

Procedural Sedation and Analgesia (PSA) for Adults and Children in the Emergency Setting

Updated October 2017



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- ***Suggested Module Citation:*** Procedural Sedation and Analgesia (PSA) for Adults and Children in the Emergency Setting, 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/>.

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Learning Objectives

Learning Objectives

- ☐ Identify clinical circumstances in which procedural sedation and analgesia (PSA) may be indicated in adults and children.
- ☐ Review definitions of sedation levels on the sedation continuum.
- ☐ Explain the basis for development of safe and effective PSA practices including sources of current practice guidelines.
- ☐ Identify common medications used in PSA including dosage and side effects.
- ☐ Identify reversal agents for opioids and benzodiazepines commonly used in PSA.
- ☐ Explain regulatory requirements regarding proper sedation, monitoring and discharge of patients undergoing PSA.

Case Scenarios



Case Scenario 1

A 5 year old boy is brought in by EMS after falling from the monkey bars. His triage exam reveals an obvious deformity to his right forearm and initial x-rays show displaced distal radial and ulnar fractures. The Orthopedic consultant plans on performing a closed reduction in the ED.

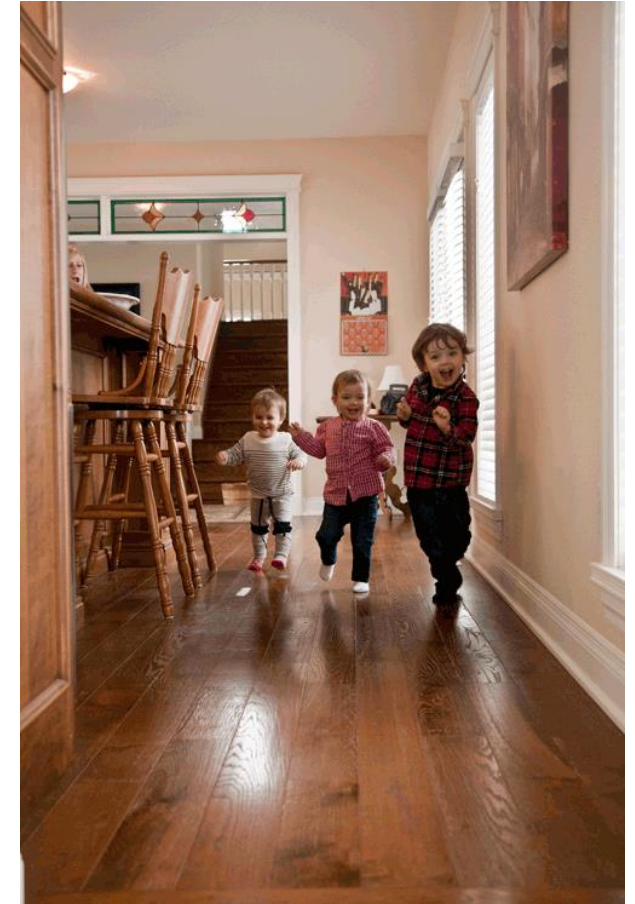
- ☐ Is this patient a candidate for procedural sedation?
- ☐ What age appropriate adjustments do you need to consider when planning care for this procedure?
- ☐ What medications will you select in making your treatment plan?



Case Scenario 2

A 2 year old with a history of Factor IX deficiency tripped while running and struck his head on the edge of the coffee table. There was no loss of consciousness or vomiting. Upon initial ED exam, the child is crying, upset and difficult to assess. You order a head CT to assess for intracranial bleeding.

- ☐ How will you facilitate radiographic assessment in this un-cooperative child?



Background Information



Background Information

The use of sedatives and analgesics to relieve pain and anxiety in diagnostic tests and procedures has significantly increased over the last 10-15 years.

The increase was partially prompted by FDA approval of short-acting analgesic and sedative medications and by improved equipment for noninvasive monitoring.



It is difficult to estimate the incidence of PSA in the ED setting but some institutional reports indicate over half of PSA procedures are managed by non-anesthesiologists.

- Studies have shown there is **not conformity** in providers' choice of medication(s) or depth of sedation to accomplish the same procedure and new medication regimes are constantly evolving.

Background Information

Procedural sedation and analgesia (PSA) is a standard practice of emergency physicians, recognized by the American College of Emergency Physicians (ACEP) as integral to the practice of emergency medicine.

PSA is **defined** as the use of pharmacologic agents to provide anxiolysis, analgesia, sedation, **or** motor control during procedures or diagnostic tests.

- Procedural sedation and analgesia reduces the discomfort, apprehension, and potential unpleasant memories associated with procedures and facilitates improved performance.

Background Information

Patient safety and risk reduction **must** be considered by adhering to a systematic approach of appropriate assessment, monitoring, and rescue skills in order to promote safe and effective PSA.



There are **specific populations** which have increased risks due to their unique characteristics. Sedation and analgesia introduces an independent **risk factor** for morbidity and mortality, in addition to the procedure itself.

When to consider PSA?

**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**

When is PSA used?

Procedure	Percentage of cases in one pediatric ED
Orthopedic fracture and dislocation reduction	30%
Diagnostic imaging studies	22%
Repair of facial lacerations	22%
Repair of other lacerations	5%
Abscess drainage	4%
Arthrocentesis	3%
Lumbar puncture	3%
Other	11%

Definitions

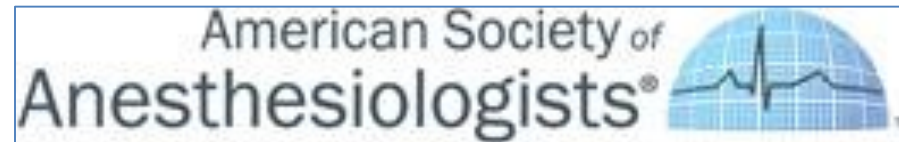


Many different professional organizations and The Joint Commission have definitions for procedural sedation, analgesia, and/or terms related to the continuum of sedation.

Definitions and Guidelines



Creating standardized definitions and guidelines has been a challenge as sedation policies vary across related societies. The Joint Commission recognized PSA risks and mandated sedation practices be monitored and evaluated by hospital departments of anesthesia.



The American Society of Anesthesiology (ASA) created practice guidelines for non-anesthesiologists who provide sedation and analgesia. This was followed by development of [ACEP clinical policies](#) and similar policies and statements by other professional organizations regarding moderate sedation and procedural sedation.

Definition of Procedural Sedation and Analgesia (PSA)

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



Procedural Sedation 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.

Continuum of Sedation

Analgesia →

Minimal sedation→

Moderate sedation and analgesia →

Deep sedation and analgesia →

General anesthesia

Dissociative sedation



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.
- 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

Tips

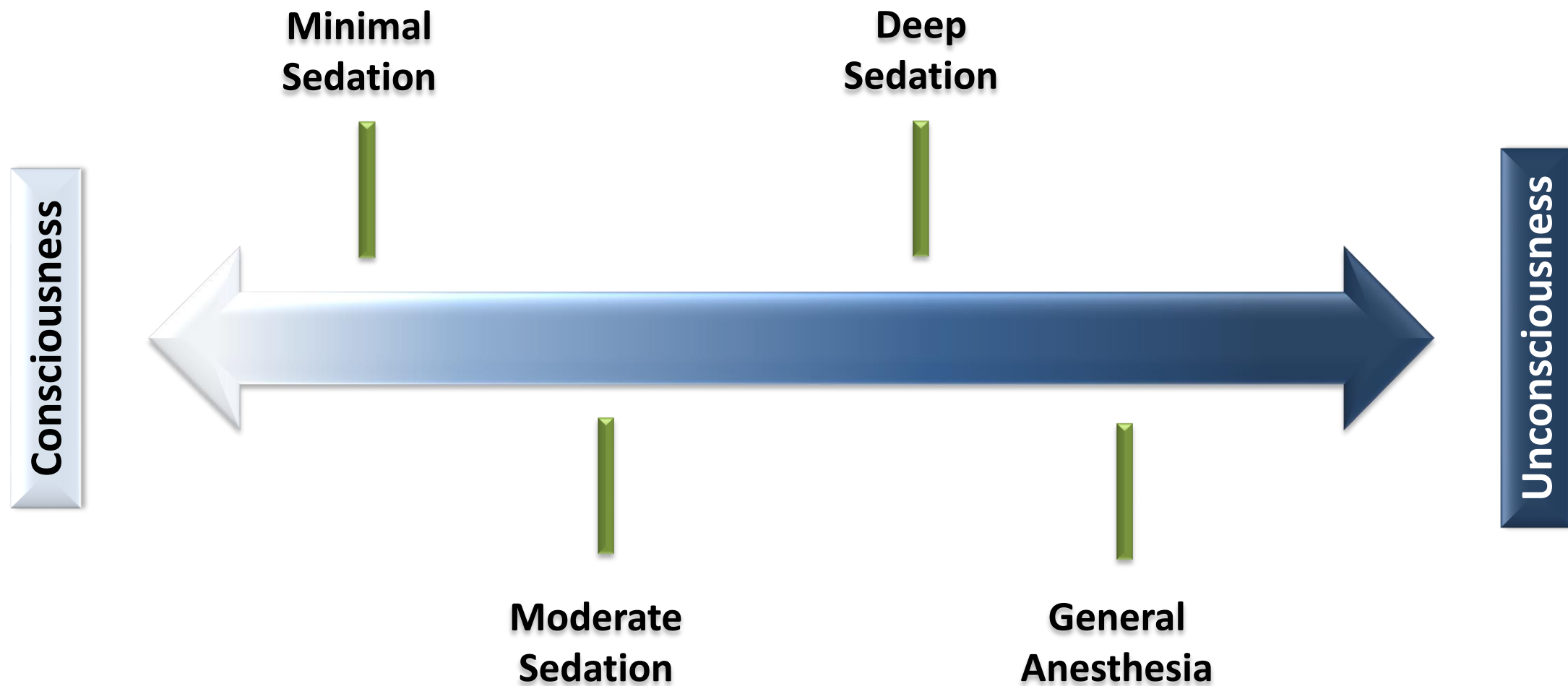
PSA Continuum Tips

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 ACLS and/or 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 ED setting but does not fall neatly within the continuum.*



Continuum of Sedation

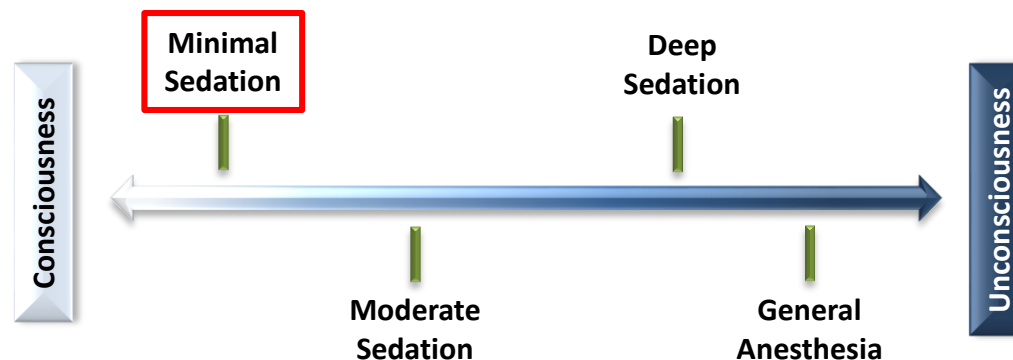


Continuum of Sedation: Analgesia

Analgesia – Relief of pain without intentionally producing a sedated state.

- Altered mental status may occur as a secondary effect of medications administered for analgesia.

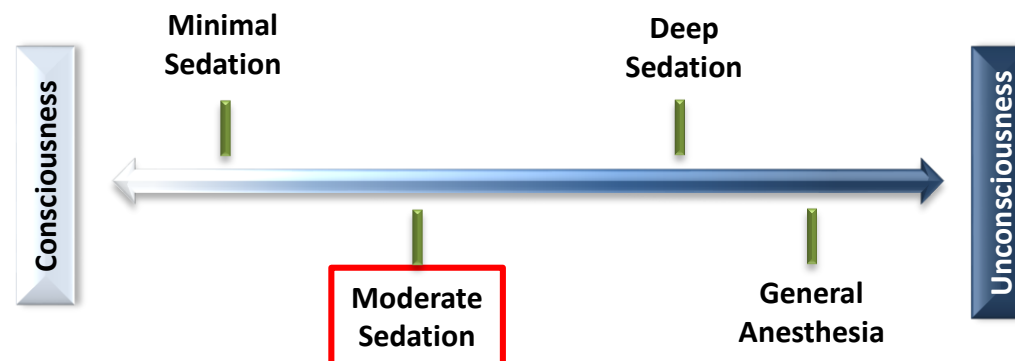
Continuum of Sedation: Minimal Sedation



Minimal sedation – The patient responds normally to verbal commands.

- Cognitive function and coordination may be impaired, but ventilatory and cardiovascular functions are unaffected.
- Near-baseline level of alertness.
- Pharmacologically induced state where the patient responds normally to verbal commands.
- Normal ventilatory and cardiovascular function.
- Example: low dose analgesic or anxiolytic medication.

