Pediatric Moderate Sedation

Illinois Emergency Medical Services for Children
February 2008

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INTRODUCTION & BACKGROUND
Main Resources

The following publications were the central sources of information for the module, and will be referenced throughout:


- American Society of Anesthesiologists. Task Force on Sedation and Analgesia by Non-anesthesiologists. Practice Guidelines for Sedation and Analgesia by Non-anesthesiologists


In the past decade, the use of sedatives and analgesics to relieve pain and anxiety associated with invasive diagnostic and therapeutic/painful procedures on pediatric patients in non-traditional settings (i.e., Emergency Department, Radiology, EEG lab, etc.) has substantially increased.

Further complicating matters, there is very little existing conformity in providers’ choice of technique, medication(s) and depth of sedation/anesthesia to accomplish the same procedure.

Consequently, adhering to a systematic approach of appropriate assessment, monitoring, and rescue skills has become critically important in promoting safe and effective procedural sedation and analgesia.
This module fuses the existing professional guidelines and regulatory standards related to pediatric moderate sedation.

**Purpose:** Familiarize audience with principles and standards underlying safe and effective pediatric moderate sedation, review optimal presedation patient evaluation, review commonly used sedative/analgesic drugs, review potential patient complications, and provide resources to improve patient safety and outcomes.

**Goal:** Help organizations assess and improve their pediatric moderate sedation processes.
Due to the volume and complexity of this subject matter, this module will focus on established guidelines related to the level of procedural sedation known as “moderate sedation” after reviewing some general sedation/analgesia information.

- This document is intended as a quality improvement resource – not to take the place of clinical judgment of emergency medicine professionals.

- Refer to the American Society of Anesthesiologists (ASA) and/or your Anesthesia Department for guidelines for the delivery of general anesthesia and monitored anesthesia care by anesthesiologists.

- Additionally, guidelines related to sedation for mechanical ventilation and postoperative situations are beyond the scope of this document.
In 2007, 121 EDs within Illinois (that actively participate in the Illinois EMSC program) were surveyed regarding pediatric moderate sedation practices in their facilities.

- Survey consisted of two distinct sections: a general survey of hospital policy/procedures related to moderate sedation, and two case scenarios (Case 1 = diagnostic/non-painful; Case 2 = therapeutic/painful) with follow-up questions related to how the individual hospital would respond in each scenario.

- A summary report is available on the Illinois EMSC Web site. Examples of findings:
  - **Respiratory/Resuscitation Equipment** - high availability was found for pulse oximetry, BP monitor, IV access and/or IV equipment, oxygen, and bag mask ventilation.
  - **Meperidine Use** – meperidine (which is not recommended for use in pediatric patients due to heightened risk of seizure activity) continues to be a drug of choice in higher than expected numbers in both case scenarios.
  - **Patient Monitoring** – the support personnel responsible for monitoring the sedated patient was allowed to perform or assist in the procedure more often than expected.
Children receive sedation more frequently than adults (largely due to diagnostic procedures that require controlled/no movement).

To meet necessary goals, sedation/analgesia usually must be deeper than given to adults.

Due to physiologic differences, children are at higher risk for respiratory depression and life-threatening hypoxia.

Technically, providers with the intent to practice “moderate sedation” may be closer to the definition of “general anesthesia” because children can easily slip from one level to another.
Pediatric Sedation in the News

The story of Diamond Brownridge speaks to the importance of appropriate medication choices, proper monitoring, and need for advanced rescue skills.

- September 2006 -- 5-year-old Diamond went to the dentist to have two cavities filled and caps put on some lower front teeth.

- For the procedure, Diamond (16 kg) received 0.5 mg/kg oral diazepam, nitrous oxide/oxygen mixture, 0.006 mg/kg of IV atropine, 0.5 mg/kg IV pentazocine (Talwin®), 0.08 mg/kg IV midazolam, and 0.4 mg/kg of diazepam, plus an additional 0.25 mg/kg of diazepam five minutes later. All of this medication was given within a 90-minute time frame.

- After the procedure, Diamond’s mother noticed that she stopped breathing; she could not be resuscitated. She was transferred to a local children’s hospital where she lapsed into a coma and died 4 days later.

- Illinois Department of Financial and Professional Regulation concluded the dentist failed to properly monitor Diamond’s blood pressure, pulse and respiration during her treatment.

- Autopsy revealed that the cause of Diamond’s death was anoxic encephalopathy caused by anesthesia during a dental procedure.

- The dentist admitted he failed to do crucial monitoring.

Source: http://www.idfpr.com/Forms/Memo/052407RIBAFindings.pdf
The **Pediatric Sedation Research Consortium** (an international collaborative of 35 institutions dedicated to improving pediatric sedation/anesthesia care) conducted a study to determine the incidence and nature of adverse events for procedures outside the OR. Reviews of over 30,000 records revealed the following:

- **Serious adverse events were rare** – no deaths reported; CPR was required in one case

- **However, the following adverse events were more common:**
  - \(\text{O}_2\) desaturation (below 90% > 30 seconds)
  - Stridor
  - Laryngospasm
  - Unexpected apnea
  - Excessive secretions
  - Vomiting
  - Prolonged sedation/recovery
  - “Failed” sedation

- **One in every 200** sedations required airway and ventilation interventions ranging from bag mask ventilation, oral airway placement, and/or emergency intubation.

**Conclusion:** While serious adverse events were low, reported events with the potential to harm, and that require timely rescue interventions, are significant.
In another recent study, researchers reviewed sedative drug-related adverse events reported to the FDA.

Notable findings included:

- Negative outcomes were often associated with:
  - Drug combinations and interactions
  - Use of 3 or more sedating medications (compared with 1 or 2 medications)
  - Drug overdose (esp. prescription/transcription errors)
  - Drugs administered by nonmedically trained personnel
  - Drugs administered at home (before scheduled procedures)

- No relationship between outcome and drug class nor route of administration

PATIENT MONITORING AND AIRWAY SKILLS ARE THE KEYS TO SAFETY
Procedural Sedation/Analgesia Continuum
To provide context for the document, here is some general information regarding the definition and categorization of procedural sedation.

- Sedation/analgesia is defined by a continuum of “levels” ranging from minimally impaired consciousness to unconsciousness.

