Sedation-Analgesia Adult Course
2018-2019

Department of Anesthesiology
Perioperative Medicine and Pain Management
University of Miami
Adult Procedural Sedation/Analgesia
Procedure #400.016
Objectives

Upon completion of this course, the clinician will be able to:

1. Describe the qualification requirements for providing moderate (conscious) sedation within the Jackson Health System.
2. Describe the levels of sedation.
3. Describe the current practice and management of procedural sedation-analgesia in the adult patient.
4. Identify the types of equipment that must be available when providing sedation.
5. Describe patient monitoring requirements intra-procedure during moderate (conscious) sedation.
Sedation- Analgesia Policy

• Responsibility
  – A health care provider with current sedation-analgesia privileges must conduct a pre-procedure evaluation, and obtain informed consent for sedation analgesia
  – ONLY a licensed independent practitioner (dentist, physician, oral surgeon, etc.) with sedation analgesia privileges may approve a sedation/ analgesia plan and is considered to be responsible for all drugs administered
  – Only patients reasonably expected to meet discharge criteria as specified shall receive sedation-analgesia
Sedation-Analgesia Policy

• Definition of Sedation-Analgesia
  – Sedation-analgesia (SA) is defined as the administration of sedation and analgesia (a.k.a. conscious sedation) for diagnostic and therapeutic procedures
  – The process includes ongoing pre-, intra- and post-procedure monitoring of patient status
Sedation- Analgesia Policy

• NOT Sedation- Analgesia
  – This policy does not apply to the direct treatment of patient disease, including pain/anxiety control
  – This policy does not apply to ventilated patients in an Intensive Care Unit due to progression of their primary disease
  – This policy does not apply to patients who have an anesthesiologist providing sedation or General Anesthesia
Sedation-Analgesia Policy

- Purpose of Policy I
  - Appropriate standards for the administration and monitoring of sedation and analgesia for therapeutic and diagnostic procedures which may result in loss of patient protective reflexes
  - To assure compliance with federal and state regulations and accrediting bodies
Sedation-Analgesia Policy

- **Purpose of Policy II**
  - To provide quality care in a safe environment for all patients within the system
  - To minimize patients’ physical and emotional discomfort
  - To decrease the risk of adverse outcomes
# Sedation-Analgesia Policy

## Levels of Sedation

<table>
<thead>
<tr>
<th>Level</th>
<th>I-Minimal/Anxiolysis</th>
<th>II-Moderate/Conscious Sedation</th>
<th>III-Deep Sedation</th>
<th>IV-General Anesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response to stimuli</td>
<td>Normal to <em>Verbal</em></td>
<td>Purposeful to <em>verbal or tactile</em></td>
<td>Purposeful to <em>repeated verbal or to pain</em></td>
<td>Unresponsive to <em>pain</em></td>
</tr>
<tr>
<td>Airway</td>
<td>Normal</td>
<td>No Required intervention</td>
<td>May require intervention</td>
<td>Often requires intervention</td>
</tr>
<tr>
<td>Breathing</td>
<td>Normal</td>
<td>Adequate</td>
<td>May require assistance</td>
<td>Often requires assistance</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Normal</td>
<td>Usually Normal</td>
<td>Usually Normal</td>
<td>May be impaired</td>
</tr>
</tbody>
</table>
Sedation-Analgesia Policy

- Level of Sedation in Sedation- Analgesia
  - Sedation-analgesia privileges only includes:
    • level II or moderate sedation
  - SA requires the patient maintain purposeful response to verbal stimuli
Sedation-Analgesia Policy

NOT Sedation-Analgesia

- Level I Sedation or minimal sedation is allowed in any patient care area under the orders and care of a licensed practitioner with privileges to order medications

- Level IV Sedation or general anesthesia can only be provided by anesthesiology personnel under the provisions and policies of the Department of Anesthesiology
Sedation- Analgesia Policy

- Sedation- Analgesia
  - During moderate sedation patient retains protective airway reflexes (gag, cough) and remains appropriately responsive to verbal stimuli
  - Moderate Sedation may be administered by qualified personnel, as delineated in this policy
Sedation-Analgesia Policy

