



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
Pain Assessment and Management Initiative

<http://pami.emergency.med.jax.ufl.edu/>



PAMI
Pain Assessment and Management Initiative

2014- 2018

FMMJUA
Florida Medical Malpractice Joint Underwriting Association

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Pain Assessment and Management Initiative
College of Medicine - Jacksonville





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PECSI



Pain Assessment and Management Initiative

Under Construction



PAMI Purpose



Pain Tips

Pain Assessment and Management Initiative (PAMI): A Patient Safety Project

PAMI is an E-Learning and patient safety educational project funded through a grant by the Florida Medical Malpractice Underwriting Association. The overall goal of PAMI is to improve the safety of patients of all ages by developing tools for health care providers to recognize, assess, and manage acute and chronic pain in acute care settings such as the Emergency Department. The tools and resources developed are designed to be used, adapted and implemented by any health care facility or agency based on their specific needs. The PAMI site will also provide pain related resources and news updates.

The aims of PAMI are to:

1. Develop a state and national multidisciplinary expert panel who will create a toolkit targeting physicians, nurses, physician assistant, pharmacists, paramedics, hospital patient safety officers, risk managers and other providers.

News about Pain

Pain Medicine News

- > Novel Compound Yields Long-Acting Anesthetic Effect
April 10, 2015
The duration of sensory blockade was significantly prolonged by a novel site 1 sodium channel blocker that belongs to the class of paralytic shellfish toxins.
- > Pharmacist Survey Raises Concerns for Patient Access to Generic Pain Drugs
April 9, 2015
Ultimately patients will be impacted if pharmacists cannot afford to fill prescriptions.

American Academy of Pain Management

- > You Can Treat Fibromyalgia and Chronic Fatigue Syndrome Successfully
April 9, 2015
By Kenneth Mühich, DC For many allopathic physicians, fibromyalgia and, to a somewhat lesser extent, chronic fatigue syndrome (CSF) do not fall into the allopathic practice of relying on objective...
- > The Practice of Low-Level Laser Therapy
April 9, 2015
By Bernard E. Fäner, MD Low-level laser therapy (LLLT) has only been used in the United States since 2002, although it has been used widely in Europe and Asia for the past several decades. I admit to...

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PAMI Modules

PAMI Introduction and Basics of Pain Management and Assessment	Pharmacological Treatment of Pain (Acute & Chronic)
Non-pharmacological Treatment	Management of Acute Pain
Procedural Sedation and Analgesia	Management of Chronic Pain
Prehospital/EMS	Patient Safety and Legal Aspects
	Pediatric Pain Management



PAMI Stakeholders



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.

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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

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.....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



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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.



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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



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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

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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



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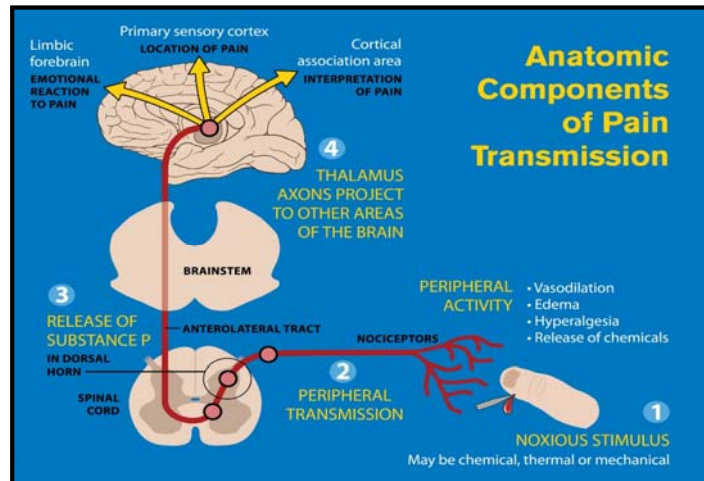
The Physiology of Pain Transmission

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.



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Review of Physiologic Consequences of Unrelieved Pain in Children

Responses to Pain	Potential Physiologic Consequences
Respiratory Changes	
Rapid shallow breathing Inadequate lung expansion Inadequate cough	Alkalosis Decreased oxygen saturation, atelectasis Retention of secretions
Neurological Changes	
Increased sympathetic nervous system activity and release of catecholamines	Tachycardia, elevated BP, change in sleep patterns, irritability
Metabolic Changes	
Increased metabolic rate with increased perspiration; Increased cortisol production	Increased fluid and electrolyte losses Increased cortisol and blood glucose levels
Immune System Changes	
Depressed immune and inflammatory responses	Increased risk of infection, delayed wound healing
Gastrointestinal Changes	
Increased intestinal secretions and smooth muscle sphincter tone, nausea, anorexia	Impaired gastrointestinal functioning, poor nutritional intake, ileus
Altered Pain Response	
Increased pain sensitivity	Hyperalgesia, decreased pain threshold, exaggerated memory of painful experiences

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Factors Affecting Pediatric Response to Painful Stimuli

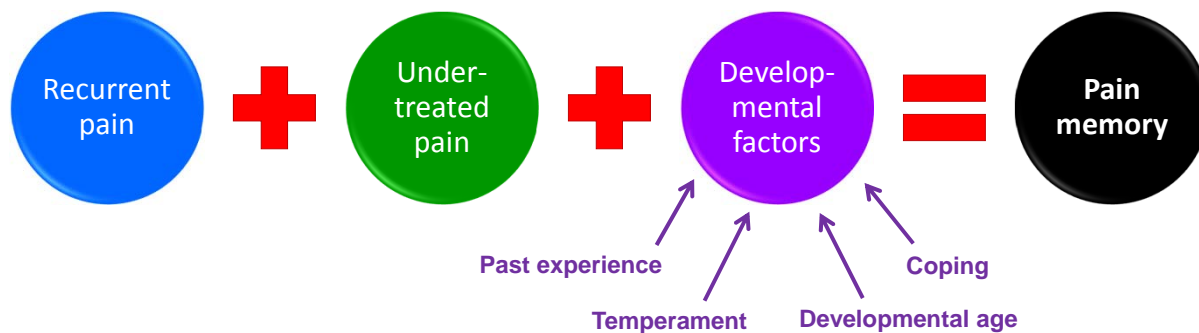
- Age, gender, ethnicity
- Socioeconomic and psychiatric factors
- Culture and religion
- Genetics
- Previous experiences
- Patient/family perceptions
- Catastrophizing



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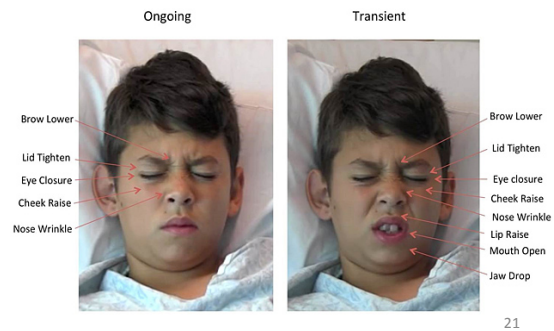
Creation of Pain Memory in Children