- The following terminology refers to the different levels of sedation intended by the practitioner

Minimum ↔ Moderate ↔ Dissociative ↔ Deep ↔ General Anesthesia

*Remember:* Levels of sedation are considered to be on a continuum because a sedated child can go in and out of an intended level quite rapidly.
Minimal Sedation (Anxiolysis) = a drug-induced state during which children respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

*Note: This level is rarely adequate for an infant or young child undergoing sedation for a procedure.*

No matter the level of sedation you intend to produce, you should be able to rescue patients one level of sedation “deeper” than that which was intended.

– Joint Commission
Continuum – Moderate Sedation

**Moderate Sedation** (formerly Conscious Sedation**) = a drug-induced depression of consciousness during which sedatives or combinations of sedatives and analgesic medications are often used and may be titrated to effect.

- Children respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation.
- No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

**The AAP officially discourages the use of the term “conscious sedation” when referencing sedation in children.**
Dissociative Sedation = (Ketamine) A trancelike, cataleptic state occurs with both profound analgesia and amnesia while maintaining protective airway reflexes, spontaneous respirations, and cardiopulmonary stability.  

- Child’s eyes remain open with nystagmic gaze; may exhibit random tonic movements of extremities.
- Causes hyperactive airway reflexes, with a risk of larynogspasm.
- Does not blunt protective airway reflexes to the same degree as other sedatives (e.g., opioids, benzodiazepines).

Due to Ketamine’s markedly different clinical effect, it does not officially fit the ASA sedation continuum. However, it is generally recognized to produce a level of sedation between moderate and deep sedation.
Deep Sedation = a drug-induced depression of consciousness during which patients cannot be easily aroused, but respond purposefully following repeated or painful stimulation.

- The ability to independently maintain ventilatory function may be impaired.
- Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate.
- Cardiovascular function is usually maintained.

Planning for deep sedation requires that the practitioner must be able to rescue a patient slipping into (unintentional) general anesthesia.
General Anesthesia (GA) = a drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation.

- The ability to independently maintain ventilatory function is often impaired.
- Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function.
- Cardiovascular function may be impaired.

Credentialing for GA is typically limited to anesthesiologists and intensivists.
Preparation
Goals of Effective Sedation

- Guard the patient’s safety & welfare
- Minimize physical discomfort & pain
- Control anxiety, minimize psychological trauma, and maximize the potential for amnesia
- Control behavior and/or movement to allow the safe completion of the procedure
- Return the patient to a state in which safe discharge from medical supervision (as determined by recognized criteria) is possible"
Strike a Balance

MAXIMIZE benefits while minimizing the associated risks

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

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

RISK

BENEFIT
Before You Begin...

Each sedation should be tailored to the individual child 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., Child Life services, distraction techniques, comfort positions, etc.).

Alternatively, **do not** undertreat the child when sedation/analgesia is appropriate & necessary.
Here is an overview of Joint Commission’s Patient Care Standards for Sedation and Anesthesia.4

PC.13.20
Operative or other procedures and/or the administration of moderate or deep sedation or anesthesia are planned.

PC.13.30
Patients are monitored during the procedure and/or administration of moderate or deep sedation or anesthesia.

PC. 13.40
Patients are monitored immediately after the procedure and/or administration of moderate or deep sedation or anesthesia.

Go to Appendix B for complete text

No matter the level of sedation you intend to produce, you should be able to rescue patients one level of sedation “deeper” than that which was intended.

– Joint Commission

For example: You must be prepared/skilled to manage and rescue a “moderately sedated” child who slips into an unintentional state of “deep sedation.”

This highlights the fact that different levels of sedation require different levels of expertise in airway & physiological function management of the patient.
Principles for Safe & Effective Sedation/Analgesia
Patient evaluation

Monitoring

Rescue Skills
The following *action items* are necessary to ensure safe sedation

**Supervision & Training**

- Children should *not* receive sedative or anxiolytic medications without supervision by medical personnel appropriately trained & skilled in both *airway management* and *cardiopulmonary resuscitation*.
  - *Do not* prescribe (or encourage) any sedating medications to be administered by the parent before arriving at the hospital.

- Formulate a reasonable plan of sedation/analgesia.

- Understand the pharmacokinetics/dynamics and interactions of sedating medications.
Guiding Principles – Staffing

Staffing

- Ensure that an adequate number of trained/credentialed/competent staff are present for procedure and monitoring (minimum of two experienced providers).

- Specifically assign a staff member whose main responsibility it is to constantly monitor the child’s cardiorespiratory status during & after the procedure, and assist in supportive or resuscitation measures (as required).

- Ensure a properly equipped & staffed recovery area (note: parents/caregivers should not be considered as part of the staff).
Evaluation

- Conduct a focused airway evaluation (potential complications include: large tonsils, anatomic airway abnormalities, loose teeth, etc.).

- Conduct a thorough presedation evaluation for underlying conditions that would increase the risk (URI, wheezing, etc.). Screen for medications the child takes at home and/or allergies the child may have.

- Ensure appropriate fasting (balance the risk/benefit of shortened fasting in emergent situations).
Guiding Principles – Equipment & Disposition

**Equipment**

- Have access to all appropriate medications and reversal agents.
- Use age/size-appropriate and functioning equipment for airway management & venous access.

**Disposition**

- Ensure patient is recovered to baseline status before discharge. Appropriately manage pain.
- Provide appropriate discharge instructions to parent/caregiver.
Primary Practitioner:

- Be qualified and institutionally credentialed to administer drugs to predictably achieve and maintain the desired level of sedation
- Recognize and manage complications of one level deeper than intended sedation
- Be trained/capable of providing (at minimum) bag mask ventilation and, ultimately, endotracheal intubation
- Understand pharmacology of sedating medications, as well as role of reversal agents for opioids and benzodiazepines
- Maintain advanced pediatric airway skills

NOTE: Joint Commission requires that a registered nurse supervise the perioperative nursing care (PC.13.20)
Personnel & Training (cont.)

Support personnel:

- At least 1 person dedicated to **constantly monitor** appropriate physiologic parameters and assist in any supportive or resuscitation measures

- Be trained in, and capable of providing, **pediatric basic life support**

- Know how to use **resuscitation equipment & supplies** in the event of an emergency

The recent EMSC Survey results showed a higher than expected percentage (> 27%) of staff being allowed to assist *beyond what the national guidelines recommend.*

**THIS PERSON SHOULD HAVE NO OTHER SIGNIFICANT RESPONSIBILITIES**
Specific moderate sedation requirements differ widely between institutions.