SA: Know the Process
- All involved in process
- Know steps and paths
- Agreement of all involved
- Report data
- Analyze where to improve

Process Flow Chart

START

PATIENT ARRIVES

PATIENT EVALUATION CONSENT

PREP PATIENT

PROCEDURE

PT. MEETS D/C CRITERIA

HOLD/TRANSFER

PT D/C

END
Sedation-Analgesia Location Requirements
Location Approval

- All locations where sedation-analgesia (SA) is practiced must be approved by the Chief Medical Officer or his/her designee.
- The hospital’s administration will maintain a list of approved locations and qualified personnel.
- Review and approval of locations and personnel will be ongoing.
SA Location Requirements

- Qualified personnel and equipment for:
  - Patient evaluation
  - Administration of sedation
  - Monitoring during and after procedure

- Emergency resuscitation equipment:
  - Crash cart with defibrillator
  - Reversal Agents, such as flumazenil and naloxone
  - Age-appropriate intubation tray
  - Ability to activate the center’s cardiac arrest system
Monitor Requirements

- The following monitors must be present, with appropriate alarm ranges turned on at all times:
  - Pulse oximeter
  - Blood pressure device
  - EKG monitor
  - End tidal CO2 monitor
Airway Requirements

- A self-inflating positive-pressure oxygen delivery system for the administration of at least a 10 L/min flow rate for a minimum of 60 minutes
- A bag-valve-mask device with a full E-cylinder meets these requirements. (Gauge will read 2200 psi if it is full)
- A continuous suction system with catheters and tonsil-type rigid suction tip
Rescue Procedure Requirements

- Airway management equipment, including an age-appropriate intubation tray

- Emergency resuscitation cart, including resuscitative drugs and defibrillator capability
Approved Sites for Sedation Analgesia at JMH

- Critical Care Units
- Radiology-Special Procedures
- Cardiac Cath Suite
- Emergency Department
- Pulmonary/Bronchoscopy
- Dental Clinic
- GI Station
Sedation-Analgesia
Patient Evaluation
Getting Started

• A health care provider with current sedation-analgesia privileges must conduct a pre-procedure evaluation, and obtain informed consent for sedation-analgesia.
• Only patients reasonably expected to meet discharge criteria (as specified elsewhere) shall receive sedation-analgesia.
• A sedation-analgiesia order must be placed in the medical record and signed by the licensed independent practitioner prior to initiating sedation-analgesia.
Patient Selection

- Consider excluding patients who may not cooperate:
  - Organic Brain Syndrome (Demented, Senile)
  - Other diagnoses of psychiatric disease
  - Intoxication (alcohol, illicit drugs)
  - Unable to communicate (language barrier, deaf, mute, etc.)
  - Unable to understand (reduced mental abilities)
  - Decreased level of consciousness
Consider an Anesthesiology Consult for:

- Patients with severe alterations in critical organ function (heart, lungs, brain, kidney)
- Full stomach (despite NPO status likely to have residual contents)
- Abnormal or potentially difficult to manage airway
Examples for considering an Anesthesiology Consult

- Morbidly obese patients or history of severe snoring or obstructive sleep apnea
- Extremes of age
- An ASA III or higher physical status
- Severe renal, hepatic or cardiopulmonary disease
- Prior adverse response to sedation-anesthesia
- Severe symptomatic gastroesophageal reflux disease
- Pregnant patients
- A difficult airway exam
ASA Physical Status Classification

I. There is no organic, physiological, biochemical, or psychiatric disturbance (i.e., totally healthy)

II. Mild to moderate systemic disturbance caused either by the condition to be treated or by other pathophysiologic processes (e.g., HTN, DM)

III. Severe systemic disturbance or disease from whatever cause, even though it may not be possible to define the degree of disability (e.g., CAD)

IV. Indicative of the patient with severe systemic disorder already life-threatening, not always correctable by the operative procedure (e.g., unstable angina, ongoing myocardial ischemia, recent heart attack, uncompensated congestive heart failure, recent or evolving stroke, acute bronchospasm, etc.)