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



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Recognition and Assessment of Pediatric Pain

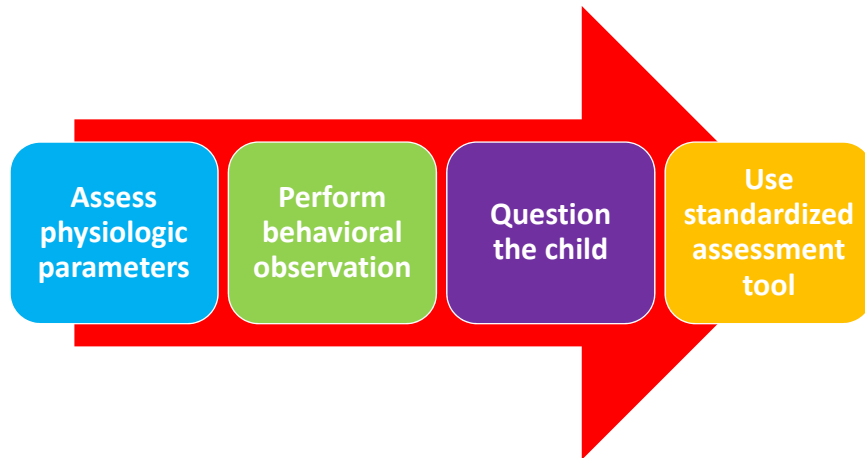


The First Step is to *Recognize* or *Anticipate* a Painful Condition

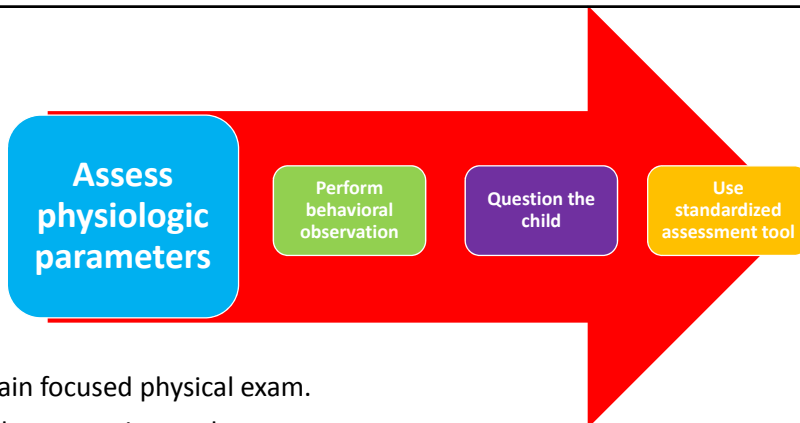
- **Recognition of pain** is the **first step** to effectively managing pain.
- Children often cannot differentiate between pain and anxiety.
- The child's demonstration of pain and response to pain is multifactorial and related to age or developmental stage.
- Additionally, procedures and treatments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



Elements of Pain Assessment



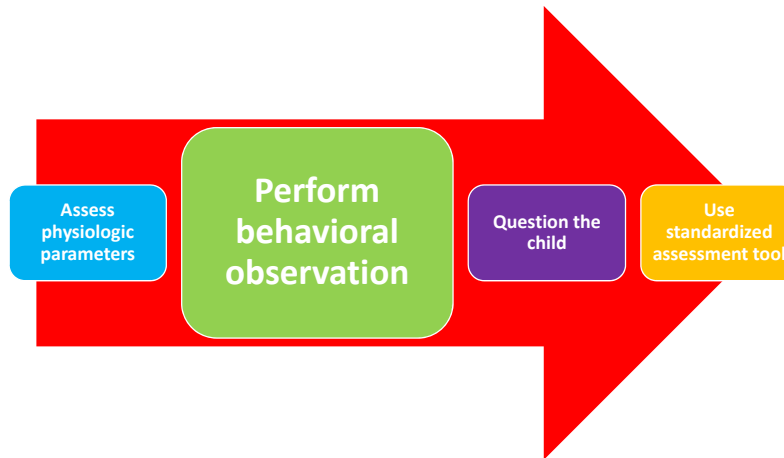
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- Perform a pain focused physical exam.
- Children with acute pain may have:
 - Tachycardia
 - Tachypnea
 - Hypertension
 - Oxygen desaturation
 - Dilated pupils
 - Flushing or pallor

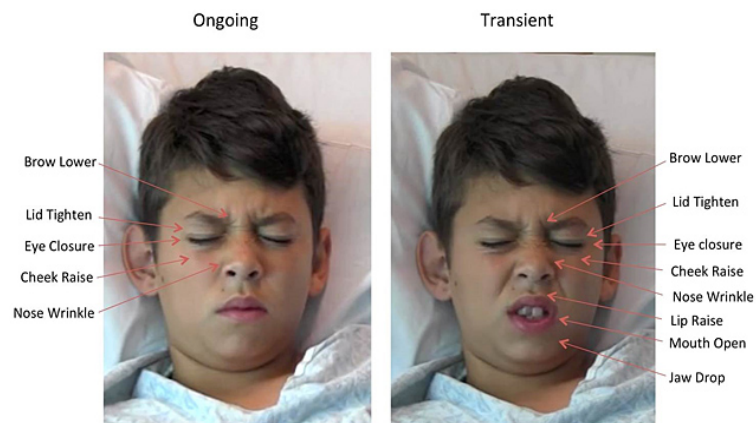
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Elements of Pain Assessment: Perform Behavioral Observation



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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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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



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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



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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

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Perform Behavioral Observation in **School-age and Adolescent**

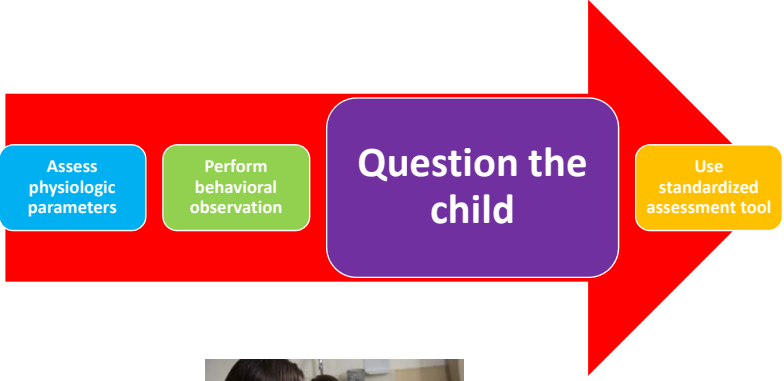


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When performing a school-age and adolescent behavioral observation, be aware of:


- Stalling/delaying
- Flat affect
- Facial expression
- Extremity activity and tone
- Guarding, splinting
- Position of comfort
- Irritability, anxiety
- Change in appetite or sleep quality

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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

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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.