In general, for physician credentialing:

- Be able to rescue a child from deep sedation
- Continually maintain skills via an advanced life support course
- Be competent in airway management & assessment (e.g., ability to perform a Mallampati classification, recognize early signs of distress, etc.)
- Have working knowledge of pharmacology of sedating/analgesic agents
- Successfully monitor and recover the child back to baseline status
- Be aware of and follow your institution’s sedation policy

For nursing/support staff competency:

- Successfully complete a basic life support course
- Successfully complete institutional training on sedation/analgesia and recovery care
- Be competent in airway assessment and successfully manage a child’s airway
- Be aware of and follow your institution’s sedation policy

Maintain a current list of credentialed/competent staff members
Sedation/Analgesia Specifics
Sedation Considerations

Consider each of these factors when planning for sedation

- **Procedural issues:**
  - What type -- therapeutic (painful) vs. diagnostic (non-painful)?
  - What is the child’s health status, age/development level & personality type?
  - How stressful/anxiety-producing is the procedure (e.g., sexual abuse evaluation)?
  - Is immobility/behavior control required?
  - What position will the child be in during the procedure?
  - How much time will it take to complete the procedure?
  - How quickly can rescue resources be available?

- **Medication issues:**
  - What is the mechanism of action?
  - How is the sedating/analgesic agent metabolized?
  - What is the duration of action? *(avoid dose stacking)*

- **Potential adverse reactions/monitoring issues:**
  - Need for appropriate reversal agent
  - Medication side effects/allergic reactions
  - Oxygen desaturation
  - Laryngospasm
  - Hypotension
To ensure systematic & thorough preparation for every sedation, the AAP¹ recommends **S O A P M E**

- **Suction** – age/size-appropriate suction catheters and suction apparatus (Yankauer-type)
- **Oxygen** – adequate O₂ supply, working flow/delivery devices
- **Airway** – age/size-appropriate airway equipment (e.g., ET tubes, LMAs, oral and nasal airways, laryngoscope blades, stylets, bag mask)
- **Pharmacy** – all basic life-saving drugs, including reversal agents (Naloxone, Flumazenil)
- **Monitors** – pulse oximeter, BP monitor, ECG, stethoscope, thermometer, cardiac monitor, end-tidal carbon dioxide (EtCO₂) monitor/detector
- **Equipment** – special equipment/drugs for particular child (e.g., crash cart w/ defibrillator, respiratory box, IV access equipment) should be readily available

**MOST IMPORTANT** PERSONNEL SKILLED IN ADVANCED LIFE SUPPORT!
Pulse Oximeter

**Non-invasive device that continually monitors oxygen saturation**

- Required for all sedations
- Compares relative amounts of oxygenated vs. deoxygenated hemoglobin in the pulsing blood (of extremity or digit)
- Reading of $\leq 90\%$ signifies early warning of hypoxia
  
  **Confirm & intervene:**
  - Suction
  - Re-position head/check airway patency
  - Provide positive-pressure ventilation
  - Provide supplemental oxygen

- To-Do List:
  - Check machine/choose appropriate sensor (size and type)
  - Warm cold extremities to improve circulation
  - Protect sensor from bright/ambient light sources
  - Remove nail polish or dirt on digit
  - Avoid placing on extremity with arterial line, BP cuff or IV/tourniquet
  - Put sensor on extremity/digit that is not moving excessively

Remember to treat the **child** not the **device**

Adapted from Dartmouth Hitchcock’s Pediatric Sedation Course (Cravero & Blike 2002)
Non-invasive device that continually monitors EtCO₂

- While pulse oximetry measures oxygen saturation, capnography monitors the status of the child’s ventilation.
  - Pulse oximetry has a significant “lag time” between apnea and reading.
- Earliest indicator of airway or respiratory compromise (e.g. apnea, hypoxia, upper airway obstruction, laryngospasm, bronchospasm, and respiratory failure)\(^9\)
- Is highly recommended for moderate & deep sedation performed outside of the OR (e.g., ED, Radiology suite, etc.)

The use of precordial stethoscope or capnograph for patients who are difficult to observe (e.g., MRI, darkened room) to aid in monitoring adequacy of ventilation is encouraged. —AAP/AAFD (2006)

Ex. Normal Waveform = patent airway, patient breathing  
Ex. Curved Waveform denotes bronchospasm
Presedation Evaluation

Evaluate every child in need of procedural sedation prior to sedation & perform universal procedures (i.e., “time out”) immediately prior to sedation.

- **Age, weight, height**
- **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
  - NPO status

- **Systems review**
  - Vital signs (BP, heart rate, respiratory rate, temperature, SpO₂)
  - Pulmonary, Cardiac, Renal, GI, Hematological, CNS, Endocrine
  - Physical exam with **focused airway evaluation** (include: body habitus, head/neck, teeth/mouth, and jaw)
  - Physical status (**ASA classification**)
  - Review of objective diagnostic data (e.g. labs, ECG, x-ray, etc.)
  - Level of child’s anxiety, pain, consciousness
  - Name and telephone number of the child’s primary physician
Mallampati classification system\textsuperscript{10} is a standard airway evaluation used as a method to predict difficult intubation.

- **Assess ability to open mouth and protrude tongue**
- **Check for loose teeth**
- **Assume** that it may be necessary to establish an artificial airway during any sedation.
- **Anticipate** any/all obstacles before the real time occurrence.
- **Class III & IV** = potential difficult intubation (consider anesthesia consult)

Airway safety is especially risky during procedures involving the upper airways, such as GI endoscopy or bronchoscopy.

<table>
<thead>
<tr>
<th>Class</th>
<th>View = patient seated with mouth open as wide as possible</th>
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<tbody>
<tr>
<td>I</td>
<td>Soft palate, fauces, uvula, tonsillar pillars</td>
</tr>
<tr>
<td>II</td>
<td>Soft palate, fauces, full uvula</td>
</tr>
<tr>
<td>III</td>
<td>Soft palate only</td>
</tr>
<tr>
<td>IV</td>
<td>Hard palate only</td>
</tr>
</tbody>
</table>
In 1941, the ASA developed a classification for a patient's physical status before sedation/surgery to alert the medical team to the patient's overall health.