V. The moribund patient who has little chance of survival but is submitted to operation in desperation
Pre-Sedation Assessment

- Informed consent for the planned procedure
- History that includes:
  - Allergies and previous adverse drug reactions
  - Current medications
  - Diseases, disorders, and abnormalities
  - Prior hospitalizations
    - Previous procedures/anesthetics and notation of any problems
  - Pertinent family history of diseases and disorders
  - FULL review of systems with concentration on cardiopulmonary function
    - EXTREME CAUTION with history of severe snoring or sleep apnea
  - Pertinent lab or other test results
  - Physical Exam
Pre-Sedation Assessment (cont.)

- Physical examination specific to the procedure being performed (as per Pre Anesthesia Evaluation or Pre Procedure Sedation/Analgesia Evaluation form # C-424SP during downtime), includes:
  - Height and weight
  - Vital signs
  - Baseline oxygen saturation by pulse oximeter
  - Airway assessment
  - Chest and cardiac examination
  - Level of consciousness
Pre-Sedation Airway Assessment

• Prior to sedation-analgesia patients should have a documented airway assessment including:
  – Body Habitus
    • (significant obesity or deformities, especially involving the neck and facial features)
  – Head and neck
    • (short neck, limited neck extension, decreased hyoid-mental distance, neck mass, cervical spine disease or trauma, tracheal deviation, previous surgery and/or radiation)
  – Mouth
    • (small opening, protruding incisors, removable dentures, loose or capped teeth, high arched palate, macroglossia, tonsillar hypertrophy, non-visible uvula)
  – Jaw
    • (small or receding jaw, trismus, beard – can hide abnormalities)
Pre-Sedation Assessment

- Aspiration risk (e.g., GERD, bowel obstruction, hiatal hernia)
- Time since last PO intake
- Assessment/Plan
Pre-Procedure Documentation

- The following must be documented pre-procedure to allow risk assessment:
  - Patient weight and height
  - Complete History and Physical
  - Patient’s medications and allergies
  - NPO status
  - ASA physical status
  - Patient airway assessment
Pre-Procedure Assessment

• Pre-sedation vital signs:
  – Blood pressure
  – Heart rate
  – Respiratory rate
  – Baseline pulse oximetry saturation
  – Temperature

• Pertinent lab results
The PAR Score
(Post Anesthesia Recovery)

- The PAR score is a numerical scoring system, which assists in the documentation of easily observed signs of physical and physiological recovery from sedation/analgesia/anesthesia.
- A PAR score must be documented:
  - Pre-procedure
  - Post-procedure
  - On discharge
# PAR Score

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Points</th>
<th>Definition of Point Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>2</td>
<td>Able to move all extremities voluntarily on command</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Able to move 2 or more extremities voluntarily or on command</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Able to move 0 extremities voluntarily or on command</td>
</tr>
<tr>
<td>Respiration</td>
<td>2</td>
<td>Able to breathe deep and cough freely</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Dyspnea or limited breathing</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Apnea</td>
</tr>
<tr>
<td>Circulation</td>
<td>2</td>
<td>BP +/- 20% of pre-anesthetic level</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>BP +/- 20 to 50% of pre-anesthetic level</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>BP +/- 50% of pre-anesthetic level</td>
</tr>
<tr>
<td>Consciousness</td>
<td>2</td>
<td>Fully Awake</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Patient arouses on calling</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Not responsive</td>
</tr>
<tr>
<td>Color</td>
<td>2</td>
<td>Pink</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Pale/Dusky/Blotchy/Jaundice/Other</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Cyanotic</td>
</tr>
<tr>
<td><strong>Total PAR Score:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NPO Status

- NPO status must be documented
- Patient must be NPO for eight hours prior to procedure
- The responsible licensed independent provider may document an exception in the event of an emergency and after discussion of risks vs. benefits of sedation options with patient or consenting individual
Females of Childbearing Age

- Females of childbearing age must have a negative urinary pregnancy test documented within the prior 10 days or a signed refusal of pregnancy testing.
- Anesthesiology consultation should be considered for all pregnant patients.
Sedation-Analgesia Monitoring
Vigilance

• You are the most important patient monitor!