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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.

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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?

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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?



QISS TAPED:

a mnemonic for pain history, assessment and exam

- **Q**uality
- **I**mpact
- **S**ite
- **S**everity
- **T**emporal
- **A**ggravating and alleviating
- **P**ast response and preferences
- **E**xpectations and goals
- **D**iagnostics and physical exam

Q	Quality	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	Impact	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	Site	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	Severity	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)?

T	Temporal Characteristics	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?)
A	Aggravating and Alleviating Factors	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?
P	Past Response, Preferences	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?
E	Expectations, Goals, Meaning	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.)
D	Diagnostics & Physical Exam	Examine and inspect site Perform a systems assessment and examination as indicated Review imaging, laboratory and/or other test results as indicated

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



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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



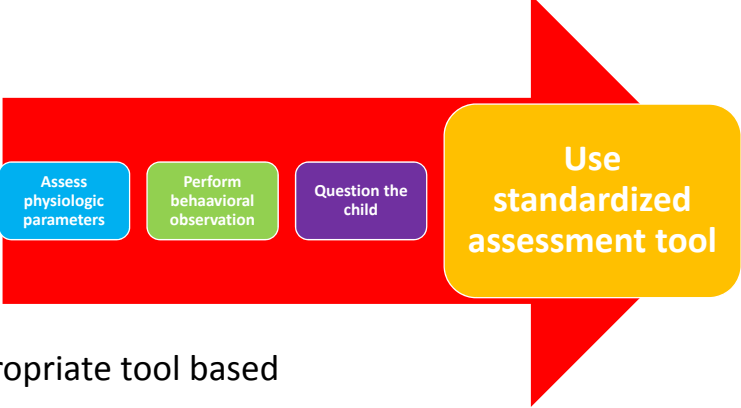
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Questioning the Special Needs Child

- 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



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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**



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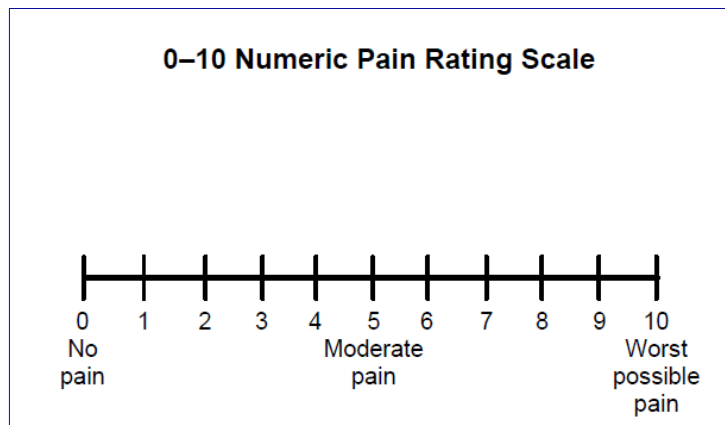
Examples of Pain Scales

Pain Scales	Verbal, Alert and Oriented	Non-verbal, GCS <15 or Cognitive Impairment
Adult	<ul style="list-style-type: none"> Numerical Rating Scale (NRS) Defense and Veterans Pain Rating Scale (DVPRS) 	<ul style="list-style-type: none"> Adult Non-Verbal Pain Scale (NVPS) Assessment of Discomfort in Dementia (ADD) Behavioral Pain Scale (BPS) Critical-Care Observation Tool (CPOT)
Pediatric	<ul style="list-style-type: none"> Wong-Baker Faces scale (ages 4 to 17 years) Numerical Rating Scale (ages 7 to 11 years) 	<ul style="list-style-type: none"> 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)

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Pediatric or Adult: Verbal, Alert and Oriented

0–10 Numeric Pain Rating Scale



This is a commonly used pain scale that employs a 0-10 rating system that can be used in alert oriented adult patients.

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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.

From Wong D.L., Hockenberry-Eaton M., Wilson D., Winkelstein M.L., Schwartz P.: Wong's Essentials of Pediatric Nursing, ed. 6, St. Louis, 2001, p. 1301. Copyrighted by Mosby, Inc. Reprinted by permission.

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

FLACC Behavioral Pain Assessment Scale

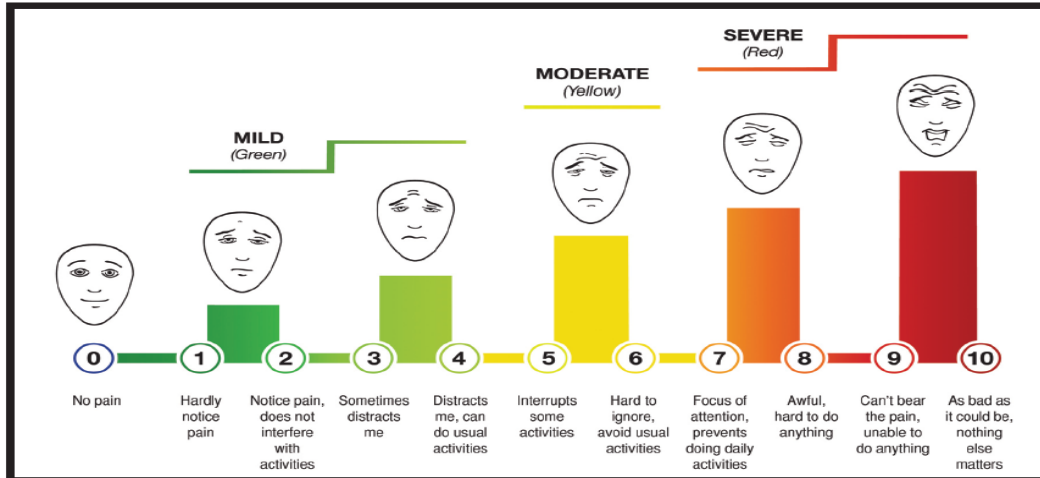
CATEGORIES	SCORING		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown; withdrawn, disinterested	Frequent to constant frown, clenched jaw, quivering chin
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No cry (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs; frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or being talked to; distractable	Difficult to console or comfort

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Adult: Verbal, Alert and Oriented

Defense and Veterans Pain Rating Scale*



*The PMTF recommended a Department of Defense and VHA Pain Assessment Tool to improve actionable information for patient encounters across Military Treatment Facilities. (Line of Action 1, Standards and System Improvements)