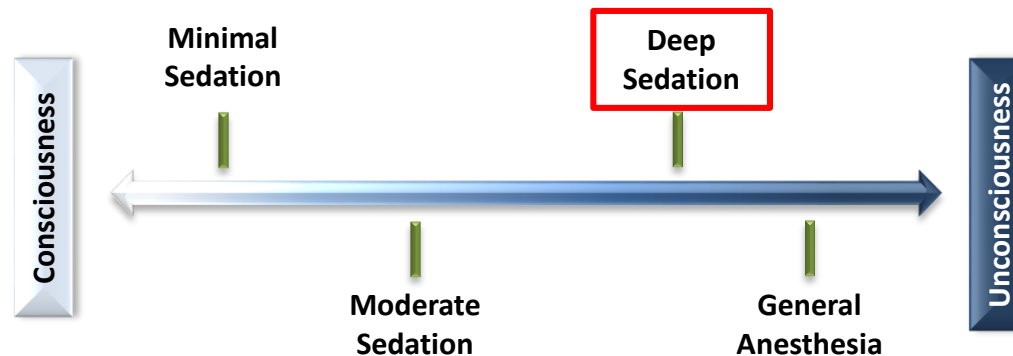
Continuum of Sedation: Moderate Sedation



Moderate sedation and analgesia – The patient responds purposefully to verbal commands alone or when accompanied by light touch.

- Protective airway reflexes and adequate ventilation are maintained without intervention.
- Pharmacologically induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation.
- Cardiovascular function remains stable.
- Patients may have ptosis, slurred speech, delayed or altered response to verbal stimuli, often experience event amnesia.
- Example: Combination of benzodiazepine and opioid

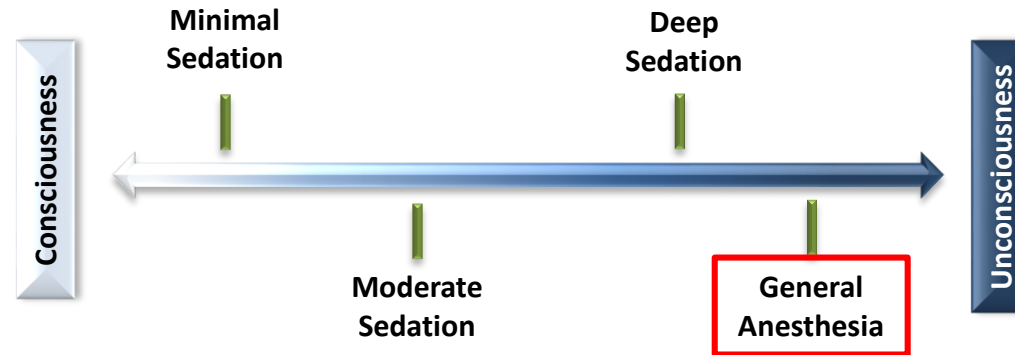
Continuum of Sedation: Deep Sedation



Deep sedation and analgesia – The patient cannot be easily aroused, but responds purposefully to noxious stimulation.

- Assistance may be needed to ensure the airway is protected and adequate ventilation maintained.
- Cardiovascular function is usually stable.
- Pharmacologic induced depression of consciousness during which patients cannot be aroused but respond purposefully after repeated or painful stimulation.
- Example: Propofol, etomidate, benzodiazepine, opioid plus sedative.

Continuum of Sedation: General Anesthesia



General anesthesia – The patient cannot be aroused and often requires assistance to protect the airway and maintain ventilation.

- Cardiovascular function may be impaired.
- Pharmacologically induced state of unresponsiveness to all stimuli, even surgical stimuli, and absence of protective airway reflexes.
- Cannot maintain a patent airway.
- Impaired ability to maintain adequate ventilation and often require positive pressure ventilation.

Continuum of Sedation: Dissociative Sedation

Dissociative sedation – Dissociative sedation is a trance-like cataleptic state in which the patient experiences profound analgesia and amnesia, but retains airway protective reflexes, spontaneous respirations, and cardiopulmonary stability

- Ketamine is the pharmacologic agent mostly commonly used for procedural sedation that produces this state.



Be cognizant of ketamine concentrations



Ramsay Sedation Scale

- First scale to measure **rousability**.
- Scale was initially validated in the ICU setting, however has been modified to correlate with The Joint Commission sedation definitions.

Clinical scores **1-2** are based on the patient's rousability during **consciousness**.

Clinical scores **3-6** are based on patients rousability during **sleep**.

Ramsay Sedation Scale

Clinical Score	Level of Sedation Achieved
1	Patient anxious or agitated
2	Patient cooperative, oriented & tranquil
3	Patient responds to command only
4	Brief response to light glabellar (between the eyes) tap or loud auditory stimuli
5	Sluggish response to light glabellar tap or loud auditory stimuli
6	No response to light glabellar tap or loud auditory stimuli

Summary of Sedation Level Definitions*

Parameter	Responsiveness	Airway	Spontaneous Ventilations	Cardiovascular Function	Modified Ramsay Sedation Scale Score
Minimal sedation (anxiolysis)	Normal responsiveness to verbal stimuli	Unaffected	Unaffected	Unaffected	1
Moderate Sedation	Purposeful response to verbal or tactile stimuli	No intervention needed	Adequate	Usually Maintained	2-4
Deep Sedation	Purposeful response to repeated or painful stimuli	Intervention may be required	May be inadequate	Usually Maintained	5-7
General Anesthesia	Unarousable even with painful or surgical stimuli	Intervention often required	Frequently inadequate	May be impaired	8

*As defined by the Joint Commission on Accreditation of Healthcare Organizations

Patient Variability

- Guidelines and regulatory agencies also use sedation depths to describe the relative risk state for a given patient, thus the level of provider care and monitoring varies with the sedation level.
- As a general rule, The Joint Commission recommends that providers have the capability of **managing patients one level deeper** than the target depth of sedation.



- The progression from **mild** sedation to **general** anesthesia is a **continuum** and patients can **easily move from one “level” of sedation to another**.
- **Patient response** to sedation is **highly variable**, with some patients becoming deeply sedated after minimal doses and others requiring much higher doses.
- In addition, differentiation of these levels of sedation may be difficult during a procedure.

Preparation

Goals of PSA

Balance of risks and benefits

Standards



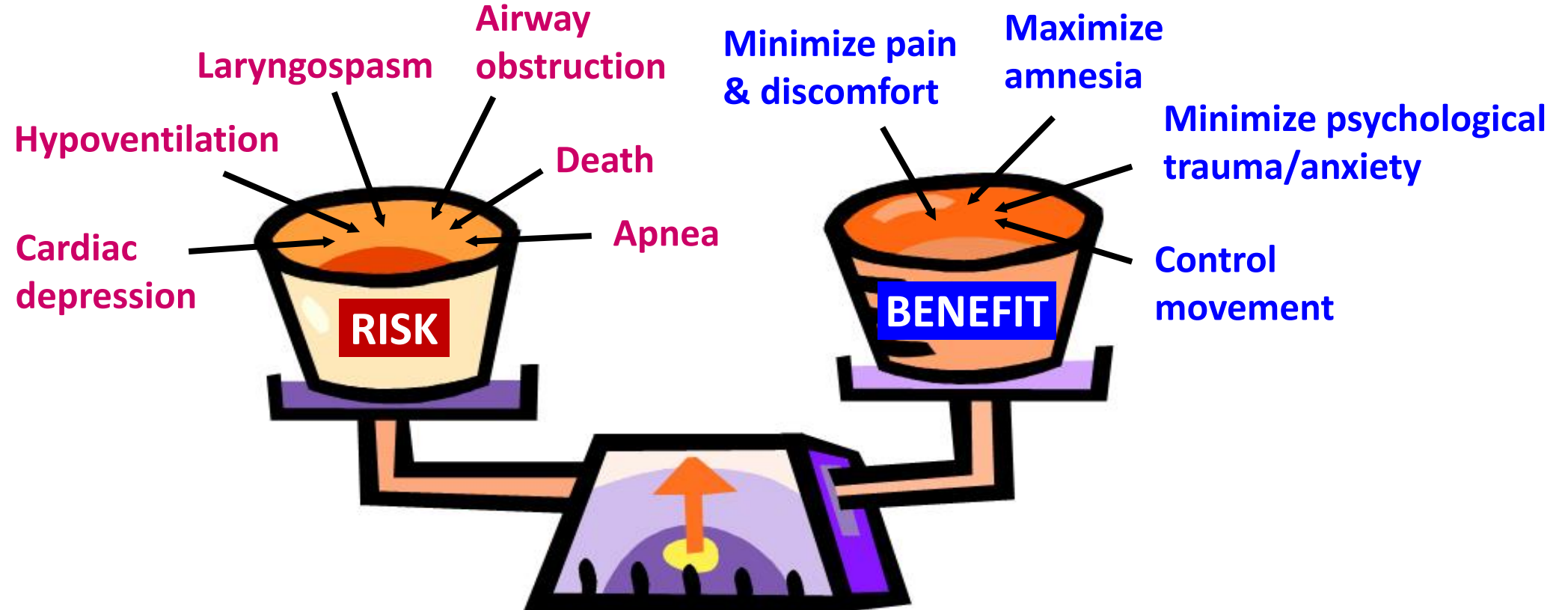
What are the Safety Goals of PSA?

1. Maintain patient safety and welfare
2. Minimize physical pain and discomfort for the patient
3. Control anxiety, minimize psychological trauma, and maximize amnesia for the patient
4. Control behavior and movement to allow safe performance of procedures for the health care providers and patient
5. Return patient to a state in which safe discharge from medical supervision is possible



Strike a Balance of Risks and Benefits

MAXIMIZE benefits while **minimizing** associated risks



Risk and Benefit Considerations

1. The clinician and patient or caregiver must **agree** that the potential benefit of procedural sedation outweighs the risks. Risks depend upon the patient and the procedure.
2. There is no specific age above which procedural sedation may not be performed; however, the **elderly and infants** have higher rates of adverse events due to increased sensitivity to sedative drugs, medication interactions, and pharmacokinetic differences.
3. Patients with major **comorbid medical conditions** are at increased risk for adverse events with procedural sedation. This correlates with an ASA physical status classification of Class III or greater ([table 1](#)). Important comorbidities are those that increase patient susceptibility to the cardiorespiratory depressant effects of sedatives.
 - heart failure, chronic obstructive pulmonary disease, neuromuscular disease, dehydration, anemia, obesity, congenital airway abnormalities and others

Table 1: ASA Physical Status Classification

ASA Physical Status	I	II	III	IV	V	VI
Definition	Healthy	Mild systemic disease	Severe systemic disease but not incapacitating	Incapacitating disease	Dying	Declared brain death
Age	>3mos to < 65 yrs	≤ 3 mos or ≥ 65 to 85 yrs	≤ 1 mos preterm NB or ≥ 85 yrs			
Functional capacity: walk up 1 flight of stairs or 200 meters on level	Complete without distress	Rest at completion because of distress	Stop en route because of distress	Unable to do		
Medical status	No organic, physiologic, or psychiatric disturbance	Single/multiple systemic disease(s) with good control No functional limitations or vital organ involvement	Poorly controlled systematic disease(s) Some functional limitations No immediate life threatening condition	Poorly controlled systemic disease(s) Significant functional limitation Constant potential threat to life	End stage disease(s) and not expected to survive within 24 hours	Clinically dead patients awaiting organ harvest
Mortality rate	0.06-0.08	0.27-0.4	1.8-4.3	7.8-23	9.4-51	
Emergency status	In addition to indicating ASA physical status, any patient undergoing an emergency operation is indicated by the suffix “E”, e.g. ASA III E					

Before You Begin...



Each PSA should be tailored to the individual patient considering the following factors:

- ✓ Select the lowest drug dose with the highest therapeutic index for the procedure - consider if agent(s) can be reversed
- ✓ Consider whether the procedure could be accomplished without sedation by engaging alternative modalities (e.g., digital nerve block, distraction techniques, comfort positions, etc.)

For more ideas and resources or to download your own Distraction toolkit visit

<http://pami.emergency.med.jax.ufl.edu/resources/new-approaches-to-pain-course/>



Do ***not*** undertreat the patient when sedation/analgesia is appropriate & necessary. *Just say no to “brutocaine”!*

Key Areas of Focus in Joint Commission Standards applicable to PSA in the ED or non-OR setting

- 1) Appropriate pre-procedural assessment of patient
- 2) Appropriate documentation
- 3) Appropriate monitoring of outcomes
- 4) Appropriate discharge

Visit The Joint Commission website to learn more and check for updates

<https://www.jointcommission.org/>

The Joint Commission Standards: Provisions of Care (PC)

Introduction to Elements of Performance (EPs) 1, 2, 4-8, 10, and 18

The elements of performance for sedation care apply when patients in any setting receive, for any purpose, by any route, moderate or deep sedation (with or without analgesia) that, may be expected to result in the loss of protective reflexes. (Review your organizational and professional standards and TJC website and e-edition standards.)