<table>
<thead>
<tr>
<th>STATUS</th>
<th>DISEASE STATE</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Healthy, normal child</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Child with mild systemic disease</td>
<td>Controlled asthma, controlled diabetes</td>
</tr>
<tr>
<td>III*</td>
<td>Child with severe systemic disease</td>
<td>Active wheezing, diabetes mellitus w/ complications, heart disease that limits activity</td>
</tr>
<tr>
<td>IV*</td>
<td>Child with severe systemic disease that is a constant threat to life</td>
<td>Status asthmaticus, severe BPD, sepsis</td>
</tr>
<tr>
<td>V*</td>
<td>Child who is moribund and not expected to survive without the procedure</td>
<td>Cerebral trauma, pulmonary embolus, septic shock</td>
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*Anesthesia consultant is usually required
ASA/AAP NPO Guidelines

### NPO Guidelines for Elective* Sedation

<table>
<thead>
<tr>
<th>INGESTED</th>
<th>TIME</th>
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<tbody>
<tr>
<td>Clear Liquids (water, fruit juices w/o pulp, carbonated beverages,</td>
<td>2 hours</td>
</tr>
<tr>
<td>clear tea, black coffee)</td>
<td></td>
</tr>
<tr>
<td>Breast milk</td>
<td>4 hours</td>
</tr>
<tr>
<td>Infant formula</td>
<td>6 hours</td>
</tr>
<tr>
<td>Nonhuman milk (similar to solids)</td>
<td>6 hours</td>
</tr>
<tr>
<td>Solids (light meal; if includes fatty/fried food, consider longer faster</td>
<td>6 hours</td>
</tr>
<tr>
<td>period)</td>
<td></td>
</tr>
</tbody>
</table>

*In emergency situations, carefully weigh the need for immediacy with the increased risk of pulmonary aspiration. Use the lightest effective sedation possible.*
### Documentation – Before & During

#### Before Sedation
- Presedation health evaluation (include initial aldrete score)
- Confirm staff privileges & universal procedures (i.e., “time out”)
- Drug calculations (include reversal agents and local anesthetics)
- Informed consent (risks vs. benefits, alternatives to planned sedation)

#### Instructions to family:
- **✓** Objectives of sedation
- **✓** Anticipated changes in behavior (during & after)
- **✓** Why/when to expect longer observation time (drugs with long half-lifes; severe underlying condition; neonates/preemies, etc.)
- **✓** Special transport instructions for children going home in car seat (child’s head positioning)
- **✓** 24-hour emergency phone #

#### During Sedation

**On a time-based flowsheet:**
- Drug name(s) & drug calculations
- Route
- Site
- Time
- Dosage (titrated to desired effect)

**During administration, record:**
- Inspired concentrations of $O_2$ & duration of sedating/analgesic agents
- Level of consciousness
- Heart rate, respiratory rate, $SpO_2$
- Adverse events and corrective intervention/treatment given

Document at least once every 5 minutes until child reaches predetermined discharge criteria
During the recovery & discharge phase, document the following:

- Time and condition of child upon discharge
- Level of consciousness
- SpO₂ on room air
- Modified Aldrete Score¹¹ (also known as the Postanesthesia Recovery Score)
- Child meets all predetermined discharge criteria
During sedation, continuously monitor:

- $\text{SpO}_2$
- Heart rate
- Respiratory rate
- Head position/airway patency
- Blood pressure (forego if interferes with sedation)
- Level of sedation (e.g., Modified Ramsey Scale$^{12}$)
- ECG monitoring (esp. child with significant CV disease or dysrhythmias)

Ensure all monitors & alarms are working & routinely safety-checked

Be vigilant to diminishing/absent protective reflexes.
If the child is transported while sedated, don’t forget to:

- Have credentialed/competent/skilled personnel accompany
- Monitor all vital signs
- Monitor level of consciousness
- Monitor $\text{SpO}_{2}$
- Bring necessary $O_2$ supplies (tank, tubing, face mask, bag mask, oral airway, etc.)
- Bring necessary emergency drugs (including reversal agents)
- Bring cardiac monitor (esp. child with significant CV disease or dysrhythmias)

Be vigilant to diminishing/absent protective reflexes.
Monitoring - After

During recovery:

- Continuously observe and monitor SpO₂, heart rate, and level of consciousness until the child is fully alert
- Monitor other required vital signs at specific intervals until the child meets appropriate discharge criteria
- Ensure adequate pain management as effects of sedation/analgesia begin to wear off
- Observe for longer periods of time if child:
  - Received any reversal agents (duration of sedating agents may exceed duration of antagonist)
  - Received sedating agents with a long half-life (e.g., chloral hydrate) that may delay return to baseline or pose risk of resedation

Be vigilant to diminishing/absent protective reflexes.
Discharge Criteria

Every hospital must develop discharge criteria based on objective measures suitable to their patient population.

Consider, at minimum, the following measures:

- Return to pre-sedation (age/developmentally-appropriate) activity/ambulation & cognitive level
- Child is easily arousable, alert and oriented
- Protective airway reflexes are intact
- Stable vital signs, pain level, O₂ and respiratory effort (e.g. Modified Aldrete Score ≥ 9)
- If reversal agent is given, allow sufficient time (up to 2 hours) after last dose to observe for risk of resedation
- Child/caregiver is able to understand written instructions (include emergency contact #)
- Child has safe transportation home with responsible adult (for infants going home in a car seat, adjust head position to ensure a patent airway if infant falls asleep)

Physician discretion is not an objective measure

Remind Parent: Child may be very unsteady – hold child’s hand when walking and watch child very carefully
Commonly reviewed Quality Improvement indicators:

- SpO₂ ≤ 90% requiring O₂
- 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, NPO status, equipment check, credential check, drugs used/calculations, etc)
- Death

Ask Yourself…
Was the sedation/analgesia appropriate & effective?
Does my ED conduct QI on moderate sedation cases?
If so, what does my ED do with our QI data?
Commonly Used Agents

The following information is adapted from a number of sources including: EMSC/ACEP’s Clinical Policy: Critical Issues in the Sedation of Pediatric Patients in the Emergency Department, Cravero & Blike’s Review of Pediatric Sedation and Krauss & Green’s Procedural Sedation and Analgesia in Children.
The following slides review commonly used sedating/analgesic agents with a focus on pediatric implications (as highlighted in current literature, demonstrated in the recent Illinois EMSC survey of EDs and clinical experience of the CQI Subcommittee members).

Have your hospital/ED pharmacist review your current policy to determine which sedation/analgesic agents are available and recommended for your patients.