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Pain Assessment Tools

Measurement Scale	Age Range	Description
Birth - 6 months		
Neonatal Infant Pain Scale (NIPS)	Preterm and full term neonates	Behavioral scale.
Neonatal Pain Assessment and Sedation Scale (N-PASS)	Preterm and full term neonates	Behavioral and physiologic scale.
Neonatal Facial Coding System (NFCS)	32 weeks gestation to 6 months	Facial muscle group movement, brow budge, eye squeeze, nasolabial furrow, open lips, stretch mouth lip purse, taut tongue, and chin quiver ³²
CRIES	32 weeks gestation to 6 months	Behavioral and physiologic scale.
Infant and older (non-verbal children)		
Revised Faces, Legs, Activity, Cry, and Consolability (r-FLACC)	2 months to 3 years, critically ill, cognitively impaired, and older than three years of age unable to utilize a self-report scale.	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.
Non Communicating Children's Pain Checklist (NCCPC-R)	3-19 years (with cognitive impairment)	30 items that assess seven dimensions: vocal, eating/sleeping, social, facial, activity, body/limb, and physiologic signs
3 years and older		
Wong Baker Faces	3 years and older	Self-report scale. Please refer to specific references for those alternative face scales.
Oucher	3 -12 years	Self-report tool consisting of a vertical numerical scale and a photo scale with expressions of "hurt" to "no hurt."
8 years and older¹⁰		
Visual Analogue Scale (VAS)	8 years and older	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.
Verbal Numeric Scale (VNS)/ Numeric Rating Scale (NRS)	8 years and older	Self-report scale. Eleven point scale that requires understanding of numbers, addition and subtraction.

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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.
- 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?

Tips

Select a scale and be consistent!

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Identifying the Type of Pain

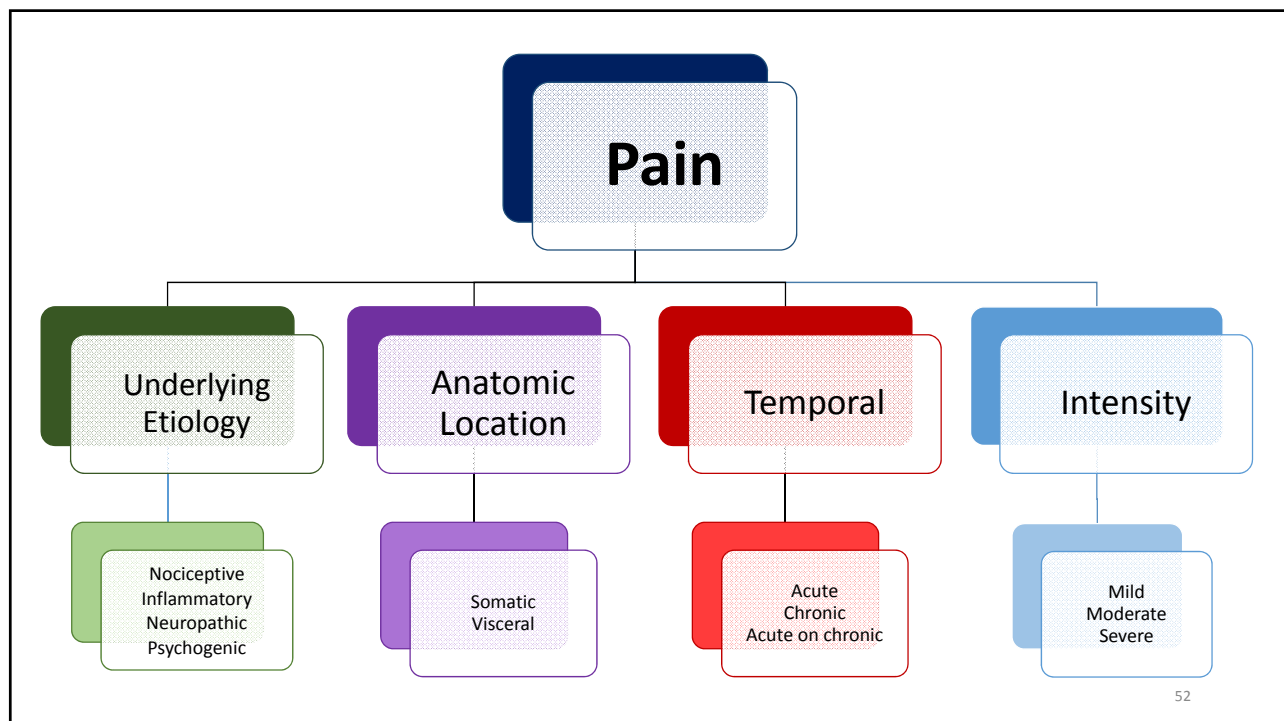
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Classification of Pain

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 be divided into **somatic** and **visceral**.
- **Temporal nature** refers to the duration of the pain.
- **Intensity** refers to how the pain experience hurts.

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Treatment Options

Pharmacological

Non-pharmacological

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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

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Pain Interventions That Alter Spinal Cord Transmission of Pain

Transmission Point

- 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.

Non-pharmacologic Interventions

- Skin stimulation
- Massage
- Acupuncture
- Application of heat and cold
- Touch

Pharmacologic Interventions

- Epidural analgesia
- Intrathecal analgesia
- Opioids

Pain Interventions That Alter Receptor Site Transmission of Pain

Transmission Point

- Increase stimuli to the brain
 - Increase blood flow to targeted areas, decreases pain chemicals
 - Increase endorphins

Non-pharmacologic Interventions

- Distraction
- Imagery
- Relaxation
- Biofeedback

Pharmacologic Interventions

- Systemic opioids

Pharmacologic Interventions



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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




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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](#)



Pain Assessment and Management Initiative

<http://pami.emergency.medjax.ufl.edu/>
Like Us on Facebook at <https://www.facebook.com/pami.ufl.edu>

Funding provided by Florida Medical Malpractice Joint Underwriting Association (FMMJUA) and University of Florida College of Medicine-Jacksonville, Department of Emergency Medicine

Last updated on 12/03/2015

We welcome your feedback on all PAMI materials and how you use them to improve patient safety and clinical care. If you would like to adapt this guide for your institution or have recommendations contact PAMI at pami@medjax.ufl.edu or 904-244-4986.