PC.03.01.01

EPs (Elements of Performance) 5, 6, 7, 10

- | | |
|----|--|
| 5 | A registered nurse supervises perioperative nursing care. |
| 6 | For operative or other high-risk procedures, including those that require the administration of moderate or deep sedation or anesthesia: The hospital has equipment available to monitor the patient's physiological status for the administration of moderate or deep sedation. |
| 7 | For operative or other high-risk procedures, including those that require the administration of moderate or deep sedation or anesthesia: The hospital has equipment available to administer intravenous fluids and medications, and blood and blood components for moderate or deep sedation. |
| 10 | For hospitals that use joint Commission accreditation for deemed status purposes: In accordance with the hospital's policy and state scope-of-practice laws, anesthesia is administered only by the following individuals: an anesthesiologist, a doctor of medicine or osteopathy other than an anesthesiologist, a doctor of dental surgery or dental medicine, a doctor of podiatric medicine, a certified registered nurse anesthetist (CRNA) supervised by the operating practitioner except as provided in 42 CFR 482.52(c) regarding the state exemption for this supervision . |

PC.03.01.03

EPs (Elements of Performance) 1, 4, 8, 18:

- | | |
|----|--|
| 1 | Before operative or other high-risk procedures are initiated, or before moderate or deep sedation or anesthesia is administered: The hospital conducts a pre-sedation or pre-anesthesia patient assessment. (See also RC.02.01.01, EP 2) |
| 4 | Before operative or other high-risk procedures are initiated, or before moderate or deep sedation or anesthesia is administered: The hospital provides the patient with pre-procedural education, according to his or her plan for care. |
| 8 | The hospital reevaluates the patient immediately before administering moderate or deep sedation or anesthesia. (See also RC.02.01.01, EP 2) |
| 18 | For hospitals that use Joint Commission accreditation for deemed status purposes: A pre-anesthesia evaluation is completed and documented by an individual qualified to administer anesthesia within 48 hours prior to surgery or a procedure requiring anesthesia services. |

PC.03.01.05: The hospital monitors the patient during operative or other high-risk procedures and/or during the administration of moderate or deep sedation or anesthesia.

- 1 The patients' oxygenation, ventilation, and circulation need to be monitored continuously during moderate or deep sedation. (See also RC.02.01.03, EP 8)

PC.03.01.07

EPs (Elements of Performance) 1, 2, 4, 7,8

- | | |
|---|---|
| 1 | The hospital assesses the patient's physiological status immediately after the operative or other high risk procedure and/or as the patient recovers from moderate or deep sedation or anesthesia. (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 operative or other high risk procedure and/or the sedation or anesthesia administered. |
| 4 | A qualified licensed independent practitioner discharges the patient from the recovery area or from the hospital. In the absence of a qualified licensed independent practitioner, patients are discharged according to criteria approved by clinical leaders. (See also RC.02.01.03, EPs 9 and 10) |
| 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. |

The Joint Commission Standards Performance Improvements (PI)

PI.01.01.01: The hospital collects data to monitor its performance.



Commonly Reviewed Quality Improvement Indicators.

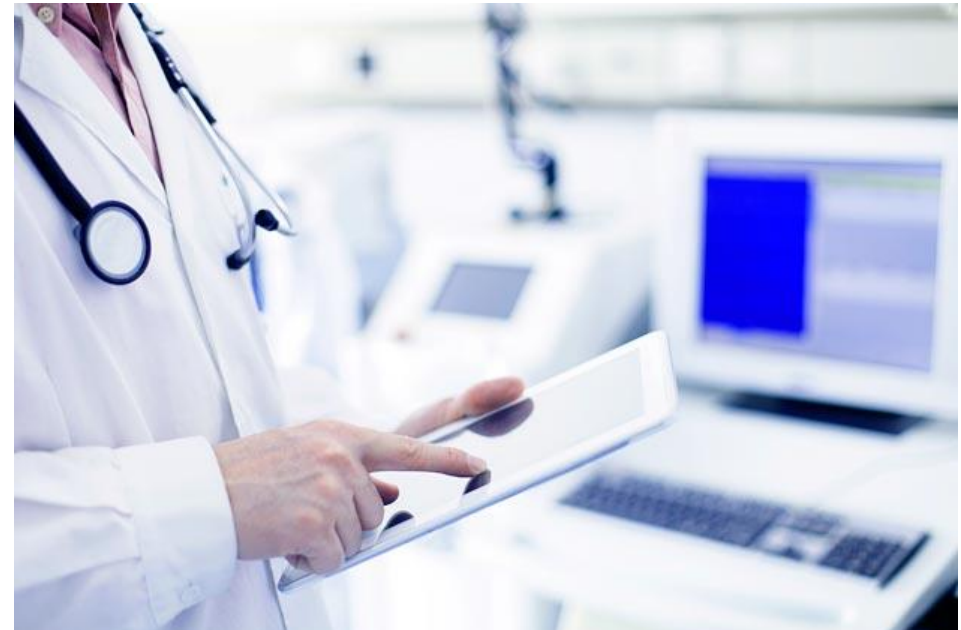


The Shewhart Cycle - The Deming Wheel - Plan-Do-Check-Act

- ✓ $\text{SpO}_2 \leq 90\%$ requiring O_2
- ✓ Any complications; need for emergency interventions
- ✓ Aspiration; airway obstruction
- ✓ Inability to complete the procedure as planned
- ✓ Long recovery time; unplanned admission
- ✓ Hypotension
- ✓ Use of reversal agents
- ✓ Proper documentation (presedation evaluation, sedation plan, equipment check, credential check, drug calculations, etc.)
- ✓ Death

The Joint Commission Standards Record of Care, Treatment, and Services (RC)

RC.02.01.03: The patient's medical record documents operative or other high-risk procedures and the use of moderate or deep sedation.



RC.02.01.03: The patient's medical record documents operative or other high-risk procedures and the use of moderate or deep sedation or anesthesia.

1	The hospital documents in the patient's medical record any administration of moderate or deep sedation.
2	A licensed independent practitioner documents the provisional diagnosis in the medical record before a high-risk procedure is performed.
3	The patient's medical history and physical examination are recorded in the medical record before a high-risk procedure is performed.
5	A high-risk procedure report is written or dictated upon completion and before the patient is transferred to the next level of care.
6	The high-risk procedure report includes: name(s) of licensed independent practitioner(s) who performed procedure and assistant(s), name and description of procedure, findings of the procedure, any estimated blood loss, any specimen(s) removed, and the postoperative diagnosis.
7	When a high-risk procedure report cannot be entered immediately into the patient's medical record after the procedure, a progress note is entered before the patient is transferred to the next level of care.
8	The medical record contains the following postoperative information: vital signs, level of consciousness, medications, including IV fluids and blood products, and unanticipated events or complications and the management of those events.
9	The medical record contains documentation that the patient was discharged by the licensed independent practitioner responsible for care or according to discharge criteria.
10	The medical record contains documentation of the use of approved discharge criteria that determine the patient's readiness for discharge.
11	The postoperative documentation contains the name of the licensed independent practitioner responsible for discharge.
15	The hospital has a complete and up-to-date operating room register that includes the following: patient's name, patient's hospital identification number, date of operation, inclusive or total time of operation, name of surgeon and any assistants, name of nursing personnel, type of anesthesia used and name of person administering it, operation performed, pre- and postoperative diagnosis, and age of patient.

General Risk Considerations

- PSA may be completed on a variety of patients; however, there are certain populations that need special consideration.
 - Elderly
 - Pediatrics
 - Medical comorbidities and chronic illness
 - Difficult airway anticipation
 - Developmental delay
 - Obesity
- Last oral intake should be considered before performing procedural sedation, although this does not appear to have a major impact on aspiration risk.



Fasting Time and Aspiration Risks

ASA Guidelines

ACEP Guidelines

Fasting Time: ASA Guidelines



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

Implementing these guidelines in the ED presents several problems:

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

Last Meal: ACEP 2014 Guidelines



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

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

(Level B recommendation)

Fasting Controversy Discussion



“ASA guidelines are based on extrapolation of general anesthesia cases in the OR in which airway manipulation during intubation and extubation increases the aspiration risk. It is not clear whether applying these guidelines to ED PSA reduces the risk of emesis or aspiration. Even within the framework of ASA guidelines, emergent sedations are an exclusion from fasting requirements. Future research should focus on identification of high-risk populations that might benefit from a fasting time. Concerns about procedural difficulty, ED resource utilization, and pediatric hypoglycemia related to enforced fasting periods for ED procedural sedation have not been well evaluated.”

Informed Consent

- Before performing procedural sedation, the clinician must discuss **risks**, **benefits**, and **alternatives** of the procedure and the planned sedation with the patient or caregiver and answer any questions.
- A printed informed consent form is available in most EDs and hospitals. This consent is in addition to the procedural consent- if indicated.
- Implied consent is acceptable in some cases where the patient is unable to provide explicit consent due to severe pain or altered mental status.
- Failure to obtain informed consent leaves the physician and hospital open to liability.



Informed Consent: Key Points

Diagnosis or Purpose of PSA

Benefits of PSA:

Anxiolysis

Amnesia

Analgesia

Ability to tolerate potentially painful
or anxiety provoking procedures
while avoiding general anesthesia

Risks of PSA:

Side effects of each medication

Risk of not doing the procedure

Risk of deep sedation

Post-sedation risks

Mechanics of PSA:

Placement of IV access

Cardio-respiratory monitoring

Time constraints

Recovery monitoring

Sample PSA Patient Information Education Forms for adults and children can be found on the PAMI website:

<https://com-jax-emergency-pami.sites.medinfo.ufl.edu/files/2015/02/PSA-patient-information-05012015-child.pdf>

PAMI Resources

<http://pami.emergency.med.jax.ufl.edu/resources/educational-materials/procedural-sedation/>

Procedural Sedation and Analgesia (PSA) Patient Information

While in the Emergency Room (ER), your child may have to get tests or procedures that can cause nervousness, fear or pain. For example, your child may need a CT scan and be scared of small spaces or your child could have a broken arm that needs to be repaired or a cut that needs stitches requiring them to get procedural sedation and analgesia (PSA).

What is Procedural Sedation and Analgesia (PSA)?

PSA means giving medicines that help your child relax or go to sleep (sedative), block pain (analgesic) or not remember the procedure (amnesia). In some cases PSA is used together with medications that numb the area (local anesthetic). **Please don't eat or drink anything in the ER until after the procedure is finished.*

Before the Procedure It is important to tell your doctor or nurse: <ul style="list-style-type: none"> about any new or old health conditions, diseases or surgeries (asthma, sleep apnea, sickle cell, etc.) if your child is taking any medications, herbs, supplements or vitamins- even "over-the-counter" drugs like Motrin if your child has allergies to medications or food if your child or a family member has ever had difficulty with anesthesia or surgery when your child last ate or drank who will be responsible for getting your child's discharge instructions, driving your child home, and taking care of your child 	How long PSA takes to start and end depends on: <ul style="list-style-type: none"> the type of test or procedure how long it takes your child to wake up and be their normal self <ul style="list-style-type: none"> It can take 30 minutes to a few hours for your child to wake up and be their normal self. This is because of the medicine your child was given. Everyone reacts to medications in different ways.
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What to expect during PSA?

Your child will be watched during the whole procedure and be put on a monitor that measures oxygen and vital signs.

- heart monitoring pads will be placed on your child's chest and a blood pressure cuff will be wrapped around your child's arm
- a wrap or clip will be put on your child's fingertip to measure oxygen levels
- a small tube may be placed in your child's nose to see how well they are breathing
- an oxygen mask may be put on your child's face if needed

Your child will probably need an IV line put in their arm or hand to get their medications. Medications are sometimes given in your child's mouth or nose or as a shot. After the medicines are given, your child will probably feel sleepy and calm or like they are in a "dream" and may not remember much about the procedure after waking up.

Risks and Side Effects

The use of PSA is usually very safe. Ask your child's doctor to review any possible side effects from your child's medications. The most common side effects after PSA are throwing-up and feeling "light-headed" or weak. Low blood pressure or oxygen may rarely happen during the procedure, which is why your child is watched closely and cared for by a team of specially trained doctors and nurses.

What To Know Before You Go Home Your child cannot be discharged until he or she: <ul style="list-style-type: none"> has normal vital signs returns to their normal self can walk without help (2 years or older) can drink fluids without vomiting has a safe ride home with parent or guardian has discharge instructions given to parent or guardian 	For the next 24 hours your child should: <ul style="list-style-type: none"> eat light, healthy small meals and drink plenty of fluids avoid driving, riding a bike or playing sports follow ER instructions for recovery, wound care, and medications schedule follow-up appointments Your child should be able to return to their regular activities after 24 hours <i>unless they have a fracture, concussion or severe injury</i> . Don't forget to ask for a school or work excuse if needed.
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Recommended Number of Health Care Providers for PSA

- Clinicians providing PSA should have in-depth knowledge of the relevant drugs, including mechanism of action, doses, side effects, and reversal agents and be proficient in pediatric and adult resuscitation and advanced airway management.
- The number of providers needed to safely perform PSA and the procedure may vary according to the patient and the procedure. In most cases there are two providers.
 - One performs the procedure while another orders PSA agents and monitors vital signs and clinical status.
- Whenever possible, two health care *providers* should be present during procedural sedation.



Pre-sedation Preparation

Pre-sedation Preparation: SOAPME

SOAPME is a commonly used acronym which can assist in planning and preparing for PSA.

Suction

Oxygen

Airway

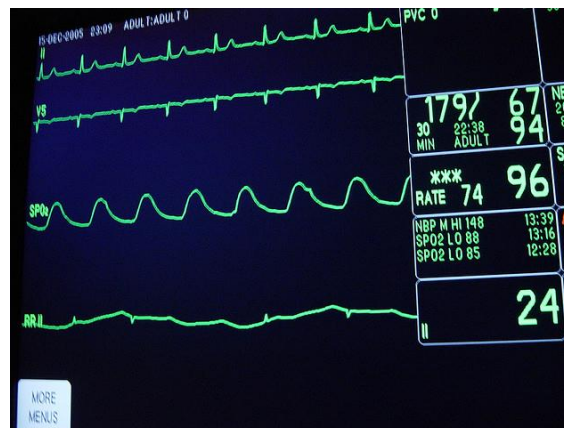
Pharmacology

Sedation, analgesic, antiemetic,
resuscitation and reversal medications

Monitoring

Equipment

Equipment



Resuscitation equipment should be readily available but does not need to be opened.