**REMEMBER:** Ideally, pediatric sedation/analgesia should be tailored to the child and the procedure to be performed (as noted earlier in this module).
# Chlortal Hydrate

<table>
<thead>
<tr>
<th><strong>Class:</strong></th>
<th>Sedative/hypnotic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action:</strong></td>
<td>Sedation (no analgesia)</td>
</tr>
</tbody>
</table>
| **Contraindications:** | Hepatic or renal impairment  
Children > 3 years (due to decreased efficacy) |
| **Common side effects:** | Respiratory depression; hypoxia  
Ataxia  
Airway obstruction (secondary to skeletal muscle relaxation)  
Paradoxical excitement; disorientation/dizziness/confusion  
Nausea & vomiting (aspiration can lead to severe laryngospasm) |
| **Recommended for:** | Painless procedures (e.g., diagnostic radiology)  
Minimally painful procedures  
Children ≤ 48 months |
| **Reversal agent:** | None |
| **Clinical Cautions:** | Onset is difficult to predict  
Long half-life increases potential for reedation and may produce residual effects up to 24 hours after administration |
## Etomidate

<table>
<thead>
<tr>
<th>Class:</th>
<th>Hypnotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action:</td>
<td>Anesthesia, amnesia (no analgesia)</td>
</tr>
<tr>
<td>Contraindications:</td>
<td>Addison’s disease</td>
</tr>
<tr>
<td></td>
<td>Children ≤ 10 years (higher risk of adrenal suppression)</td>
</tr>
<tr>
<td></td>
<td>Children in shock</td>
</tr>
<tr>
<td>Common side effects:</td>
<td>Myoclonus (premedication w/ benzo or opioid can decrease SE)</td>
</tr>
<tr>
<td></td>
<td>Pain with injection</td>
</tr>
<tr>
<td></td>
<td>Nausea and vomiting</td>
</tr>
<tr>
<td>Recommended for:</td>
<td>Nonpainful diagnostic procedures</td>
</tr>
<tr>
<td></td>
<td>Brief painful procedures</td>
</tr>
<tr>
<td>Reversal agent:</td>
<td>None</td>
</tr>
<tr>
<td>Clinical Cautions:</td>
<td>Rapid onset; lasts approximately 3-5 minutes</td>
</tr>
<tr>
<td></td>
<td>Frequently used in the emergency setting to induce unconsciousness during endotracheal intubation (RSI)</td>
</tr>
</tbody>
</table>
# Midazolam

<table>
<thead>
<tr>
<th>Class:</th>
<th>Benzodiazepine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action:</td>
<td>Sedation, amnesia, and anxiolysis (no analgesia)</td>
</tr>
<tr>
<td>Contraindications:</td>
<td>Hypersensitivity to benzodiazepines</td>
</tr>
<tr>
<td></td>
<td>Chronic respiratory insufficiency</td>
</tr>
<tr>
<td>Common side effects:</td>
<td>Respiratory depression</td>
</tr>
<tr>
<td></td>
<td>Paradoxical excitement</td>
</tr>
<tr>
<td></td>
<td>Occasional hypotension</td>
</tr>
<tr>
<td>Recommended for:</td>
<td>Minor invasive procedures</td>
</tr>
<tr>
<td></td>
<td>Good complementary sedation for painful procedures</td>
</tr>
<tr>
<td>Reversal agent:</td>
<td>Flumazenil</td>
</tr>
<tr>
<td>Clinical Cautions:</td>
<td>Rapid onset/offset</td>
</tr>
<tr>
<td></td>
<td>Routinely combined with ketamine</td>
</tr>
<tr>
<td></td>
<td>Reduce dose when used in combination with opioids (combination increases risk of respiratory compromise)</td>
</tr>
<tr>
<td><strong>Class:</strong></td>
<td>Benzodiazepine</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Action:</strong></td>
<td>Anxiolysis, sedation, amnesia (no analgesia)</td>
</tr>
</tbody>
</table>
| **Contraindications:** | Hypersensitivity to benzodiazepines  
Acute narrow angle glaucoma  
Pregnancy |
| **Common side effects:** | Respiratory depression  
Hypotension  
Confusion/disorientation  
Nausea |
| **Recommended for:** | Minor invasive procedures  
Anxiety relief |
| **Reversal agent:** | Flumazenil |
| **Clinical Cautions:** | May see paradoxical reactions including hyperactivity or aggressive behavior  
Effects may be prolonged when combined with other agents  
Reduce dose when used in combination with opioids (*combination increases risk of respiratory compromise*) |
# Fentanyl

<table>
<thead>
<tr>
<th>Class:</th>
<th>Opioid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action:</td>
<td>Analgesia (no sedation)</td>
</tr>
</tbody>
</table>
| Contraindications: | Increased intracranial pressures  
|                  | Severe respiratory disease/depression |
| Common side effects: | Respiratory depression  
|                  | Hypoxia and/or apnea          
|                  | Hypotension/bradycardia       
|                  | Nausea & vomiting             
|                  | Pruritis                      |
| Recommended for: | Short painful procedures    |
| Reversal agent:  | Naxolone                      |
| Clinical Cautions: | 100 times more potent than morphine 
|                  | Rapid onset; lasts approximately 30-60 minutes 
|                  | Rapid bolus infusion may lead to chest wall rigidity 
|                  | Reduce dosing when combined with benzodiazepines (combination increases risk of respiratory compromise) |
Morphine

<table>
<thead>
<tr>
<th><strong>Class:</strong></th>
<th>Opioid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action:</strong></td>
<td>Analgesia (no sedation)</td>
</tr>
<tr>
<td><strong>Contraindications:</strong></td>
<td>Acute or severe asthma</td>
</tr>
<tr>
<td></td>
<td>Hypersensitivity to morphine</td>
</tr>
<tr>
<td><strong>Common side effects:</strong></td>
<td>Hypotension</td>
</tr>
<tr>
<td></td>
<td>Urticaria</td>
</tr>
<tr>
<td></td>
<td>Drowsiness</td>
</tr>
<tr>
<td></td>
<td>Nausea &amp; vomiting</td>
</tr>
<tr>
<td><strong>Recommended for:</strong></td>
<td>Long painful procedures</td>
</tr>
<tr>
<td><strong>Reversal agent:</strong></td>
<td>Naloxone</td>
</tr>
<tr>
<td><strong>Clinical Cautions:</strong></td>
<td>Monitor mental status, hemodynamics, and histamine release</td>
</tr>
<tr>
<td></td>
<td>Requires longer recovery time than fentanyl</td>
</tr>
<tr>
<td></td>
<td>Reduce dosing when combined with benzodiazepines <a href="#">combination increases risk of respiratory compromise</a></td>
</tr>
</tbody>
</table>
Propofol