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Pain Management and Dosing Guide

Pain Management and Dosing Guide Includes:

1. Principles of Pain Management, Discharge and Patient Safety Considerations, Analgesic Ladder
2. Non-opioid Analgesics, Opioid Prescribing Guidelines and Equianalgesic Chart, Opioid Cross-Sensitivities, Intranasal Medications
3. Topical and Transdermal Medications
4. Procedural Sedation and Analgesia (PSA) Medications
5. Stepwise Approach to Pain Management and PSA

Principles of Pain Management

- Establish realistic pain goals
Will vary depending on patient and type of pain - goal of zero may not be feasible
- Educate patient/caregivers on pain management goals and regimen
- Consider pharmacologic and non-pharmacologic treatment options and initiate therapy
- Continually reassess patient's pain and monitor for medication efficacy and side effects
 - Use same scale to reassess pain
 - Use scale that is age and cognitively appropriate
 - If no improvement, adjust regimen

Pain Management Considerations

- Type of pain: nociceptive, neuropathic, inflammatory
- Acute vs. chronic vs. acute on chronic pain
- Pain medication history: OTC and Rx
- Patient factors: genetics, culture, age, comorbidities, previous pain experiences

Treatment Options

- Pharmacotherapy (systemic, topical, transdermal, nerve blocks)
- Non-pharmacologic modalities
- Refer to pain, palliative or other specialists for advanced treatment

Non-pharmacological modalities
Spining, distraction, hydroflor therapy, exercise, massage, imagery, and others

Discharge and Patient Safety Considerations

- Assess and counsel regarding risks, driving, work safety, and medication interactions
- Identify red flags for opioid misuse/abuse
- Verify signs and oral intake before discharge
- Document all pain medications administered
- Document in terms of discharge or care transition
- Consider OTC and non-pharmacologic options
- Can patient implement pain management plan? insurance coverage, transportation, etc.

Analgesic Ladder and Treatment Basics

Step 3: Severe Pain
Step 1 and Step 2 Strategies + Scheduled Opioid Analgesics

↑

Step 2: Moderate Pain
Step 1 Strategy + Intermittent Dose of Opioid Analgesics (PO, IV) + Interventional (Blocks & Procedures)

↑

Step 1: Mild Pain
Nonopioid Analgesic (APAP, NSAIDs, COX-2 Inhibitors) +/- Local/Topical Anesthetics

Ladder Basics

1. Use oral route when possible
2. Give analgesic at regular intervals
3. Prescribe according to pain intensity
4. Dosing must be adjusted to individual
5. Analgesic plan must be refined and communicated with patient and staff

Generic (Brand)	Adult	Pediatric	Opioid Prescribing Guidelines and Equianalgesic Chart					
			Medication	Start (Dose and Duration) (H)	Equianalgesic	Max (Dose and Duration) (H)	Max (Dose and Duration) (H)	Max (Dose and Duration) (H)
Hydrocodone/Acetaminophen (Vicodin)	5-10 mg/325 mg q4-6h	1-2 mg/150 mg q4-6h	Hydrocodone/Acetaminophen	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h
Hydrocodone/Acetaminophen (Lorcetab)	5-10 mg/325 mg q4-6h	1-2 mg/150 mg q4-6h	Hydrocodone/Acetaminophen	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h
Hydrocodone/Acetaminophen (Zydone)	5-10 mg/325 mg q4-6h	1-2 mg/150 mg q4-6h	Hydrocodone/Acetaminophen	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h
Hydrocodone/Acetaminophen (Zydone)	5-10 mg/325 mg q4-6h	1-2 mg/150 mg q4-6h	Hydrocodone/Acetaminophen	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h	5-10 mg/325 mg q4-6h

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Generic (Brand)	Formulation	Strength	Concentration	Volume	Weight	Age	Indication	Onset	Duration	Max Dose	Max Rate
Propofol (Diprivan)	Injectable	10 mg/mL	10 mg/mL	10 mL	100 mg	18-65 yr	General anesthesia	1-2 min	10-15 min	1-2 mg/kg	10 mg/kg
Etomidate (Amidate)	Injectable	2 mg/mL	2 mg/mL	10 mL	20 mg	18-65 yr	General anesthesia	1-2 min	10-15 min	0.2-0.3 mg/kg	0.3 mg/kg
Midazolam (Versed)	Injectable	5 mg/mL	5 mg/mL	10 mL	50 mg	18-65 yr	Sedation	1-5 min	1-2 hr	0.05-0.1 mg/kg	0.1 mg/kg
Propofol (Diprivan)	Injectable	10 mg/mL	10 mg/mL	10 mL	100 mg	18-65 yr	Sedation	1-5 min	1-2 hr	0.5-1 mg/kg	1 mg/kg

Block	General Distribution of Anesthesia
Subarachnoid (Spinal Block)	Thoracic, upper arm, elbow and forearm
Epidural (Epidural Block)	Upper arm, elbow, wrist and hand
Brachial Plexus Block	Upper arm, elbow, wrist and hand
Radial Nerve Block	Hand and forearm
Ulnar Nerve Block	Hand and forearm
Median Nerve Block	Hand and forearm
Sciatic Nerve Block	Lower leg, foot, ankle and distal lower leg
Tibial Nerve Block	Foot and ankle
Peroneal Nerve Block	Foot and ankle
Trochanteric Nerve Block	Foot and ankle
Tibial Nerve Block	Foot and ankle
Deep Peroneal Nerve Block	Foot and ankle
Common Peroneal Nerve Block	Foot and ankle
Saphenous Nerve Block	Foot and ankle

Local Anesthetic	Onset	Duration (hr)	Max Dose (mg/kg)	Max Rate (mg/kg/hr)
Lidocaine (1.5%)	Rapid	1-2	4.5	7
Bupivacaine (0.5%)	Slow	4-8	4	2
Mepivacaine (1.5%)	Rapid	1-2	4.5	7
Chlorbutolone (1%)	Rapid	1-2	4.5	7
Propofol (10%)	Medium	1-2	4.5	7

Medication	Indication	Onset (hr)	Duration (hr)	Max Dose (mg/kg)	Max Rate (mg/kg/hr)
Etomidate (Amidate)	General anesthesia	1-2 min	10-15 min	0.2-0.3 mg/kg	0.3 mg/kg
Propofol (Diprivan)	General anesthesia	1-2 min	10-15 min	1-2 mg/kg	10 mg/kg
Midazolam (Versed)	Sedation	1-5 min	1-2 hr	0.05-0.1 mg/kg	0.1 mg/kg
Propofol (Diprivan)	Sedation	1-5 min	1-2 hr	0.5-1 mg/kg	1 mg/kg

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Medication	Indication	Onset (hr)	Duration (hr)	Max Dose (mg/kg)	Max Rate (mg/kg/hr)
Pain-Ease [®] Vapocoolant/Skin Refrigerant	Cooling intact skin and mucus membranes and minor open wounds	O, immediate	D: few sec to 1 min	—	—
Lidocaine	Foley catheter and nasogastric tube insertion; intubation; nasal packing; gingivostomatitis	O: 2-5 min D: 30-60 min	—	2% topical gel/jelly, 5% topical ointment, 2% oropharyngeal viscous topical solution	3-5 mg/kg

*Dosages are guidelines to avoid systemic toxicity in patients with normal intact skin and with normal renal and hepatic function