Equipment for All Ages and Sizes

Intubation tray	Nasal airways
ETT tubes	Laryngeal masks
Laryngoscope	Lidocaine spray
Stylet	Emergency Cricothyrotomy kit
Length based pediatric dosing tape	Defibrillator
Syringes with saline flush	Cardiac monitor with various sizes of BP cuffs
Nonrebreather oxygen masks	Continual blood pressure and cardiac monitoring
Bag valve masks	Capnography and pulse oximetry
Suction apparatus and catheters	Emergency medication cart or tray and length based pediatric resuscitation tape or system
Oxygen	IV supplies and fluids
Oral airways	

Pre-Oxygenation and Supplemental Oxygen During PSA

Routine pre-oxygenation and/or supplement oxygenation during PSA in the emergency department setting is controversial and depends on the following factors:

- Patient characteristics and risk factors
- Selected medication(s) for used during in PSA
- Procedure
- Local and institutional policies

Pre-Oxygenation and/or Supplemental Oxygen During PSA-Pros and Cons

Pro:

- Transient hypoxia has been seen with propofol, midazolam, and fentanyl but is less likely with ketamine when administered as a solo agent.
- A 2011 study concluded that high-flow oxygen reduced the frequency of hypoxia during ED propofol sedation in adults.

(Deitch et al. The utility of high-flow oxygen during emergency department procedural sedation and analgesia with propofol: A randomized, controlled trial. *Ann Emerg Med*. 2011;58(4):360-364. doi:10.1016/j.annemergmed.2011.05.018.)

Con:

- Use of supplemental oxygen during sedation and analgesia delays the detection of apnea by pulse oximetry (ASA 2012)
- The clinical significance of transient hypoxia with propofol use has not been well studied in ED settings and there are not uniform definitions.

Need for supplemental oxygen is determined by the patient, by the procedure and by the medication(s). Pre-oxygenation is not indicated in most healthy patients.

Capnography Monitoring During PSA

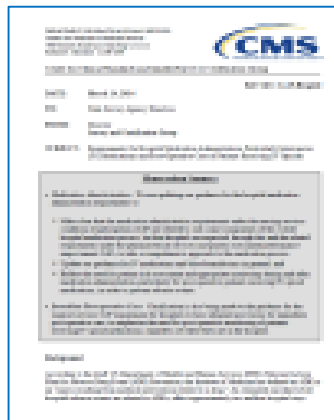
ACEP 2014 Clinical Policy recommendations

Level B recommendation:

- “Capnography **may be used as an adjunct** to pulse oximetry and clinical assessment to detect hypoventilation and apnea earlier than pulse oximetry and/or clinical assessment alone in patients undergoing procedural sedation and analgesia in the ED.”
- ETCO₂ monitoring detects hypoventilation earlier than pulse oximetry and pulse rate alone, especially if supplemental oxygen is administered.

Capnography Monitoring During PSA

- Review of current ASA standards + literature + CMS 2014 Standards on Opioids indicate strong recommendations to:
 - Use capnography with all moderate and deep levels of sedation
 - Reflect indications for capnography in ED policies and procedures
 - Document use of capnography during PSA



<http://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/Survey-and-Cert-Letter-14-15.pdf>

Pre-sedation Patient Evaluation

☐ Age and weight

☐ Health history

- ✓ Allergies and previous allergic or adverse drug reactions
- ✓ Medication history, including OTC, herbal or illicit drugs (dosage, time, route, and site)
- ✓ Relevant diseases, physical abnormalities, and pregnancy status
- ✓ Relevant hospitalizations
- ✓ Prior sedations & surgeries, and any complications (esp. airway issues)
- ✓ Relevant family history of adverse effects with sedation, analgesia or regional/general anesthesia
- ✓ NPO status

☐ Systems review

- ✓ Vital signs (BP, heart rate, respiratory rate, temperature, SpO₂)
- ✓ Pulmonary, Cardiac, Renal, GI, Hematological, CNS, Endocrine
 - ✓ Recent URI
 - ✓ Snoring, sleep apnea, congenital abnormalities, large tongue
- ✓ Physical exam with focused airway evaluation (body habitus, head/neck, teeth/mouth, and jaw)
- ✓ Physical status (ASA class)
- ✓ Review of available objective diagnostic data (e.g. labs, ECG, x-ray, etc.)
- ✓ Level of anxiety, pain, consciousness
- ✓ Name and telephone number of patient's parent or next of kin and primary care physician

Physical Exam

Physical Exam: Difficult Airway Features

Potential Difficult airway features:

- Obesity
- Malocclusion of the jaw
- Cervical vertebral disease
- Past/current facial trauma
- Congenital Anomalies
 - Micrognathia
 - Immobile neck
 - Laryngomalacia



If only patients came with labels!

Physical Exam: Difficult Airway Mnemonics

Difficult Bag Mask Ventilation

MOANS

Difficult Extraglottic Device

RODS

Difficult Laryngoscopy

LEMON

Difficult Cricothyroidectomy

SHORT

Physical Exam: Difficult Bag Mask Ventilation (MOANS)

Mask seal: beard, distorted lower facial contour

Obese/**O**bstruction

Age greater than 55 years

No teeth

Stiff or noncompliant lungs

Physical Exam: Difficult Extraglottic Device (RODS)

Restricted mouth opening: must allow for oral access to insert device

Obstuction: cardinal signs of upper airway obstruction at larynx

- muffled voice
- difficulty swallowing secretions
- stridor: occurs when the airway circumference is < 50% of normal
- sensation of dyspnea

Distorted Airway

- compromised seat/seal of the device

Stiff lung or c-spine

- Increased airway resistance (severe asthma)
- Decreased pulmonary compliance (pulmonary edema)
- Decreased cervical movement (trauma, atlanto-axial instability with Down Syndrome, ankylosing spondylitis)

Physical Exam: Difficult Laryngoscopy (LEMON)

Look externally

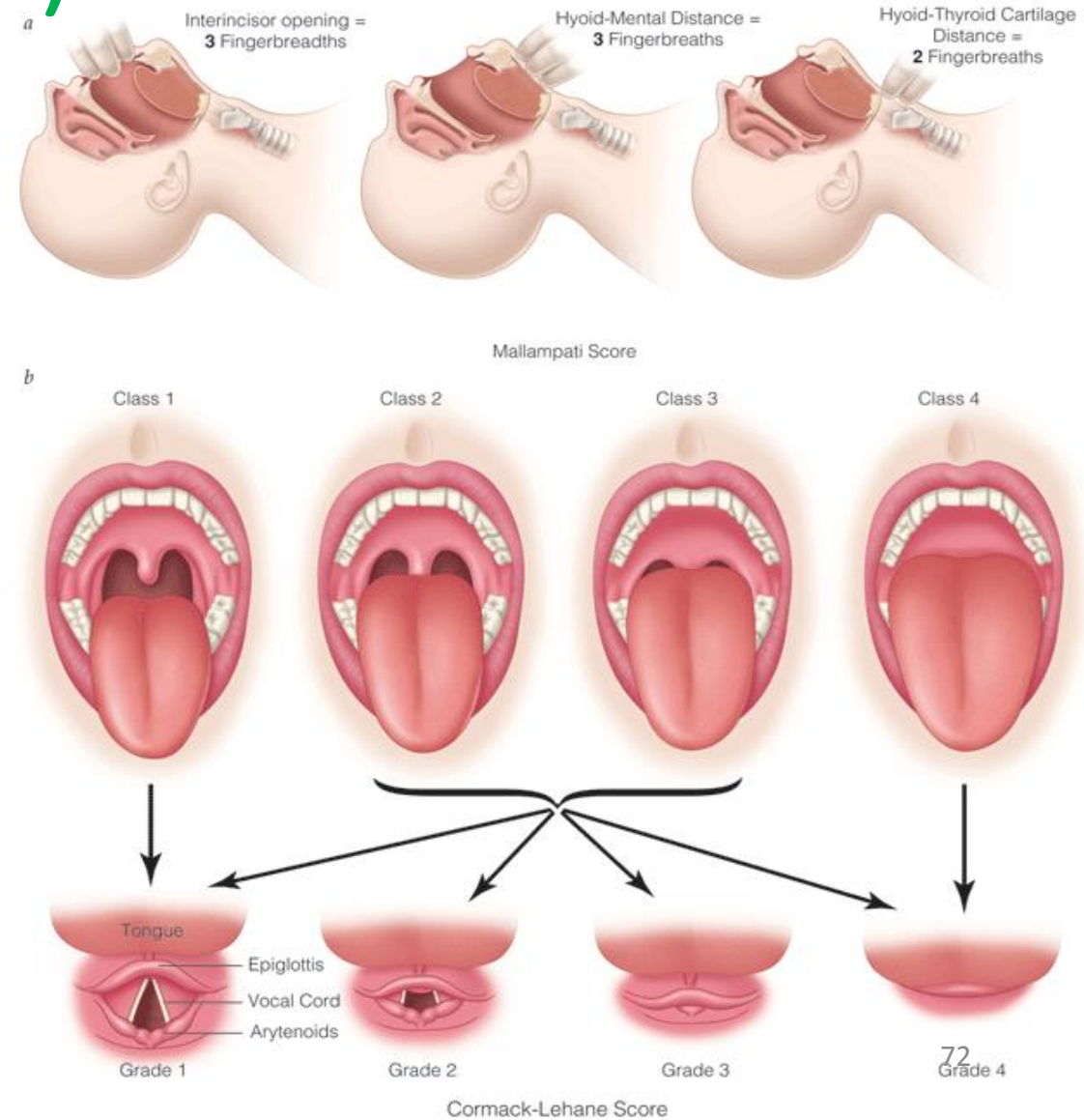
Evaluate 3-3-2 rule

Mallampati score

- Class 1: faucial pillars, soft palate & uvula seen
- Class 2: Faucial pillars & soft plate seen. Uvula partially masked by the base of the tongue.
- Class 3: Only soft palate seen.
- Class 4: Soft palate not seen.

Obesity/ Obstruction

Neck mobility



Physical Exam: Difficult Cricothyroidectomy (SHORT)

Surgery

Hematoma

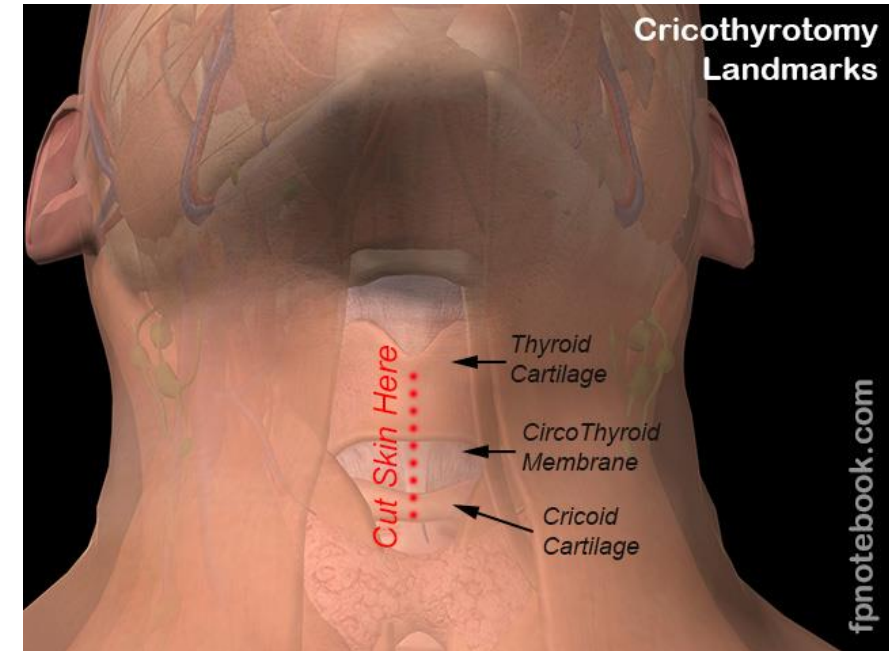
Obesity

Radiation Distortion

- distortion of the anatomy
- scar tissue
- fixed flexion
- deformity of the cervical spine

Tumor

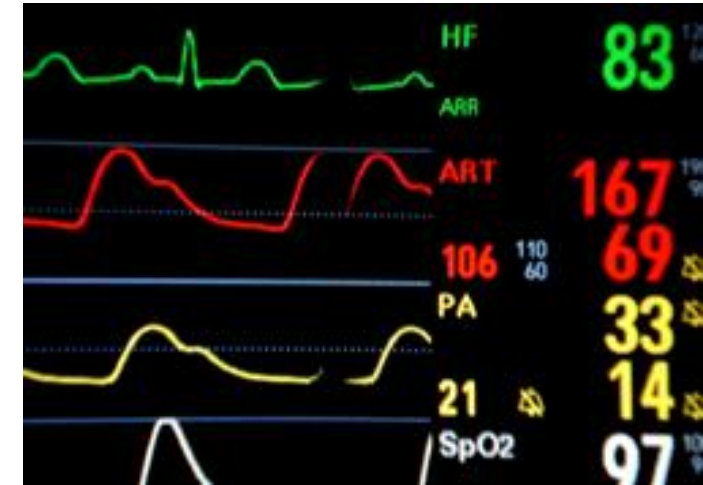
- Extrinsic vs intrinsic



Monitoring During and After PSA

When to Monitor Vital Signs

- Before starting the procedure
- After administration of the sedative/analgesic agent
- During procedure
- At completion of the procedure
- During early recovery
- At completion of recovery and prior to discharge home



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.