<table>
<thead>
<tr>
<th>Class:</th>
<th>Sedative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action:</td>
<td>Anesthesia (no analgesia)</td>
</tr>
<tr>
<td>Contraindications:</td>
<td>Head trauma (decreases ICP)</td>
</tr>
<tr>
<td></td>
<td>Hypotension</td>
</tr>
<tr>
<td></td>
<td>Allergy to soy, eggs, glycerol</td>
</tr>
<tr>
<td>Common side effects:</td>
<td>Apnea; hypoventilation; respiratory depression</td>
</tr>
<tr>
<td></td>
<td>Rapid &amp; profound changes in sedative/anesthetic depth</td>
</tr>
<tr>
<td></td>
<td>Hypotension</td>
</tr>
<tr>
<td>Recommended for:</td>
<td>Nonpainful diagnostic procedures</td>
</tr>
<tr>
<td></td>
<td>Brief periods of deep sedation (e.g., burn debridement)</td>
</tr>
<tr>
<td>Reversal agent:</td>
<td>None</td>
</tr>
<tr>
<td>Clinical Cautions:</td>
<td>Only for use by personnel trained in the administration of general anesthesia (i.e., anesthesiologists, intensivists, emergency physicians)</td>
</tr>
<tr>
<td></td>
<td>Rapid onset/offset (within minutes)</td>
</tr>
<tr>
<td></td>
<td>Continuously monitor patients for oxygen saturation, respiration, heart rate and blood pressure – <strong>EXPECT APNEA</strong></td>
</tr>
<tr>
<td></td>
<td>Have age-appropriate equipment immediately available for maintenance of a patent airway, oxygen enrichment, artificial ventilation, and circulatory resuscitation(^\text{16})</td>
</tr>
</tbody>
</table>
## Ketamine

<table>
<thead>
<tr>
<th>Class:</th>
<th>Dissociative anesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action:</td>
<td>Anesthesia, sedation, amnesia, analgesia</td>
</tr>
</tbody>
</table>
| Contraindications: | Infants ≤ 3 months (higher risk of airway complications)  
Acute neurological/head injury  
Thyroid disease  
Significant eye injury and/or disease |
| Common side effects: | Laryngospasm  
Emergence reactions  
Increased salivation & intracranial/intraocular pressure  
Hypertension/tachycardia  
Nausea & vomiting |
| Recommended for: | Hard-to-handle patients (e.g., developmentally delayed)  
Painful procedures (e.g., burn debridement, orthopedic, foreign body removal) |
| Reversal agent: | None |
| Clinical Cautions: | Rapid onset (1-2 minutes); lasts approximately 5 – 15 minutes  
Combine with anticholinergic to counter hypersalivation  
Due to occasional purposeless jerking movements, not a good choice if child needs to remain motionless for procedure |
# Nitrous Oxide

<table>
<thead>
<tr>
<th>Class:</th>
<th>Anesthetic (blended with 50 – 70% O₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action:</td>
<td>Amnesia, analgesia, mild anxiolysis</td>
</tr>
</tbody>
</table>
| 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 |
| 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%) O₂ concentration at a flow rate appropriate to child’s size  
                       Requires gas scavenging system to minimize adverse effects on staff |
Additional Pain Management

- **Topical/Local anesthetics** – appropriate application is very important to the overall effectiveness of managing procedural pain and reducing the child’s anxiety. Large doses may have their own sedating effects and, thus, enhance sedative effects when used in combination with other sedatives or narcotics.¹

  **NOTE:** these agents are cardiac depressants so the maximum allowable safe dosage should be calculated *before* administration to avoid overdose.

- **Oral Sucrose** – 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 single, painful procedure.¹⁷

  - Efficacy improves when combining sucrose and comfort measures (nonnutritive sucking, holding)
  - Appears to be less effective in infants between 1– 6 months of age
Lytic cocktail/Demerol\textsuperscript{®}, Phenergan\textsuperscript{®}, Thorazine\textsuperscript{®} (DPT) has long been discouraged for use in children due to the combination’s remarkably unfavorable pharmacokinetics and known serious adverse effects\textsuperscript{7,18-23}.

- In fact, current pediatric sedation/analgesia literature rarely, if at all, mentions Demerol\textsuperscript{®} or DPT as potential drugs of choice to focus on numerous better options available.

There is a high rate of therapeutic failure as well as a high rate of serious adverse reactions, including respiratory depression and death, associated with its use... The dose cannot be titrated easily and individually, the onset of action is significantly delayed (20 to 30 minutes), the duration of sedation is protracted (5 to 20 hours), the duration of analgesia is much shorter (1 to 3 hours), and no anxiolytic or amnestic properties exist. - AAP (1995)

- However, the 2007 Illinois EMSC Survey demonstrated that respondents still consider using Demerol\textsuperscript{®} (discouraged for pediatric use due to heightened risk of seizure activity\textsuperscript{24}) in higher numbers than expected for the two case scenarios:
  - Sedation for CT of head = 11%; Sedation for closed fracture reduction = 10%

**Does your ED use Demerol\textsuperscript{®} or DPT during pediatric sedations?**
If so, request pharmacy and/or anesthesia departments recommend a different agent(s) with a better safety profile and rate of efficacy.
Clinical Cautions

- **Dose Response** – most sedative/analgesic medications have non-linear “dose-response” curves (the amount of effect achieved for a given dose of medication). Consequently, initial doses having little or no effect until a certain point, followed by a clear, incremental effect for each dose.

  - Calculate the approximate "loading dose" you can give relatively quickly, and then administer small doses allowing adequate time to evaluate the effect.

  - On the contrary, starting with small doses, and then (due to a lack of effect) escalating the dose can lead to overdose.

Adapted from Children’s Hospital Central California Pediatric Sedation Course

Dose-response curve
Clinical Cautions

- **Dose Stacking** – term refers to what happens when you administer medications so close together that the peak effects of each dose coincide. This practice can result in an excessive total drug effect over time.
  - When two drugs are being used in sedation, titrate one of them to the desired level before administering the second.
  - **Example:** If child is in pain, administer an analgesic to a desired level of pain relief, then administer an anxiolytic to further enhance sedation.

- **Synergism** – the interaction of two or more agents so that their combined effect is greater than the sum of their individual effects.
  - Primary practitioners must recognize the risks associated with the use of combinations of medications.
  - **Example:** When opiates are combined with benzodiazepines, respiratory depression is much more likely than when either of these drug classes are used by themselves.