Procedural Sedation and Analgesia Chart				Comments
Medication	Adult	Pediatric		
Ketamine (Ketalar [®])	IV 0.5-1.0 mg/kg IM 4-5 mg/kg	>3 mo: IV 1-2 mg/kg; additional doses 0.5 mg/kg IV q 10-15 min prn. IM 4-5 mg/kg		Risk of laryngospasm increases with active asthma, upper respiratory infection and procedures involving posterior pharynx; vomiting occurs commonly consider premedication. Not recommended in patients <3 mo
Midazolam (Versed [®])	IV 0.05-0.1 mg/kg IV slow push over 1-2 minutes	IN 0.2-0.3 mg/kg (IN max 1mL per nostril); IV 0.05-0.1 mg/kg		Initial max dose 2 mg. Max total dose in >60 years is 0.1 mg/kg. Decrease dose by 33-50% when given with opioid
Propofol (Diprivan [®])	0.5-1 mg/kg slow push (1-2 min); additional doses 0.5 mg/kg	1 mg/kg slow push (1-2 min); additional doses 0.5 mg/kg		Risk of apnea, hypoventilation; respiratory depression, rapid & profound changes in sedative depth, hypotension
Etomidate (Amidate [®])	0.1 - 0.2 mg/kg; additional doses 0.05 mg/kg IV			Risk of myoclonus (premedication w/ benz or opioid can decrease). Pain with injection. Nausea and vomiting. Not recommended in <10 yo due to higher risk of adrenal suppression
Ketamine + Propofol	—	IV ketamine 0.75 mg/kg + propofol 0.75 mg/kg. Additional doses: ketamine 0.5 mg/kg, propofol 0.5-1 mg/kg		See ketamine and propofol comments respectively
Dexmedetomidine (Precedex [®])	1 mcg/kg loading dose (over 10 minutes) followed by 0.5 to 2 mcg/kg/hour continuous infusion. Use 0.5 mcg/kg for geriatric patients	0.5-2 mcg/kg loading dose (over 10 minutes) followed by 0.5 to 2 mcg/kg/h continuous infusion		Risk of bradycardia, Hypotension, especially with loading dose or rapid infusions. Apnea, bronchospasm, respiratory depression
Nitrous oxide	—	50% N2O/50% O2 inhaled		Do not use if acute asthma exacerbation, suspected pneumothorax/other trapped air or head injury with altered level of consciousness
Morphine	0.05-0.1 mg/kg or 5-10 mg	0.1-0.2 mg/kg IV, titrated to effect		Monitor mental status, hemodynamics, and histamine release. Requires longer recovery time than fentanyl. Difficult to titrate during procedural sedation due to slower onset and longer duration of action. Reduce dosing when combined with benzodiazepines (combination increases risk of respiratory compromise)
Fentanyl	1-3 yo: 2 mcg/kg; 3-12 yo 1-2 mcg/kg			100 times more potent than morphine; Rapid bolus infusion may lead to chest wall rigidity. Reduce dosing when combined with benzodiazepines and in elderly. Preferred agent due to rapid onset and short duration.

Stepwise Approach to Pain Management and Procedural Sedation Analgesia (PSA)
<http://pami.emergency.med.jax.ufl.edu/resources/educational-materials/procedural-sedation/>

- 1. Situation Checkpoint**
What are you trying to accomplish? 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 "Recipe."
- 7. Monitoring & Discharge Checkpoint**
Joint Commission standards, reassessments, facility policies, discharge and transportation considerations.

Topical Anesthetics

AGENT	INDICATION	DOSE/ROUTE	TIME ONSET/ DURATION	MAXIMUM DOSE	COMMENTS
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 Duration 60 minutes	Externally 3-4 times per day Apply in area less than 100cm ² for children less than 10 kg Apply in area less than 600cm ² for children between 10 and 20 kg	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 Duration 30-60 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

AGENT	INDICATION	AGE/DOSE/ROUTE	TIME ONSET/ DURATION	MAXIMUM DOSE	COMMENTS
EMLA (2.5% Lidocaine 2.5% Prilocaine) (for children > 3 months age)	Dermal analgesic (intact skin)	3-12 months (and >5 kg) maximum area covered 20 cm ² 1-6 years (and >10 kg) maximum area covered 100 cm ² 7-12 years (and >20 kg) maximum area covered 200 cm ² topical/transdermal (cover area with occlusive dressing)	Onset 45-60 minutes Duration 3-4 hour	2 gm 10 gm 20 gm Maximum application time not to exceed 4 hours	Advantages Painless application, patient compliance, decreased repair time Risks Methemoglobinemia Contact dermatitis

Topical Anesthetics

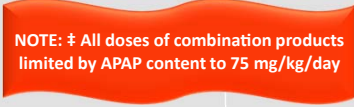
AGENT	INDICATION	DOSE/ROUTE	TIME ONSET/ DURATION	MAXIMUM DOSE	COMMENTS
Pain-Ease®	Cooling intact skin and mucus membranes and minor open wounds	Spray for 4-10 seconds from a distance of 8-18 cm	Onset- immediate Duration- a few seconds, up to a minute	When skin turns white	Advantages Quick acting Risks 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 2% 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.

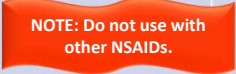
Infiltrative Anesthetics

AGENT	INDICATION	DOSE/ROUTE	TIME ONSET/ DURATION	MAXIMUM DOSE	COMMENTS
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 7 mg/kg maximum dose Additional dosing after maximum reached, may occur after 2 hours.	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

NON-OPIOID	INDICATION	DOSE/ROUTE*	MAX DOSE	COMMENTS
Acetaminophen (APAP)‡ 	Mild pain	10 - 15 mg/kg	75 mg/kg/day or 4 g/day	Advantages Minimal adverse effects on GI tract or renal function Risks Liver toxicity
		Every 4-6 hr PO, PR	60mg/kg/day for neonates	
Ibuprofen (Motrin®, Advil®) > 6 months of age	Mild pain	5 - 10mg/kg Every 6-8 hr PO	40 mg/kg/day Adults 3200 mg/day	Advantages Inhibits prostaglandin-induced nociception Risks Nausea, vomiting, ulcers, platelet dysfunction, liver toxicity

Moderate Pain Agents

NON-OPIOID	INDICATION	DOSE/ROUTE*	MAX DOSE	COMMENTS
Ketorolac (Toradol®) 	Moderate - severe pain	0.5 mg – 1 mg/kg every 6 hr IV, IM*	30 mg/IM every 6 hr	Advantages Effective alternative to opioids for treatment of moderate to severe pain Risks Bleeding diathesis; hyperkalemia; depression of renal function; and hepatotoxicity
		PO for patients > 50 kg	Adult dose: 60 mg IM or 30 mg IV. <i>If</i> <i>< 50 kg use 30 mg</i> <i>IM and 15 mg IV.</i>	

*IM routes not recommended as first line treatment.