Monitoring During PSA

- The patient's response to medications and the procedure must also be closely monitored during procedural sedation and analgesia.
- Important factors in determining subsequent medication doses include
 - level of alertness
 - depth of respirations
 - response to painful stimuli
- Sedation scales, such as the Richmond Agitation Sedation and Ramsay Sedation Scales, have not been well studied in the setting of ED PSA.

Scales and Scoring Tools

Modified Ramsey Scale

Provides a consistent method to document level of sedation during *and* after a procedure

Indication	Score*
1. Anxious, Agitated, Restless	1
2. Awake, cooperative, oriented, tranquil Accepts mechanical ventilation	2
3. Semi asleep but responds to commands	3
4. Brisk response to light glabellar tap or loud noise	4
5. Sluggish response to light glabellar tap or loud noise	5
6. No Response	6

*Desired score depends on indication for sedation

Modified Aldrete Score

Used to determine when a patient can be safely discharged after undergoing sedation/analgesia

Parameter	Description of patient	Score
Activity level	Moves all extremities voluntarily/on command	2
	Moves 2 extremities	1
	Cannot move extremities	0
Respirations	Breathes deeply and coughs freely	2
	Is dyspneic, with shallow, limited breathing	1
	Is apneic	0
Circulation (blood pressure)	Is 20 mm Hg > preanesthetic level	2
	Is 20 to 50 mm Hg > preanesthetic level	1
	Is 50 mm Hg > preanesthetic level	0
Consciousness	Is fully awake	2
	Is arousable on calling	1
	Is not responding	0
Oxygen saturation as determined by pulse oximetry	Has level >90% when breathing room air	2
	Requires supplemental oxygen to maintain level >90%	1
	Has level <90% with oxygen supplementation	0

Maximum total score is 10; a score of ≥ 9 is required for discharge.

Richmond Agitation and Sedation Scale

Score	Term	Description
+4	Combative	Overtly combative, violent, immediate danger to staff
+3	Very agitated	Pulls or removes tubes/catheters; aggressive
+2	Agitated	Frequent nonpurposeful movement, fights ventilator
+1	Restless	Anxious, apprehensive but movements not aggressive or vigorous
0	Alert & calm	
-1	Drowsy	Not fully alert but has sustained awakening to voice (eye opening & contact \geq 10 sec)
-2	Light sedation	Briefly awakens with eye contact to voice (eye opening & contact <10 sec)
-3	Moderate sedation	Movement or eye-opening to voice (but not eye contact)
-4	Deep sedation	No response to voice but movement or eye opening to physical stimuli
-5	Unarousable	No response to voice or physical stimuli

Monitoring Post-PSA

- Monitor for adverse events
 - hypoxemia, apnea, airway obstruction, cardiovascular events, emesis
- Decreased stimulation, delayed drug absorption, and slow elimination places patients at risk during the recovery period
- Patients should be monitored until:
 - Return to baseline mental status AND
 - No longer at risk for cardiorespiratory depression

Complications in PSA

- Serious complications attributable to PSA *rarely* occur.
- Types of adverse complications
 - Significant respiratory compromise
 - develops in < 1% of cases
 - Cardiovascular instability
 - Vomiting and/or aspiration
 - Emergence reactions
 - Inadequate sedation preventing completion of the procedure



[illegible]

Medications*

Premedications

Sedative-hypnotics/anxiolytics

Analgesics

Dissociative agents

Inhalation agents


Reversal agents

*[For more information visit the PAMI Pain Management and Dosing Guide and website](#)

PAMI Pain Management and Dosing Guide

- 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/>




Pain Management & Dosing Guide

Pain Assessment and Management Initiative

Updated August 2017

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

Stepwise Approach to Pain Management



7. Monitoring & Discharge Checklist

For medications in status, management, history, adverse, culture are appropriate for management.

8. Management Checklist

Obtain vital signs for pain management and pharmacologic response.

9. Patient Assessment Checklist

Review patient's risk factors and history.

4. Facility Checklist

Type of setting and setting, nurse experience, patient history, etc.

3. Family Dynamic Checklist

Who is living in the patient's home? What are the family dynamics?

2. Developmental/Cognitive Checklist

What is the patient's development stage?

1. Situation Checklist

What are you trying to accomplish? Analgesia, anxiolysis, sedation, or all three.

Consideration: The clinical context regarding pain management is critical. What are the patient's goals? What are the patient's needs? What are the patient's expectations?

Pain Management and Dosing Guide Includes:

- Stepwise Approach to Pain Management and Procedural Sedation
- Non-Opioioid Analgesics, Opioid Prescribing and Equianalgesic Chart, and Opioid Cross-Sensitivities
- Intranasal and Rebolized Medications
- Procedural Sedation and Analgesia (PSA) Medications
- Pain Management, Discharge and Patient Safety Considerations
- Nerve Blocks, Neurophatic and Muscular Relaxant Medications
- Ketamine Indications and Dosing
- Topical and Transdermal Medications
- Nonpharmacologic and Other Interventions

Non-Opioioid Analgesics*

Generic (brand)	Adult	Pediatric
Acetaminophen (Tylenol)	325-650 mg PO q 4-6 hrs	10-15 mg/kg PO q 4-6 hrs
Ibuprofen (Advil)	400-800 mg PO q 6-8 hrs	10-20 mg/kg PO q 6-8 hrs
Aspirin (Bayer)	325-650 mg PO q 4-6 hrs	10-20 mg/kg PO q 4-6 hrs
Naproxen (Aleve)	250-500 mg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs
Celecoxib (Celebrex)	100-200 mg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs
Valproic Acid (Depakene)	15-30 mg/kg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs
Carbamazepine (Carbatam)	10-20 mg/kg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs
Phenytoin (Dilantin)	10-20 mg/kg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs
Valproic Acid (Depakene)	15-30 mg/kg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs
Carbamazepine (Carbatam)	10-20 mg/kg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs
Phenytoin (Dilantin)	10-20 mg/kg PO q 12-16 hrs	10-20 mg/kg PO q 12-16 hrs

*Consult the package insert for dosing and contraindications.

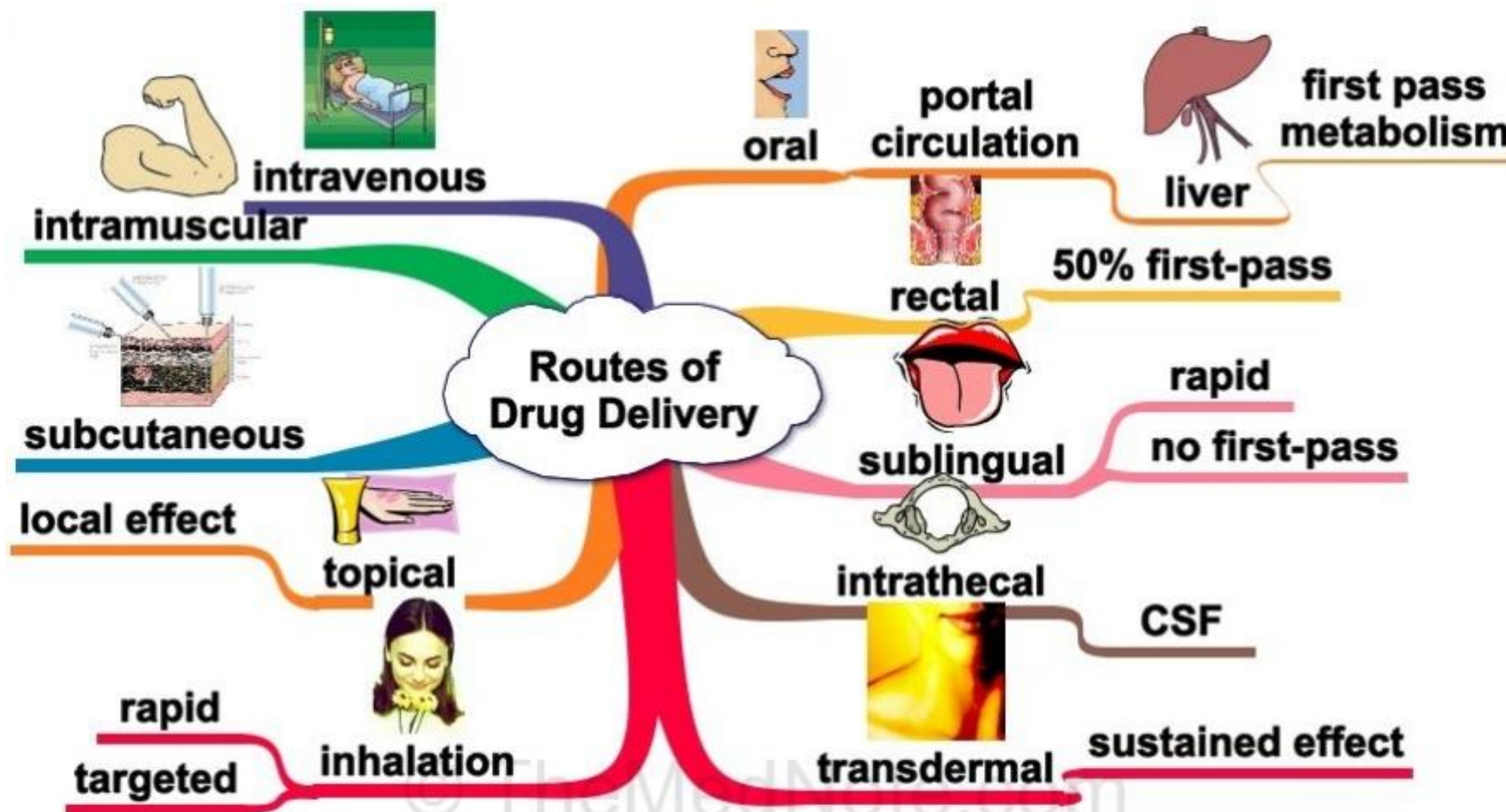
Opioid Prescribing and Equianalgesic Chart

Generic (brand)	Oral (mg)		IV (mg)		Subcut (mg)		Intrathecal (mg)	
	Adult	Pediatric	Adult	Pediatric	Adult	Pediatric	Adult	Pediatric
Hydrocodone (Vicodin)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Acetaminophen (Vicodin)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Buprenorphine (Ultram)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Naloxone (Exalgo)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Propofol (Diprivan)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Xanax (Klonopin)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Zanax (Xanax)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Valium (Valium)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Versed (Versed)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Propofol (Diprivan)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Xanax (Klonopin)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Zanax (Xanax)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Valium (Valium)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg
Hydrocodone/Versed (Versed)	5-10 mg	0.1-0.2 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	2.5-5 mg	0.05-0.1 mg/kg	0.1-0.2 mg	0.01-0.02 mg

Topical and Transdermal Medications*

Generic (brand)	Indications	Recommended STARTING dose for ADULTS	Recommended STARTING dose for CHILDREN	Maximum Dose
Epidermal (lidocaine) 1-2% topical	Local anesthesia	1-2% w/ 1% prilocaine	1-2% w/ 1% prilocaine	1-2% w/ 1% prilocaine
Epidermal (lidocaine) 1-2% topical	Local anesthesia	1-2% w/ 1% prilocaine	1-2% w/ 1% prilocaine	1-2% w/ 1% prilocaine
Epidermal (lidocaine) 1-2% topical	Local anesthesia	1-2% w/ 1% prilocaine	1-2% w/ 1% prilocaine	1-2% w/ 1% prilocaine
Epidermal (lidocaine) 1-2% topical	Local anesthesia	1		

Medication Routes to Consider



PSA Medication Routes

Most significant procedures are performed using IV medications for PSA, however, other routes may be used in:

- cases of difficult IV access
- non-painful procedures requiring sedation or anxiolysis
- combination with local anesthetics or nerve blocks

Nasal administration is a commonly preferred route in children due to rapid absorption. It is less traumatic than rectal or IM routes.



Courtesy Seattle Children's Hospital.