Adapted from Dartmouth Hitchcock's Pediatric Sedation Course (Cravero & Blike 2002)
Potential Complications
**Respiratory Depression**

Clinical state characterized by increase work of breathing. Can usually be managed with simple maneuvers, only occasionally requiring endotrachael intubation.

Everyone whom practices moderate sedation should be an expert with bag mask ventilation.

<table>
<thead>
<tr>
<th>Signs &amp; Symptoms:</th>
<th>Maneuvers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color = pale, dusky, blue</td>
<td>Provide supplemental O₂</td>
</tr>
<tr>
<td>Tachypnea; Tachycardia</td>
<td>Open airway/reposition head</td>
</tr>
<tr>
<td>Use of accessory muscles</td>
<td>Suction airway</td>
</tr>
<tr>
<td>Retractions; nasal flaring; stridor</td>
<td>Use bag mask ventilation</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>Consider reversal agents for opioid or benzodiazepine overdose</td>
</tr>
<tr>
<td>Altered level of consciousness</td>
<td>If air movement is minimal, consider intubation (LMA, oropharyngeal airway, etc.)</td>
</tr>
</tbody>
</table>
A forceful, involuntary spasm of laryngeal musculature caused by stimulation of the superior laryngeal nerve

Laryngospasm management must be part of any procedural sedation plan (as it is, perhaps, the most common significant complication).

- Occurs more commonly in children
- Occurs at light levels of sedation/analgesia
- Treat with positive pressure ventilation (using 100% O₂ with tightly fitting mask)
  - Consider administering IV lidocaine (1 - 1.5 mg/kg)
- Employ the laryngospasm maneuver
- If laryngospasm persists and hypoxia develops, administer succinylcholine (0.25 - 1 mg/kg) in order to paralyze the laryngeal muscles and allow controlled ventilation
Apply firm inward pressure bilaterally with both index fingers at the laryngospasm notch (located just behind the earlobe - the posterior aspect of the mandible, the anterior aspect of the mastoid, and the inferior aspect of the ear canal/skull base). This action exerts pressure on the styloid process and induces laryngeal relaxation.

- This hand positioning allows for excellent manual control of the mandible (esp. during invasive procedures threatening or involving the upper airway).

- You may palpate the tip of the styloid process.

- Avoid the angle of the mandible which places the fingers too low and may threaten the carotids.

Adapted from: Sedation and Analgesia for the Child during Procedures (PowerPoint presentation). Lowell Clark, MD Noreen Peyatt, RN, Children’s Hospital, Macon GA (2007)
Abnormally low blood pressure is usually due to excessive sedation with myocardial insufficiency (esp. with opiates) and/or vasodilation (esp. barbiturates, opiates, benzodiazepines)

**Responses:**

- Put child in Trendelenburg position (legs up)
- Verify/obtain patent airway, assist ventilation
- Give 100% O₂
- Fluid bolus 10-20 ml/kg rapidly
- Chest compressions if bradycardia or PEA
- Discontinue sedation (esp. if using continuous infusion)
- Consider reversal agent, atropine, epinephrine
- Intubate (if necessary)

Photo: University of Utah Health Sciences Center
Adjuncts
To
Sedation/Analgesia
Child Life Services

**Child Life Specialist** - *specially trained to provide developmental, educational, and therapeutic interventions for children and their families undergoing stressful healthcare experiences (such as an intervention requiring moderate sedation).*

**Related services include:**
- Provide psychosocial preparation for tests, surgeries, and other procedures.
- Facilitate medical play using special dolls, stuffed animals and medical equipment to inform and prepare child for what he/she is going to hear, see, feel in honest, yet soft and relatable language.
- Reduce overall anxiety to help prevent a negative medical experience.
- Evaluate influence of previous negative experiences to help determine appropriate level of sedation.

- **Preparation = Break down intervention to manageable tasks while developing & encouraging coping techniques to be employed during a procedure.**
- **With appropriate support, preparation, and pain management (i.e., topical analgesic), a young child may be capable of remaining still for minor procedures with minimal sedation and/or restraint.**
Comfort positions are used by parents and caregivers to reduce stress and anxiety to infants and children undergoing invasive medical procedures.

Why use positioning for comfort?

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

Example - Child straddling mom during IV placement

• Child’s attention is focused on the toy
• Kicking is from knee only
• Upper body movement is restricted

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

Photo: Children's Mercy Hospital – Kansas City
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 (e.g., guided imagery)
- Distraction boxes
- Not having parent hold child down

Child should practice technique for 5-10 minutes before procedure

Box of distraction supplies

Distraction technique (w/ Child Life Specialist)

Distraction technique w/ parents

Photos: Cleveland Clinic
Guided imagery helps children use their imagination to divert their thoughts from the procedure to a more pleasant experience.

- **Supplies:** creativity, a child’s imagination

- **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)
Focus on enhancing training, safety, and effectiveness

- **Training:**
  - Establish uniform minimum skill requirements for primary and support personnel
  - Investigate the effectiveness of simulation-based training as a teaching method to improve procedural sedation & analgesia skills

- **Safety:**
  - Define the most appropriate monitoring for the different levels of sedation
  - Establish adverse event registries to monitor safety and standards of practice

- **Efficacy:**
  - Determine which drugs are most effective for a specific procedure and age of patient
  - Define what constitutes a successful sedation for the patient, the family, and the practitioners
References
References


References


Appendix A: Additional Resources
Modified Ramsey Scale

- Provides a consistent method to document the child’s level of sedation during and after a procedure

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

*Desired score depends on indication for sedation

Modified Aldrete Score

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

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

Maximum total score is 10; a score of ≥9 is required for discharge.
Choosing Agent(s) & Route

Factors determining medication choices & sedation endpoints

- Operating theatre
- Postpone procedure
- Undertake procedure

Risk-benefit analysis
- Personal or equipment availability
- Time of day (infants and toddlers)
- Previous experience
- Anxiety
- Age and cooperation

Patient-related factors

Procedural factors
- Median control
  - Sedative, dissociative drugs
- Analgesia
  - Sedative, dissociative drugs
- Sedation
  - Sedative, dissociative drugs
- Analgesia
  - Opioids, dissociative drugs
- Anaesthesia
  - Opioids, dissociative drugs, or sedative