Moderate Pain Agents

OPIOIDS [§]	INDICATION	DOSE/ROUTE*	ONSET	DURATION	MAX DOSE	COMMENTS
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	<p>Advantages Rapid onset action</p> <p>Risks Nausea, vomiting, constipation, respiratory depression, hypotension, bradycardia, CNS depression See current FDA warnings</p>

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.

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Moderate Pain Agents

OPIOIDS	INDICATION	DOSE/ROUTE*	ONSET	DURATION	MAX DOSE	COMMENTS
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	<p>Advantages Oral medication, moderately rapid onset</p> <p>Risks Dizziness, sedation, nausea, vomiting, constipation</p>
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	<p>Advantages Oral medication, moderately rapid onset</p> <p>Risks CNS depression, respiratory depression, hypotension, bradycardia, nausea</p>

NOTE: Generally not recommended in children less than 6 years of age.

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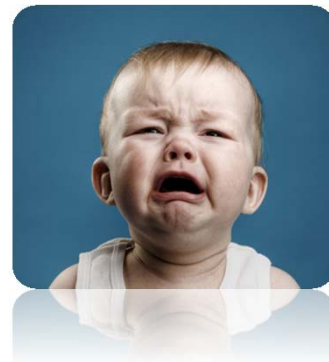
NSAIDS versus Opioids- Update

- 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).

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Severe pain

- Use high potency analgesics
 - Morphine
 - Fentanyl
 - Hydromorphone
- Intractable pain may require:
 - Nerve block, epidural or patient controlled analgesia (PCA)



Severe Pain

OPIOIDS	INDICATION	DOSE/ROUTE*	ONSET	DURATION	MAX DOSE	COMMENTS
Fentanyl (Sublimaze*)	Moderate - severe pain	1-2 mcg/kg/dose IV (over 3-5 min)	1-2 min IV	30-60 min IV	1-3 mcg/kg/dose	Advantages Rapid onset, short duration, potent analgesic; preferred for renal patients Risks Respiratory depression, apnea may precede alteration of consciousness chest wall rigidity if given too rapidly
		IN 1.5-2 mcg/kg (divide dose equally between each nostril)	10 min IN	60 min IN		
		IM*	7-15 min IM	1-2 hr IM		

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

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

Severe Pain

OPIOIDS	INDICATION	DOSE/ROUTE*	ONSET	DURATION	MAX DOSE	COMMENTS
Morphine (Roxanol*)	Moderate - severe pain	IV, SC, IM* <6mo: 0.05-0.1 mg/kg q4h prn; 6 mo-12yo: 0.1-0.2 mg/kg q2-4h prn >12yo: 3-10mg q2-6h prn	5-15 min	3-4 hr	15 mg	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
		PO <6mo: 0.1 mg/kg q3-4H prn; 6mo-12yo: 0.2-0.5 mg/kg PO q4-6h prn >12yo: 10-30 mg q3-4h prn				
		Chronic Pain PCA route <50kg: 0.01-0.03 mg/kg IV q6-20 min prn; >50kg: 0.5-2.5mg IV q6-20min prn				

NOTE: Avoid in children with renal failure.

*IM routes not recommended as first line treatment.

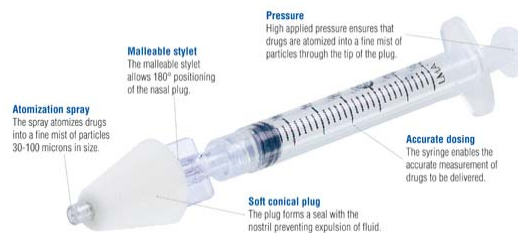
Severe Pain

OPIOIDS	INDICATION	DOSE/ROUTE*	ONSET	DURATION	MAX DOSE	COMMENTS
Hydro-morphone (Dilaudid®)	Severe pain	0.01-0.015 mg/kg IV	Almost immediately	2-4 hr	0.015 mg/kg/dose	Advantages Rapid onset; less pruritis than morphine Risks Respiratory depression, CNS depression, sedation
		Every 4 hr 0.03 - 0.06 mg/kg PO Every 4 hr	Up to 30 min	4-5 hr	Adult dose=1-4 mg/dose	

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

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



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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.



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Non-pharmacologic Interventions

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



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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.



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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*



Box of distraction supplies

Distraction technique
(with Child Life Specialist)



Distraction technique
with parents

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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)



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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



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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



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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



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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



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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



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Reassessment of Pain



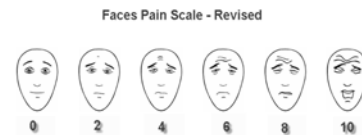
88

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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From: <http://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1823&navItemNumber=1119>

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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.



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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)**."



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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

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Procedural Sedation Definitions

Organization	Definition or Statement
 ACEP	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
 ASA	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.
 AAP	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.



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.

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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.**

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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?**

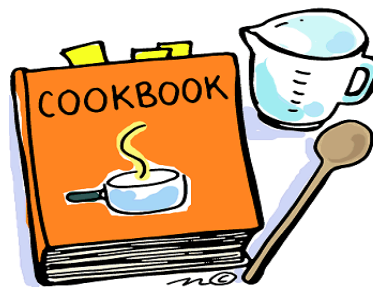
Answer: Do not delay procedural sedation in adults or pediatrics in the ED based on fasting time. Pre-procedural fasting for any duration has not demonstrated a reduction in the risk of emesis or aspiration when administering procedural sedation and analgesia.

(Level B recommendation) *

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

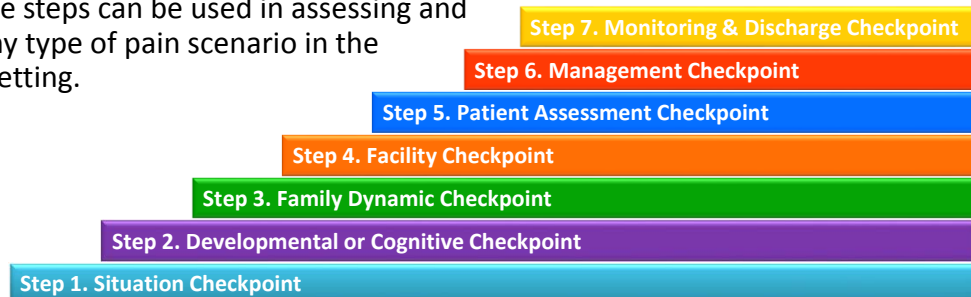
- What do you want to cook?
- Know your ingredients
- Recipe options
- Use careful measurements
- Follow the steps
- Bake and observe
- Don't leave the kitchen!



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.