Premedication: Atropine

Class:	Anticholinergic agent
Action:	Antisialagogue – reduces vagal tone thereby increasing heart rate and dries secretions
Dose: (IV, IM, SC)	<i>Pediatric</i> 0.01- .02 mg/Kg; <i>Adult</i> 0.4 - 0.6 mg IM, IV, or SQ
Contraindications:	Hypersensitivity to atropine Closed angle glaucoma Tachycardia Obstructive GI disease or ileus Myasthenia gravis Elderly patients
Common side effects:	Tachycardia, Arrhythmias, Tremor, Headache, Nausea, Dry mouth
Recommended for:	Inhibiting salivation and decreasing secretions during procedures (eg: Ketamine and dental procedures)
Reversal agent:	None
Clinical cautions:	Minimum dose 0.1 mg

Premedication: Zofran(Ondanestron)

Class:	Antiemetic
Action:	Antagonizes serotonin 5-HT ₃ receptors
Dose: IV or ODT	<15 kg give 2 mg; >15 kg give 4 mg
Contraindications:	Known hypersensitivity
Common side effects:	Headache, Dizziness, Drowsiness, Extrapyrarnidal reactions, Anxiety Rare: anaphylactoid reactions, seizures, and hypoxia
Recommended for:	Prevention or treatment of vomiting especially in children receiving ketamine
Reversal agent:	None
Clinical cautions:	Use with caution in patients with prolonged QTc

Sedative-hypnotics: Benzodiazepines

- General features
 - Dose-dependent effects (e.g. anxiolysis, amnesia, sedation, hypnosis)
 - Opiate-sparing – may diminish anticipatory pain response
 - No analgesic effect
 - Lipophilic, fast onset, short distribution half-life
 - midazolam > diazepam > lorazepam*

Sedative-hypnotic: Midazolam (Versed®)

Class:	Benzodiazepine
Action:	Enhances the inhibitory effect of GABA in the central nervous system resulting in sedation, amnesia, and anxiolysis (NO analgesia)
Dose:	See next slide Onset: 1-2 minutes; Duration: 20-40 minutes
Contraindications:	Hypersensitivity to benzodiazepines Chronic respiratory insufficiency
Common side effects:	Respiratory depression, Paradoxical excitement, Occasional hypotension and bradycardia
Recommended for:	Minor invasive procedures Good complementary sedation for painful procedures combined with analgesic, nerve blocks or topical agents
Reversal agent:	Flumazenil (Romazicon®)
Clinical cautions:	Use with caution in elderly and neonates. Often combined with morphine, fentanyl or ketamine Reduce dose in combination with opioids due to increased risk of respiratory compromise

Midazolam Dosing and Routes

Route	Dose	Comments
IV	0.05 - 0.1 mg/kg IV slow push over 1-2 minutes	<ul style="list-style-type: none"> • Max initial dose 2 mg • Max total dose in >60 years or high risk is 0.1 mg/kg • Decrease dose by 33-50% when given with opioid
Nasal	0.3 mg/kg	<ul style="list-style-type: none"> • Pediatric use with atomizer; Max dose 10 mg
Oral	0.5 mg/kg to max 20 mg	<ul style="list-style-type: none"> • 6 mos- 6 yo or uncooperative may require higher dosing • Max 20 mg • Dose based on ideal body weight in obese patients
Rectal	0.5 mg/kg	<ul style="list-style-type: none"> • Not well tolerated by children
IM	0.1 mg/kg	

Sedative-hypnotic: Propofol (Diprivan®)

Class:	Sedative-hypnotic
Action:	Enhances activity of GABA in the central nervous system resulting in sedation and amnesia (NO analgesia)
Dose	Initial: 0.5 - 1 mg/kg IV; Repeat 0.5mg/kg IV every 3-5 minutes. Administer via slow IV push (to decrease risk of hypotension), shake well Onset: <1 min; Duration: 3-10 minutes
Contraindications:	Hypotension Allergy to soy, eggs, glycerol
Common side effects:	Apnea; hypoventilation; respiratory depression, Rapid & profound changes in sedative depth, Hypotension
Recommended for:	Non-painful diagnostic procedures Ideal for procedures requiring brief periods of deep sedation (e.g., burn debridement)
Reversal agent:	None
Clinical cautions:	Site injection pain Caution in patients with disorders of lipid metabolism (e.g. pancreatitis) Monitor for propofol related infusion syndrome (rare)

Sedative-hypnotic: Etomidate (Amidate)

Class:	Sedative-hypnotic
Action:	Enhances activity of GABA in central nervous system resulting in sedation and amnesia (NO analgesia)
Dose:	Initial : 0.1 - 0.2mg/kg; Subsequent : 0.05mg/kg IV Administer IV over 30-60 seconds Onset: < 1 min; Duration: 3-5 minutes
Contraindications:	Addison's disease Children \leq 10 years (higher risk of adrenal suppression) Children in shock
Common side effects:	Myoclonus (premedication w/ benzo or opioid can decrease), Pain with injection, Nausea and vomiting
Recommended for:	Nonpainful diagnostic procedures Brief painful procedures
Reversal agent:	None
Clinical cautions:	Mild (usually clinically insignificant) adrenocortical suppression after a single IV bolus

Sedative-hypnotic: Dexmedetomidine (Precedex®)

Class:	Alpha-2 agonist
Action:	Selective alpha-2 adrenergic agonist with sedative, anxiolytic, and minimal analgesic properties
Dose:	1 to 3 mcg/kg IV loading dose (over 10 minutes) followed by 0.5 to 2 mcg/kg/hour continuous infusion
Contraindications:	Children who are debilitated, inadequately hydrated, or have reduced cardiac output Patients receiving digoxin or other medications acting on sinus node or with sinus node dysfunction
Common side effects:	Bradycardia, Hypotension, especially with loading dose or rapid infusions, Apnea, bronchospasm, respiratory depression
Recommended for:	Nonpainful procedures, diagnostic imaging (CT, MRI)
Reversal agent:	None
Clinical cautions:	<i>Limited data in ED setting including intranasal administration.</i>

CNS Effects

Agent	Analgesia	Hypnosis*	Anxiolysis*	Amnesia*
Opioids	+++	+	—	—
Benzodiazepines	—	+++	++	+++
Propofol	—	+++	+	—
Dexamedtomidine	+	+++	++	—

* Sedation

Opioid Analgesics

- Possess **NO** ceiling analgesic effects
- Bind to opioid receptors in the CNS
- Block the release of neurotransmitters in the spinal cord
- Agonist of Mu, delta, kappa receptors
- Titrate dose to effect

Analgesic: Fentanyl (Sublimaze)

Class:	Opioid analgesic
Action:	Strong agonist at mu opiate receptors causing analgesia (NO sedation)
Dose:	<i>Pediatric:</i> 1-3 yo: 2-3 mcg /kg; 3-12 yo 1-2 mcg/kg; <i>Adult:</i> 0.5-1 mcg /kg IV Onset: 1-2 min; Duration: 30-60 minutes
Contraindications:	Increased intracranial pressure Severe respiratory disease/depression
Common side effects:	Respiratory depression, Hypoxia and/or apnea, Hypotension/bradycardia, Nausea & vomiting, Pruritus
Recommended for:	Short painful procedures
Reversal agent:	Naxolone
Clinical cautions:	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

Analgesic: Hydromorphone (Dilaudid)

Class:	Opioid analgesic
Action:	Strong agonist at mu opiate receptors causing analgesia (NO sedation)
Dose:	<i>Adult:</i> Initial dose 0.5-2.0 mg SC/IV q3-6hrs and titrate to effect; <i>Pediatric:</i> <6mo 0.005 mg/kg SC/IV q2-6 hrs; >6mo & <50kg 0.015 – 0.02 mg/kg SC/IV q2-6 hrs
Contraindications:	Hypersensitivity to hydromorphone
Common side effects:	Respiratory depression, Hypoxia and/or apnea, Hypotension/bradycardia, Nausea & vomiting, Pruritus
Recommended for:	Short painful procedures
Reversal agent:	Naxolone
Clinical cautions:	Approximately 5-7 times more potent than morphine Slower onset and longer duration of action compared to morphine

Analgesic: Morphine

Class:	Opioid analgesic
Action:	Strong agonist at mu opiate receptors causing analgesia (NO sedation)
Dose:	<i>Adult:</i> Initial dose 0.05-.0.1 mg/kg or 5-10 mg <i>Pediatric:</i> 0.1-0.2 mg/kg IV, titrated to effect.
Contraindications:	Acute or severe asthma Hypersensitivity to morphine
Common side effects:	Hypotension, Urticaria, Drowsiness, Nausea & vomiting
Recommended for:	Long painful procedures due to duration of action
Reversal agent:	Naloxone
Clinical cautions:	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)

Dissociative Agent: Ketamine (Ketalar®)

Class:	Dissociative amnesia and analgesia
Action:	Sedation, amnesia, analgesia
Dose:	<p><i>Adult:</i> 0.5-1 mg/kg slow IV push over 2-3 mins</p> <p><i>Pediatric:</i></p> <p>IV: 1-1.5 mg/kg slow IV push (max rate 0.5mg/kg/min); additional doses 0.5 mg/kg IV q10-15 min prn (when given with propofol, reduce initial dose to 0.5 mg/kg)</p> <p>IV Onset: < 1 min; Duration: 5-10mins</p> <p>IM: 4 - 5 mg/kg</p>
Contraindications:	<p>Infants ≤ 3 months (higher risk of airway complications)</p> <p>Ketamine increases pressures (BP, IOP, ICP)</p> <p>Acute neurological/head injury</p> <p>Significant eye injury and/or disease</p>
Common side effects:	<p>Laryngospasm, Emergence reactions, Increased salivation & intracranial/intraocular pressure</p> <p>Hypertension/tachycardia, Nausea & vomiting</p>
Recommended for:	Painful procedures (e.g., burn debridement, fracture reduction, foreign body removal)
Reversal agent:	None
Clinical cautions:	<p>Active pulmonary infection/ URI, Cardiovascular disease, Glaucoma or acute eye injury</p> <p>History of airway instability, tracheal surgery/ stenosis, Psychosis, Porphyria, thyroid disease</p>

Inhalation: Nitrous Oxide (N₂O)

Class:	Anesthetic (blended with 50 – 70% O ₂)
Action:	Amnesia, analgesia (unreliable), mild anxiolysis
Dose:	50% N ₂ O/50% O ₂ inhaled Onset: 3-5 minute; Recovery 3-5 minute after cessation of gas
Contraindications:	Some chronic obstructive pulmonary diseases Small bowel obstruction Pneumothorax Severe emotional disturbances or drug-related dependencies
Common side effects:	Respiratory depression (esp. in combination with other sedatives), Dizziness & headache, Disorientation, Nausea & vomiting
Recommended for:	Moderately painful procedures Anxiety/distress reduction Widely used to reduce anxiety during dental procedures Advantage when no vascular access
Reversal agent:	None
Clinical cautions:	Potential for deep sedation with high concentrations or when combined with opioids Delivery equipment must be able to deliver 100% (and never less than 25%) O ₂ concentration at a flow rate appropriate to child's size Requires gas scavenging system to minimize adverse effects on staff

Pain Management Adjuncts for Procedures



Topical/Local anesthetics

Safety Tip: agents are cardiac depressants; maximum allowable safe dosage should be calculated *before* administration to avoid overdose, especially in pediatric cases.

- EMLA[®]: 60 min onset, lidocaine 2.5% and prilocaine 2%
- LMX4[®]: 40 min onset, liposomal lidocaine 4%
- LET: 20 min onset, lidocaine , epinephrine ,and tetracaine (A gel form of TAC can be made by adding 150 mg of methyl-cellulose 4000 cps to 3 mL of LET solution)
- Synera[®]: 20 min onset, lidocaine and tetracaine patch
- Topical Anesthetic Skin Refrigerant (Pain Ease[®]): < 5 min onset

Pain Management Adjuncts for Procedures

Oral Sucrose (Sweet-Ease™)

Recommended as a safe and effective nonpharmacologic intervention to reduce pain and signs of distress in young infants (preterm and term neonates ≤ 28 days old) undergoing a painful procedure.

- Efficacy improves when combining sucrose and comfort measures
- Appears to be less effective in infants between 1–6 months of age



Intranasal Medications

- Use an atomizer, if > 1ml divide into nares
- Ketamine ??? dosage
 - Dosage not well established; reports of 0.5-10 mg/kg of 50 mg/ml solution
 - Use with caution until further studied
- Midazolam 0.3 mg/kg, max 10 mg; 5mg/ml solution
- Fentanyl 2 µg/kg, max 50 µg
- Dexmedetomidine IN
 - Not well studied in ED setting

Combination Therapy Options

Combining agents may **increase** risks of **adverse** events compared to each drug individually. Risks and benefits must be considered.

1. When combining agents, the drug with the greatest risk of respiratory depression should be given first.
2. Enough time should be given to evaluate the effect of the first drug before giving the second.
3. Common Combinations:
 - Fentanyl and Midazolam
 - Ketamine and Propofol

Ketamine and Propofol = “Ketofol”

Dosing:

- Prepare 1:1 mixture of ketamine and propofol (10mg/1ml concentration of each drug)
- Anticipate single dose of 0.75 mg/kg Ketamine + 0.75mg/kg Propofol

• Benefits:

- Ketamine’s sympathomimetic properties counter propofol induced hypotension
- Propofol counters ketamine induced nausea and emergence delirium
- Rapid onset of sedation with rapid recovery time
- Ketamine provides analgesia and dissociative state

• Risks

- Transient hypoxia,
- Hypoventilation,
- Emergence delirium,
- Insufficient sedation requiring additional dosing

Key Safety Tip

- Always double check drug concentration as many medications used in PSA are available in numerous concentrations
- The recent epidemic of drug shortages has led to frequent substitutions with varying concentrations
- Use concentrated solution for nasal or rectal administration



Reversal Agents

Naloxone (Narcan®)

Class:	Reversal Agent
Action:	Opioid receptor antagonist which can reverse the effects of opioid toxicity: respiratory depression, apnea, chest wall rigidity, pruritus and hypotension
Dose:	0.4 mg – 2 mg (0.1 mg/kg in pediatrics) IVP every 2-5 minutes until adequate ventilation. Onset: IV, within 1 minute; Duration of action: 15 - 30 mins If no response by 8 – 10 mg, opioid toxicity is not likely the main cause of respiratory depression Anticipate high doses of naloxone to reverse methadone, or meperidine (6-10 mg)
Contraindications:	Hypersensitivity to Naloxone
Common side effects:	Analgesic cessation, narcotic withdrawal
Recommended for:	Symptomatic opioid, clonidine, and imidazoline derivative (i.e. Visine®, Afrin®) overdose
Reversal agent:	None
Clinical cautions:	Aspiration risk during acute opioid withdraw, pulmonary edema. Reversing the sedative effects of an opioid may amplify the toxic effects of other drugs