Non-painful
- Diagnostic imaging
  - Chloral hydrate (oral)
  - Pentobarbital (oral, rectal, intramuscular, intravenous)
  - Midazolam (oral, rectal, intravenous)
  - Propofol (intravenous)

Minimally painful
- Instrumentation
  - Ketamine (intramuscular, intravenous)
  - Fentanyl + midazolam (intravenous)
  - Propofol + fentanyl (intravenous)
  - Regional anaesthesia
- Nitrous oxide

Painful
- Instrumentation
  - Ketamine (intramuscular, intravenous)
  - Fentanyl + midazolam (intravenous)
- Nitrous oxide

Monitoring
- Mild-moderate sedation
  - ECG, Blood pressure, SpO2
- Deep-dissociative sedation
  - ECG, Blood pressure, SpO2, EEG

### INTRAPROCEDURE

<table>
<thead>
<tr>
<th>Time of Arrival</th>
<th>Time of Procedure</th>
<th>Time Procedure Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Medication IV's Delebrance**

<table>
<thead>
<tr>
<th>Time</th>
<th>MSS</th>
<th>B/P</th>
<th>R/In</th>
<th>RR</th>
<th>GL</th>
<th>GL</th>
<th>Initial</th>
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**Pharmacologist**

*Please initial here.*

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**Post Procedure**

- **Time of Departure:**
- **Assessment:**
  - [ ] MSS
  - [ ] B/P
  - [ ] R/In
  - [ ] RR
  - [ ] GI
  - [ ] GL
  - [ ] Initial

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**Patient List**

- [ ] MSS
- [ ] B/P
- [ ] R/In
- [ ] RR
- [ ] GI
- [ ] GL

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**Notes**

- Immediate+
- Medical
- Sedation
- Indication

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**Radiology Report**

- [ ] MSS
- [ ] B/P
- [ ] R/In
- [ ] RR
- [ ] GI
- [ ] GL

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**Radiation Therapy**

- [ ] MSS
- [ ] B/P
- [ ] R/In
- [ ] RR
- [ ] GI
- [ ] GL

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**Radiation Therapist**

*Please initial here.*

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**Sedation Therapist**

*Please initial here.*
In 2007, 121 EDs around Illinois (who are active participants in the Illinois EMSC program) were surveyed regarding pediatric moderate sedation practices in their facilities.

This survey consisted of two distinct sections: a general survey of hospital policy/procedures related to moderate sedation, and two case scenarios (one designed to be diagnostic/non-painful; one therapeutic/painful) with follow-up questions related to how the individual hospital would respond in each scenario.

**Case Scenario 1 (Diagnostic/non-painful):**
A 3-year-old male is brought in by his mother after he fell playing in the park about 2 hours ago. He has a 2cm hematoma on the right side of his head. The mother states he was unresponsive for about 5 minutes and threw up 3 times initially, but has not thrown up in the last 90 minutes or during the car ride to the ED. There are no focal findings. He will require moderate sedation for a CT of the brain. The child is very anxious and the mother states he will not hold still during the head CT. Sedation is discussed with the mother and she agrees to this. His vital signs are: Temp: 37.3/99.1 HR: 114 RR: 22 BP: 98/62 O₂ saturation: 99% on RA There are no other injuries or contraindications to sedation.

**Case Scenario 2 (Therapeutic/painful):**
A 6-year-old female has suffered a severely angulated wrist fracture in a fall. The child is very agitated and cries when any stranger comes near her. The orthopedist will perform a fracture reduction, and the child will need moderate sedation to undergo the procedure. Her vital signs are: Temp: 36.4/97.5 HR: 110 RR: 28 BP: 108/70 O₂ saturation: 99% on RA There are no other injuries or contraindications to sedation.
Appendix B: Joint Commission’s PC Standards
Joint Commission’s 2008 Patient Care Standards for Sedation and Analgesia.  

The following slides include the rationale and elements of performance for the Patient Care Standards 13.20 – 13.40.
Operative or other procedures and/or the administration of moderate or deep sedation or anesthesia are planned.

Rationale = Because the response to procedures is not always predictable and sedation-to-anesthesia is a continuum, it is not always possible to predict how an individual will respond. Therefore, qualified individuals are trained in professional standards and techniques to manage patients in the case of a potentially harmful event.
Elements of Performance

- Sufficient numbers of qualified staff (in addition to the individual performing the procedure) are present* to evaluate the patient, help with the procedure, provide sedation and/or anesthesia, monitor and recover the patient.

  *For hospitals providing obstetric or emergency operative services, this means they can provide anesthesia services as required by law and regulation.

- Individuals administering moderate or deep sedation and anesthesia are qualified and have the appropriate credentials to manage patients at whatever level of sedation or anesthesia is achieved, either intentionally or unintentionally.
Elements of Performance (cont.)

- A registered nurse supervises perioperative nursing care.
- Appropriate equipment to monitor the patient’s physiologic status is available.
- Appropriate equipment to administer intravenous fluids and drugs, including blood and blood components, is available as needed.
- Resuscitation capabilities are available.

The following must occur before the operative and other procedures or the administration of moderate or deep sedation or anesthesia:

- The anticipated needs of the patient are assessed to plan for the appropriate level of postprocedure care.
- Preprocedural education, treatments, and services are provided according to the plan for care, treatment, and services.
- Conduct a “time out” immediately before starting the procedure as described in the Universal Protocol.
- A presedation or preanesthesia assessment is conducted.
- A licensed independent practitioner with appropriate clinical privileges plans or concurs with the planned anesthesia.
- The patient is reevaluated immediately before moderate or deep sedation and before anesthesia induction.
Patients are monitored during the procedure and/or administration of moderate or deep sedation or anesthesia

Elements of Performance

- Appropriate methods are used to continuously monitor oxygenation, ventilation, and circulation during procedures that may affect the patient’s physiological status.

- The procedure and/or the administration of moderate or deep sedation or anesthesia for each patient is documented in the medical record.
Patients are monitored immediately after the procedure and/or administration of moderate or deep sedation or anesthesia

Elements of Performance

- The patient’s status is assessed immediately after the procedure and/or administration of moderate or deep sedation or anesthesia.
- Each patient’s physiological status, mental status, and pain level are monitored.
- Monitoring is at a level consistent with the potential effect of the procedure and/or sedation or anesthesia.
- Patients are discharged from recovery/hospital by a qualified licensed independent practitioner or according to rigorously applied criteria approved by the clinical leaders.
- Patients who have received sedation or anesthesia in the outpatient setting are discharged in the company of a responsible, designated adult.