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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



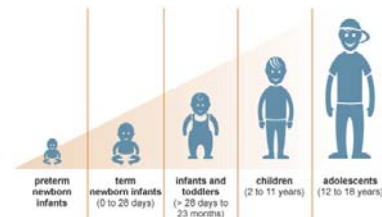
Determination accomplished after a brief history and PE or triage

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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!**



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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



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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?

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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
- 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



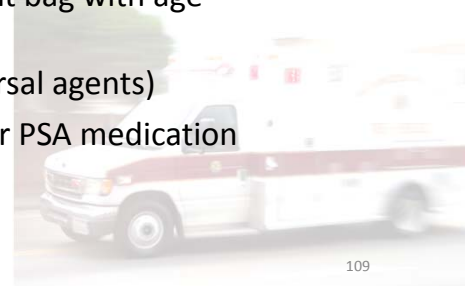
Patient safety tip: Complications from sedation such as respiratory depression are most likely to occur within 5 to 10 minutes after administration of IV medication and immediately after the procedure when stimuli associated with the procedure are removed. Thus, monitoring should be especially close during these periods.



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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



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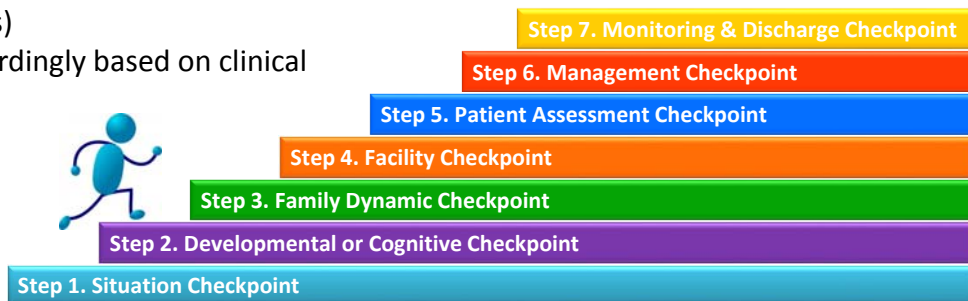
Discharge Planning, Transition to Care, Patient Safety and Risk Considerations in Pain Management



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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



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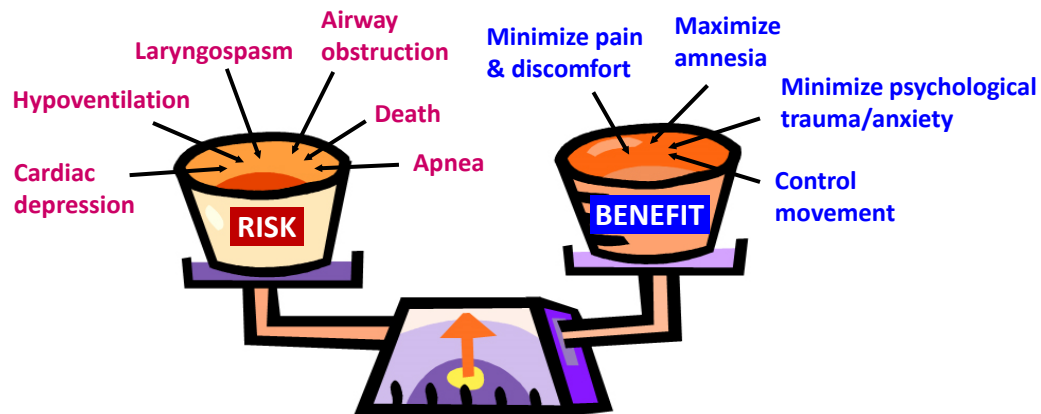
My Favorite “Recipes”

- 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



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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-opioid 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

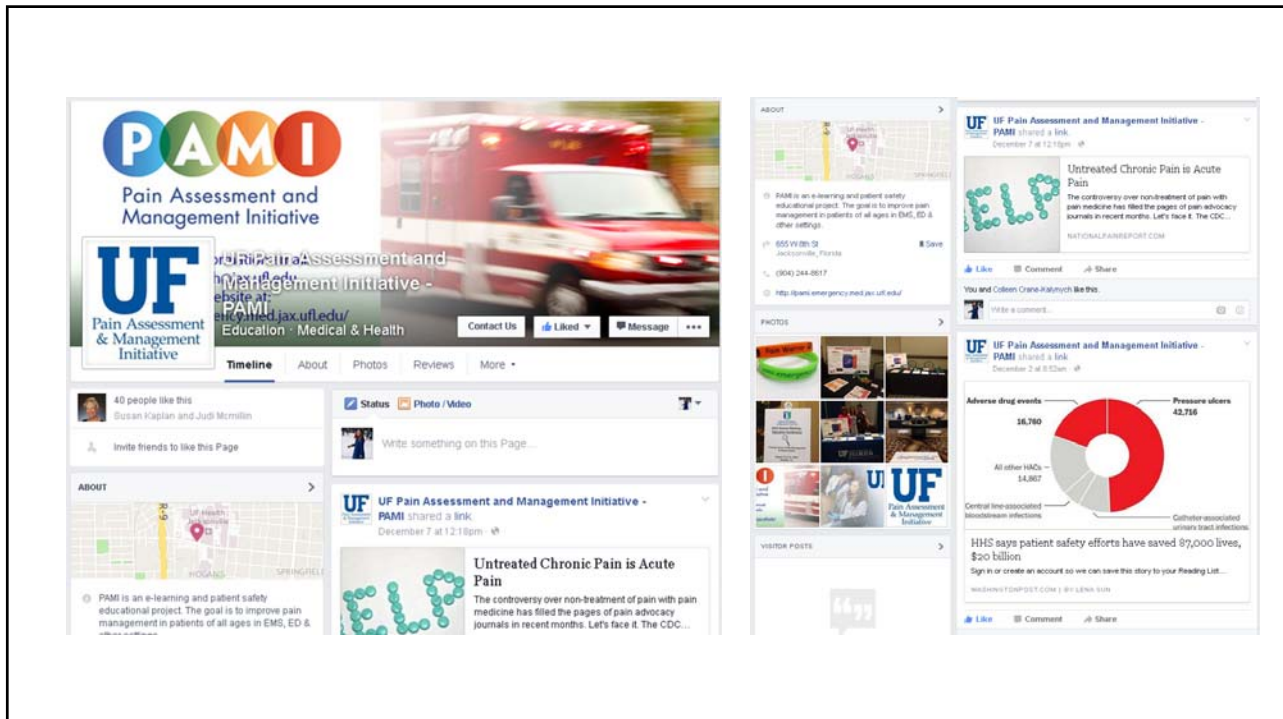


The PAMI website offers access to learning module handouts, pain tools, resources, websites, and recent pain news.

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
 - 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**

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