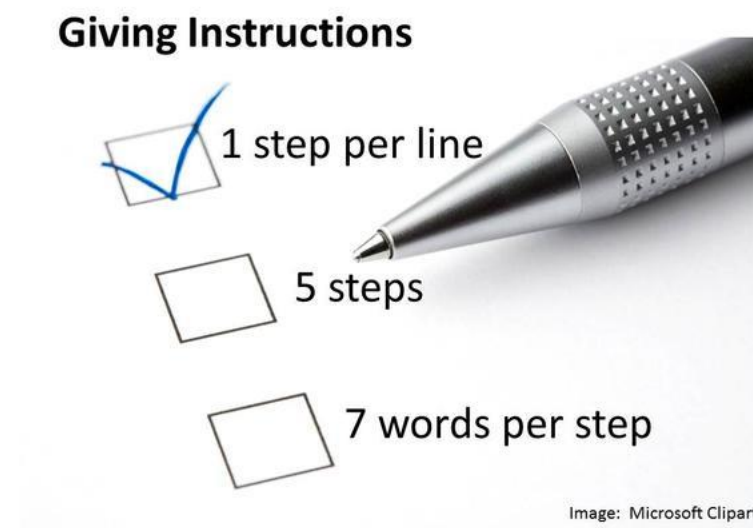
Flumazenil (Romazicon®)

Class:	Reversal Agent
Action:	Reverse benzodiazepine toxicity, serious respiratory depression
Dose:	0.2 mg IV slowly over 30 sec q 1 min, then 0.3 mg continuing in 0.5 mg increments (max 5 mg) Duration of action: 30 - 45 min
Contraindications:	Hypersensitivity to flumazenil; Use of benzodiazepines to control seizures or increased ICP; Use with caution in patients dependent on alcohol or benzodiazepines; Toxic co-ingestion of cyclic antidepressants May precipitate seizures in patients with chronic benzodiazepine use; May provoke panic attacks in those with underlying anxiety disorders
Common side effects:	Seizures, nausea, vomiting, hyperventilation, emotional lability, anxiety, sweating, resedation
Recommended for:	Reverse benzodiazepine toxicity, serious respiratory depression May precipitate seizures in patients with chronic benzodiazepine use May provoke panic attacks in those with underlying anxiety disorders
Reversal agent:	None
Clinical cautions:	Should not be substituted for airway management Monitor for the duration of at least 1-4 hours (Resedation is common)

Discharge Instructions

Clear discharge instructions should be given and explained to patient and caregiver who will be assisting with care following PSA.

- **What was done,**
- **Expected course,**
- **Potential problems,**
- **What to do if problems arise,**
- **When and where to follow up,**
- **When to return to normal activities**



For more information see [PAMI ED Discharge Planning Toolkit for Pain](#)

Discharge After PSA

Certain conditions should be met before a patient can be considered safe for discharge following PSA:

Alert , oriented and back to pre-sedation baseline (Modified Aldrete Score ≥ 9)	Stable vital signs, respiratory and cardiac functions
Tolerating fluids and no emesis	Patient is ambulatory and demonstrating normal activity (age/developmentally-appropriate)
Sufficient time post-administration of IV medications	Airway is patent with protective reflexes intact
Reliable caregiver to provide support, monitoring, supervision, and safe transportation home. *see risk and legal module	Instructions given to avoid any activity that requires coordination or judgment
If reversal agent was given, allow sufficient time (up to 2 hours) after last dose to observe for risk of resedation	For infants and toddlers, adjust head position in child passenger seat to ensure a patent airway if falls asleep

Discharge After PSA

Most patients can be safely discharged within an hour of receiving their last dose of sedative provided:

- no significant adverse events occurred during the procedure
- no reversal agents were administered
- patient is back to baseline



Tips

It is not uncommon for patients to experience mild symptoms, such as nausea, lightheadedness, fatigue, or unsteadiness for up to 24 hours after PSA.

Reminder: Children, especially, may be very unsteady – hold child's hand when walking and use wheelchair to transport patient to car. Avoid having patient walk to parking lot after discharge.

High Risk Populations

Pediatrics

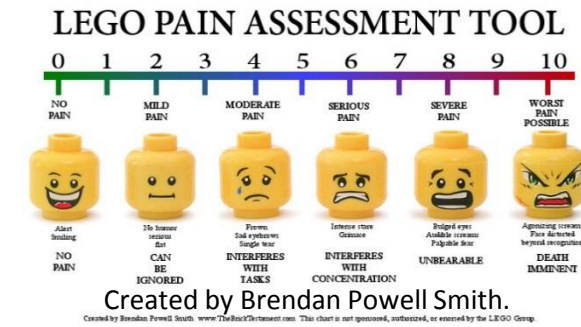
Elderly

Obesity

Pregnancy



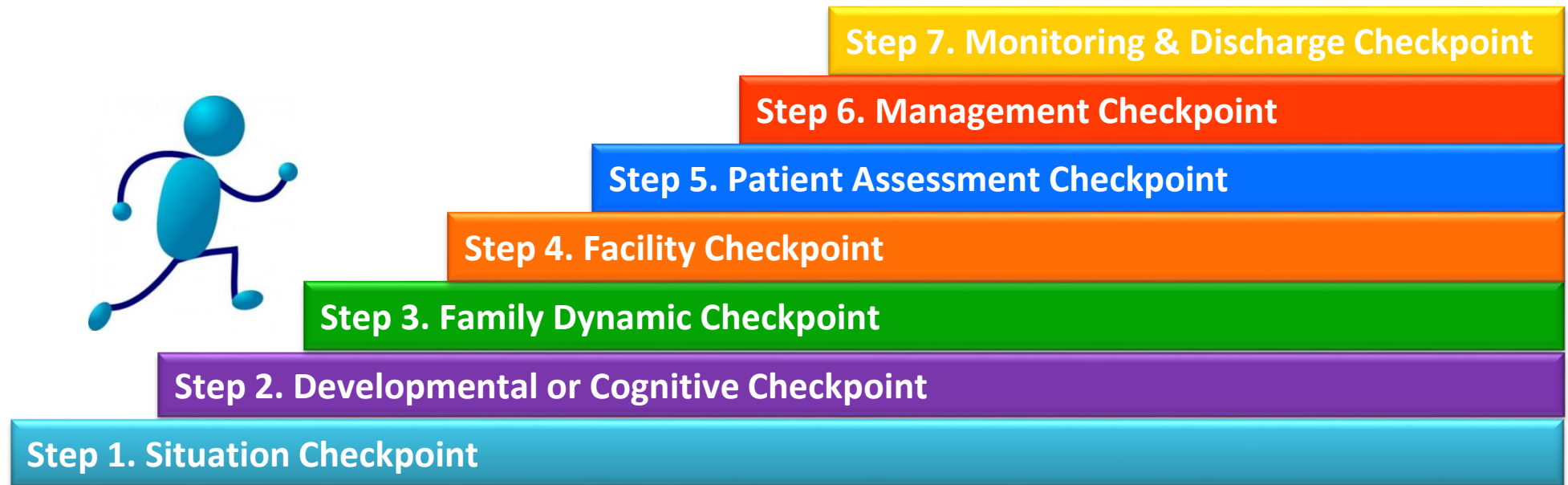
PSA in Pediatric Patients



- PSA in children is different from adults and is often administered to control behavior or to allow the safe completion of a procedure.
- Pediatric PSA must incorporate communication with the parents or caregivers and the developmental stage of the child.
- Children are harder to assess than adults and different pain assessment tools are required.
- The use of non-pharmacologic methods are essential in pediatric PSA.

[For more information see the PAMI pediatric module and pediatric resources on the PAMI website. See EMSC Illinois 2013: Pediatric Pain Management in the Emergency Setting.](#)

Stepwise Approach to Pain Management in Children or PSA

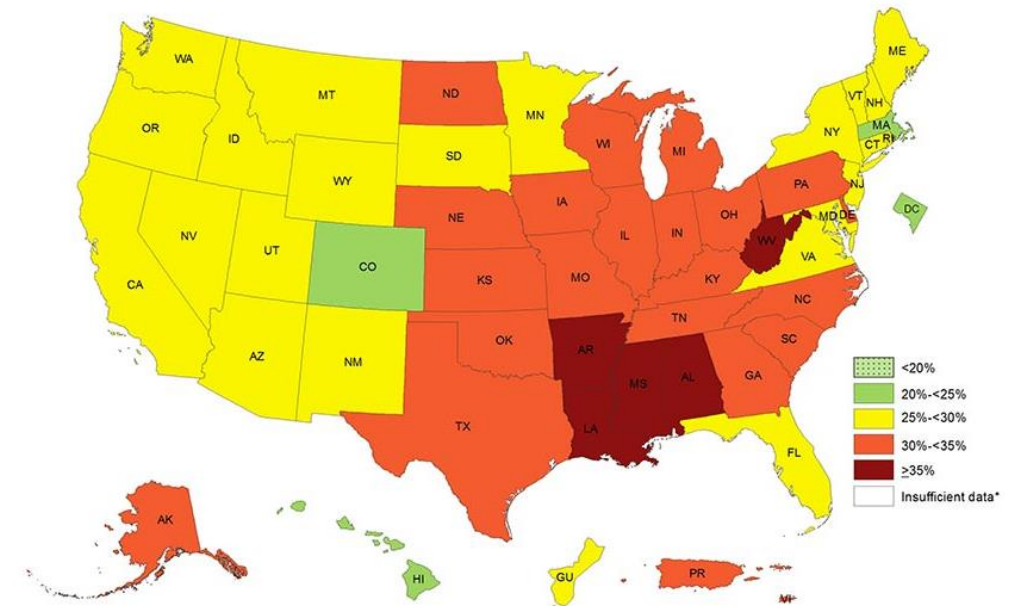


[Click here to learn more information about the Stepwise Approach: Management Update on Pain, Agitation, and Sedation in the Emergency Care of Children by Dr. Phyllis Hendry, June 2015.](#)

Obesity

- More than one-third of US adults are overweight or obese.
- There is an increased risk of airway obstruction and hypoxemia during PSA>
- Obese patients have larger adipose mass and lean body mass, less total body water, and greater glomerular filtration rates.
- These factors play a role in how the body handles PSA drugs.

Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2016



*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011

Pediatrics and Obesity

- In the U.S., around 12.7 million children, aged 2-19 years old are obese.
- Obesity is a **risk** factor for pediatric patients undergoing PSA.
- Pediatric overweight patients tend to have higher risks of:
 - Airway obstruction
 - Oxygen desaturation
 - Secretions
 - Laryngospasm
- There is a higher risk for airway interventions, such as repositioning, suctioning, jaw thrust, airway adjuncts, and bag-valve-mask ventilation.
- Patients tend to have longer recovery times.
- Further research is needed in this population.



Elderly Population

- To reduce risk of adverse events in the elderly and patients with major comorbid disease, use a more conservative approach to PSA medications, including:
 - Giving a lower starting dose
 - Using slower rates of administration
 - Repeat dosing of medications at less frequent intervals
- PSA is relatively contraindicated in patients who are likely to be difficult to ventilate or oxygenate. Alternatives to PSA may be preferable if signs suggesting a difficult airway are identified.



Pregnancy

Modifications of PSA guidelines recommended for pregnant women include:

- Preprocedural administration of medications to improve gastroesophageal sphincter tone, reduce gastric volume (metoclopramide), and decrease stomach acidity (H2 antagonists) may reduce risk of vomiting and aspiration and is unlikely to cause harm.
- Preprocedural hydration and left lateral displacement of the uterus (in the late second and the third trimester) helps reduce risk of hypotension, uteroplacental insufficiency, and resultant fetal hypoxemia.
- Fetal monitoring is not required, but should be considered during third trimester. Oxygen by face-mask is administered due to risk of sedation-related maternal desaturation (decreased functional residual capacity).



Dementia Patients

- It is very difficult for patients with dementia to verbalize their pain or needs making PSA consent, assessment, and monitoring challenging.
- Closely observe these patients for:
 - facial grimacing
 - vocalizations
 - body movements
 - changes in vital signs





Summary

- ✓ Procedural sedation and analgesia (PSA) is a common, yet high risk, ED clinical practice that alleviates pain, anxiety, and suffering for patients during procedures and testing.
- ✓ PSA decreases the length of time necessary to perform a procedure, increases likelihood of success, and reduces potential risk of injury to the patient or healthcare worker due to uncontrolled movements. It encompasses a continuum of altered levels of consciousness including minimal, moderate, deep, and dissociative sedation levels.
- ✓ Successful PSA requires complex decision making, a knowledge of current national guidelines and PSA related regulations, advance preparation, staff/physician education and PSA agency/hospital policies.
- ✓ Education is focused on patient assessment, pharmacologic PSA agents, non-pharmacologic adjuncts, monitoring, discharge requirements and documentation.

Closing Scenarios



Case Scenario 1

A 5 year old boy is brought in by EMS after falling from the monkey bars. His triage exam reveals an obvious deformity to his right forearm and initial x-rays show displaced distal radial and ulnar fractures. The Orthopedic consultant plans on performing a closed reduction in the ED.

- ☐ Is this patient a candidate for procedural sedation?
- ☐ What age appropriate adjustments do you need to consider when planning care for this procedure?
- ☐ What medications will you select in making your treatment plan?



