; controlled response; May not complain if given cues from other healthcare providers</td>
<td>More sophisticated descriptions with experience; may think nurses are in tune with their thoughts, so don’t need to tell nurse about their pain</td>
</tr>
</tbody>
</table>
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

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”

Step 6. Management Checkpoint

• No magic recipe, must individualize and adjust “Ingredients”
• Pharmacologic “ingredients”
  • Topical
  • Local anesthetics or blocks
  • Oral, nasal, IV
• Nonpharmacologic “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 nonpharmacological options
Step 7: Monitoring And Discharge Checkpoint

- Joint Commission standards
- Document reassessments
- Child should be back to baseline and tolerating fluids at discharge but difficult situation when after bedtime
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 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
Summary
Pain Assessment, Intervention, Reassessment, and Disposition Process (continued)

- Upon arrival, the child and parent or caregiver have their first opportunity to share pain information.
- The healthcare team completes an initial pain assessment.
- A plan of care is developed, including discussion with the child and family regarding the pain assessment process and proposed interventions.
- Before providing pain interventions, minimize anxiety by anticipating and preparing for painful experiences, for example, venipuncture, IV starts, and laceration suturing.
Pain Assessment, Intervention, Reassessment, and Disposition Process (continued)

- Timing is determined by the intervention chosen
- Document intervention(s)
- Document instruction provided
- Continue to reassess after each intervention until discharge

• Reassessment interval varies based upon hospital and current regulatory policy and the type of intervention offered.
• A good rule of thumb to follow is to conduct a reassessment 15 to 30 minutes following IV pain medication administration, and 30-60 minutes after oral pain medication administration.
Pain Assessment, Intervention, Reassessment, and Disposition Process

Assessment

- Assess for pain at triage
- Explain assessment to child and parent
- Determine intervention needed
- Explain intervention
- Document

Interventions

Reassessment

- Timing is determined by the intervention chosen
- Document intervention(s)
- Document instruction provided
- Continue to reassess after each intervention until discharge

Disposition

- Home
- Admission
- Surgery
- Transfer
Summary of the Approach to Effectively Managing Pediatric Pain

- 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
Resources
## Resources

<table>
<thead>
<tr>
<th>Websites</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAMI Home Page</td>
<td><a href="http://pami.emergency.med.jax.ufl.edu/">http://pami.emergency.med.jax.ufl.edu/</a></td>
</tr>
<tr>
<td>YouTube Video: It Doesn’t Have to Hurt</td>
<td><a href="https://www.youtube.com/watch?v=KgBwVSYqfps&amp;feature=youtu.be">https://www.youtube.com/watch?v=KgBwVSYqfps&amp;feature=youtu.be</a></td>
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PAMI learning module content will sometimes overlap due to similar topics. 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/

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