Case Scenario 1 Discussion

This child will need analgesia and procedural sedation to tolerate a forearm reduction

Must consider:

- History: ASA status, current home medications, last meal
- PE: airway evaluation, cardio-respiratory exam
- Obtain informed consent from guardian

Ensure you are prepared for procedural sedation & recovery:

- sedation medication,
- access to resuscitation equipment and medications,
- reversal medications

Adjust standard practice for pediatric patients:

- consider development and chronological age of the patient
- pediatric dosing of meds,
- pediatric resuscitations equipment & medications,
- child life & non-pharmacologic techniques,
- parent as a part of the treatment team

Medication choices:

- Ketamine,
- Ketamine & Propofol mixture
- Fentanyl & Versed
- Nitrous oxide



Case Scenario 2

A 2 year old with a history of Factor IX deficiency tripped while running and struck his head on the edge of the coffee table. There was no loss of consciousness or vomiting. Upon initial ED exam, the child is crying, upset and difficult to assess. You order a head CT to assess for intracranial bleeding.

- ☐ How will you facilitate radiographic assessment in this un-cooperative child?



Case Scenario 2 Discussion

This child will need anxiolysis and possibly sedation in order to tolerate a Head CT

- Goal is to balance need for anxiolysis +/- sedation to facilitate radiographic evaluation versus need to monitor neurologic status due to potential intracranial hemorrhage
- Choose medication with rapid onset, short duration and rapid recovery.
 - Choose least noxious delivery method: intranasal or oral.
- Choice: Benzodiazepine
 - Intra-nasal or intravenous Midazolam (Versed)



PSA Supplemental Resources

Adult and pediatric resources

Online educational courses

Websites



Resources

- VA National Center for Patient Safety- Moderate Sedation Toolkit for Non-Anesthesiologists
 - <http://www.patientsafety.va.gov/professionals/onthejob/sedation.asp>
- EMSC Illinois 2013: Pediatric Pain Management in the Emergency Setting
 - http://www.luhs.org/depts/emsc/pedpainmgmt_main_web.htm
 - Not specific for PSA
- Swedish Medical Center Pediatric Procedural Sedation
 - <http://www.swedish.org/for-health-professionals/cme/online-cmes/pediatricproceduralsedation>.
- EHC Emergency Department: Procedural Sedation Guidelines b y Emupdate.com
 - <http://ehced.org/guidelines/>
 - <http://ehced.org/learning-sessions/deep-sedation/>
- Society for Pediatric Sedation:
 - <http://www.pedsedation.org/>
- UNC Pediatric Procedural Sedation Course
 - <http://www.med.unc.edu/cce/programs/pse/pediatric-procedural-sedation-course>
- Emergency Nursing Association
 - https://www.ena.org/SiteCollectionDocuments/Position%20Statements/Archived/Procedural_Sedation_Consensus_Statement.pdf
 - <https://www.ena.org/government/State/Pages/RNProced.aspx>
- ACEP Procedural Sedation Resource
 - <http://www.acep.org/Physician-Resources/Procedural-Sedation/>
- 2014 ACEP Clinical Policy: Procedural Sedation and Analgesia in the Emergency Department:
 - <http://www.acep.org/workarea/DownloadAsset.aspx?id=93816>

Moderate Sedation Toolkit for Non-Anesthesiologists (2011)

The VA National Center for Patient Safety created a Moderate Sedation for Non-anesthesiologists Toolkit.

- The toolkit consist of 9 components:
 1. Facilitator's Guide
 2. Learner Objectives
 3. Curriculum Guide
 4. Pre-Procedure Evaluation Template
 5. Moderate Sedation Study Aid
 6. Moderate Sedation Cognitive Aid
 7. Call for Help Card
 - 8. High-Fidelity Simulation Cases**
 - 9. Table Top Situational Cases**

For detailed information about the toolkit, visit:

<http://www.patientsafety.va.gov/professionals/onthesjob/sedation.asp>



6. Moderate Sedation Cognitive Aid

This handout summarizes key components of moderate sedation.

MODERATE SEDATION TOOLKIT FOR NON-ANESTHESIOLOGISTS
Moderate Sedation Study Aid



Airway Evaluation

Evaluation*	Equipment	Interventions	LEMON Score (Difficult Intubation)
Teeth	O ₂ Delivery Devices (Nasal Cannula, Mask, Ambu® Bag)	Auditory/Manual Stimulation	<p>The score with a maximum of 10 points is calculated by assigning one point for each of the following LEMON criteria. A LEMON score ≥ 5 predicts difficult intubation.</p> <p>L = Look externally (facial trauma, large incisors, beard or moustache, large tongue) (4 points)</p> <p>E = Evaluate the "3-3-2 rule" (inter-incisor distance < 3-finger breadths, hyoid-mental distance < 3-finger breadths, thyroid-floor of mouth distance < 2-finger breadths) (3 points)</p> <p>M = Mallampati (Mallampati score ≥ 3) (1 point)</p> <p>O = Obstruction (presence of any condition like epiglottitis, peritonsillar abscess, trauma) (1 point)</p> <p>N = Neck mobility (limited neck mobility) (1 point)</p>
Mouth Opening	Nasopharyngeal Airways	Reposition Head	
Neck Extension	Oral Airways	Chin Lift	
Thyromental Distance	Intubation Equipment	Jaw Thrust	
Mallampati Classification		Airway Adjunct Use	
		Assisted Ventilation	

*LEMON Score, OBESE Score

OBESE Score (Difficult Mask Ventilation)



OBESE BEARDED ELDERLY SNORES EDENTULOUS

The Obese Patient

Pulmonary	Cardiovascular	Gastrointestinal
↑ Chest Wall Mass ↑ CO ₂ Production, ↓ FRC ↓ Pulmonary Compliance ↑ Risk of OSA* ↑ Risk of Difficult Airway ↑ Total O ₂ Consumption ↑ Work of Breathing	↑ Cardiac Output ↑ Stroke Volume Systemic Hypertension Pulmonary Hypertension Right Heart Failure Difficulties With Monitoring	↑ Risk of Aspiration ↑ Residual Gastric Contents ↑ Intra-Gastric Pressure ↑ Intra-Abdominal Pressure

*Obstructive Sleep Apnea

The Elderly Patient

General/Metabolic	Cardiac/Pulmonary
↓ Blood Volume (~25 percent) ↑ Risk of Aspiration ↓ Glomerular Filtration Rate ↓ Metabolic Rate ↑ Risk of Hypothermia ↓ Albumin ↑ Unbound Drug Concentration ↓ Enzyme Activity ↑ Sensitivity to CNS Depressants ↑ Parasympathetic Tone	↓ Max/Resting HR ↑ Risk of Coronary Artery Disease ↑ Dysrhythmias ↑ Chest Stiffness ↓ Muscle Strength ↓ Response to Hypoxia, Hypercarbia

↓ Drug Doses 30 to 50 Percent


Pharmacology

DRUG	DOSE	ONSET	PEAK EFFECT	DURATION
Fentanyl	25-50 mcg IV	3-5 min	5-15 min	30-180 min
Midazolam	0.5-2 mg IV	1-2 min	1-2 min	20-40 min
Naloxone*	0.1-0.2 mg IV***	1-2 min***	5-15 min	30-45 min
Flumazenil**	0.2 mg IV (Max 1 mg)	1-2 min	6-10 min	45-60 min

*Use with care in patients on chronic opioids **May precipitate seizures ***Naloxone may be given IM, 0.4 mg IM with onset 2-5 min

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MODERATE SEDATION TOOLKIT FOR NON-ANESTHESIOLOGISTS
Moderate Sedation Study Aid



Continuum of Sedation

	Minimal Sedation	Moderate Sedation	Deep Sedation	General Anesthesia
Response (to Stimulation)	↔*	Purposeful* Response to Verbal/Tactile Stimulation	Purposeful** Response to Tactile/Painful Stimulation	Unarousable
Airway	↔	No Intervention Needed	Intervention Often Required	Intervention Required
Spontaneous Ventilation	↔	Adequate	Possibly Inadequate	Inadequate
Vital Signs	↔	↔	↔	May be Impaired

*↔ Indicates normal or minimal change from baseline **Localization to pain does not qualify as purposeful response

High-Risk Patients

- > 70 Years
- BMI > 35 kg/m²
- Obstructive Sleep Apnea
- ASA Risk Class ≥ 3
- Difficult Airway
- Chronic Opioid Use?
- Drug/ETOH Abuse

Monitoring: Sedation Scales

Richmond Agitation Sedation Scale		Ramsay Scale	
Sedation Level	Description	Sedation Level	Description
4	Combative, Dangerous to Staff	1	Anxious, Agitated
3	Aggressive, Pulling at Lines	2	Cooperative, Oriented
2	Frequent Nonpurposeful Movement	3	Responds to Verbal Command Only
1	Anxious, Apprehensive	4	Asleep, Responds to Light Stimulation
0	Alert, Calm	5	Asleep, No Response to Light Stimulation
-1	Awakens to Voice for > 10 Sec	6	Unresponsive
-2	Sedated, Awakens to Voice for < 10 Sec		
-3	Moderate Sedation, Movement to Voice, No Eye Contact		
-4	Deep Sedation, No Response to Voice		
-5	Unarousable		

Pre-Procedural Evaluation

MEDICAL HISTORY	BASILINE VITAL SIGNS	PHYSICAL EXAM
<ul style="list-style-type: none">• Medications• Allergies• History of Sedation/Anesthesia Difficulties• Organ System Abnormalities• Tobacco, Alcohol, Other Drug Use	<ul style="list-style-type: none">• Blood Pressure• Heart Rate• SpO₂• Height• Weight• Body Mass Index	<ul style="list-style-type: none">• Body Habitus• Airway• Mental Status• Pre-Existing Neurological Deficits• Limitations to Positioning• Heart and Lung Exam• Other Relevant to Procedure

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Resources: PAMI

PAMI Website

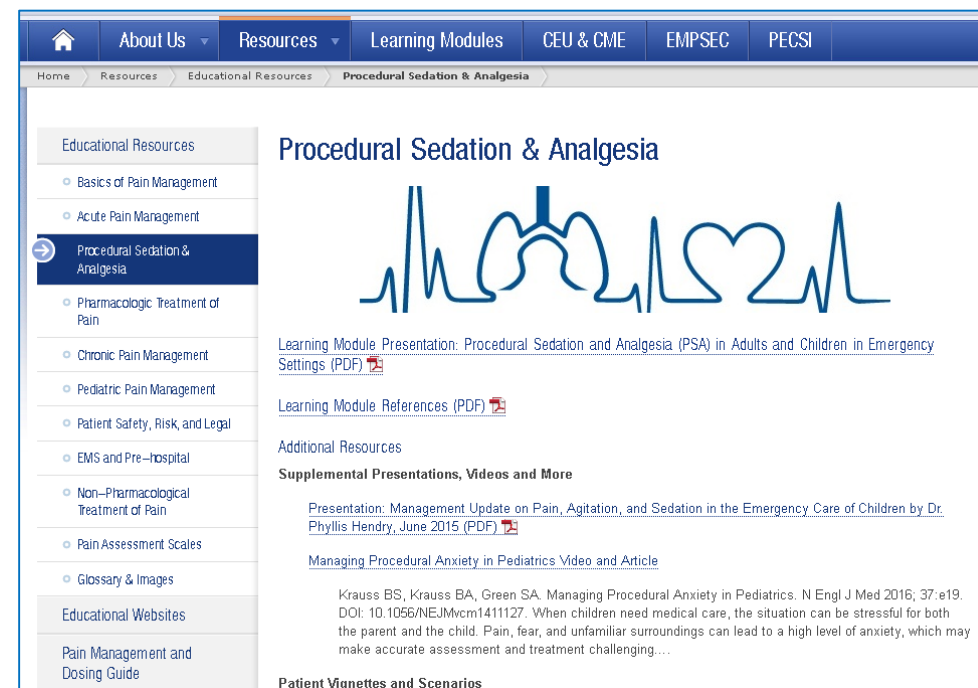
<http://pami.emergency.med.jax.ufl.edu/>



The screenshot shows the PAMI website homepage. At the top is the UF Pain Assessment and Management Initiative logo and a search bar. Below the logo is a navigation menu with links: Home, About Us, Resources, Learning Modules, CEU & CME, EMPSEC, and PECSI. The main content area features the PAMI logo and the text "Pain Assessment and Management Initiative". To the right of the logo are three boxes: "PAMI Purpose", "New Module: Prehospital Pain Management", and "Pain Management and Dosing Guide". At the bottom, there are three columns of text: "Pain Assessment and Management Initiative (PAMI): A Patient Safety Project", "News about Pain", and "Contact Us".

PSA Pediatric and Adult Patient Education Handouts

<http://pami.emergency.med.jax.ufl.edu/resources/educational-materials/procedural-sedation/>



The screenshot shows the PAMI website resources page for Procedural Sedation & Analgesia. The page has a blue header with navigation links: Home, About Us, Resources, Learning Modules, CEU & CME, EMPSEC, and PECSI. Below the header is a breadcrumb trail: Home > Resources > Educational Resources > Procedural Sedation & Analgesia. The main content area is titled "Procedural Sedation & Analgesia" and features a large graphic of a heart rate monitor. To the left of the main content is a sidebar with a list of educational resources: Basics of Pain Management, Acute Pain Management, Procedural Sedation & Analgesia (selected), Pharmacologic Treatment of Pain, Chronic Pain Management, Pediatric Pain Management, Patient Safety, Risk, and Legal, EMS and Pre-hospital, Non-Pharmacological Treatment of Pain, Pain Assessment Scales, Glossary & Images, Educational Websites, and Pain Management and Dosing Guide. The main content area includes links to "Learning Module Presentation: Procedural Sedation and Analgesia (PSA) in Adults and Children in Emergency Settings (PDF)", "Learning Module References (PDF)", "Additional Resources", "Supplemental Presentations, Videos and More", and "Patient Vignettes and Scenarios".



Pain Assessment and
Management Initiative

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/>