• A clearly identified qualified, licensed independent practitioner with privileges for sedation-analgesia must have ultimate responsibility for the patient and approve the sedation-analgesia plan prior to beginning

• A qualified individual with privileges for sedation analgesia must continuously attend to the patient from initiation of SA until discharged from their care
Monitoring Requirements

• Continuous monitoring of:
  – Pulse oximetry (SpO2)
  – End-Tidal CO2
  – Respiratory adequacy and rate (RR)
  – Non-invasive blood pressure (BP) q5 minutes
  – Level of patient responsiveness (sedation I-III)
  – Continuous ECG

• Documentation of all parameters at no less than five minute intervals
Monitor Alarms

- Alarms must be on at all times during the procedure and until patient discharge:
  - BP at 20% above and below baseline BP
  - HR 60-100 for adults
  - SpO2 alarms <95% SpO2 in a normal case scenario or at patient’s baseline
  - Positive end-tidal CO2 wave form must be present at all times during procedure
Rescue Procedure

• Consider rescue procedure if there is:
  – Decreased level of consciousness
  – Loss of protective reflexes
  – Unstable vital signs (BP >30% below or above baseline)
  – Respiratory depression: respiratory rate < 10 bpm
  – SpO2 <90% despite mask supplemental oxygen
Oxygen Supplementation

- Supplemental oxygen via mask or nasal cannula will be administered unless there is a specific contraindication (do not use supplemental O2 when electrocautery is used above the xiphoid due to fire risk!)

- All certified locations allowed to administer SA must have a positive pressure O2 source
Sedation Monitoring Record
C-410E/Electronic Health Record

- The Sedation/Analgesia Monitoring Record will include documentation every 5 minutes during the procedure and every 15 minutes during recovery:
  - HR and rhythm
  - BP
  - SpO2 with level of supplemental oxygen therapy
  - End-Tidal CO2
Sedation-Anesthesia: Causes of Errors

- Human Error 82%
  - Failure of Judgment
  - Failure of Vigilance
- System Errors 14%
- Failure to Ventilate is the MOST important
- Even experts are still plagued by this problem. 2000 to 6000 anesthesia-related deaths or permanent brain injuries/year in the US (primarily due to hypoxemia)
Common Limitations of SpO2

- Dark skin, nail polish, cold, peripheral vascular disease, low cardiac output, low blood pressure (signal not able to be perceived)
- Bright lights, motion (signal not registering or reading 85%)
- Severe anemia will cause underestimate (signal lower than true)
Automated-BP:

- Measuring BP for long periods of time at frequent intervals (every 1 minute) may cause nerve damage in the arm
ST Segment Analysis

- ST normally is isoelectric
- Depression >1mm consider ischemia (area 1 on slide)
- Elevation: transmural ischemia or infarct

1. ST segment
2. PR point (isoelectric)
3. J point (end of QRS complex)
4. ST point
5. ST deviation from PR point
Sedative-Hypnotics
Sedative Agents
(General Considerations)

- No “best” sedative agent
- Any agent given in sufficient dosage can produce any level of sedation
- Intravenous dosing is more predictable than intramuscular or oral dosing
Sedative Agents (General Considerations)

- Avoiding adverse reactions:
  - Establish a desired endpoint for your titration – what are you trying to achieve? For example, sleepy but responsive to a command to open the eyes
  - Wait until full effect is evident (i.e. slowly titrate to effect) before administration/redosing of additional medications
  - As an example, for midazolam, titrating to an endpoint of slurred speech reliably yields amnesia
Sedative Agents
(General Considerations)

• Adverse reactions are more common with:
  – Hepatic or renal insufficiency
  – Decreased cardiac or respiratory function
  – Obesity
  – Sleep Apnea
  – Concurrent use of other sedating agents (e.g., anticonvulsants or antihistamines)
Benzodiazepine Effects

- Anxiolysis/Sedation/Hypnosis
- Produce anterograde amnesia
- Minimal respiratory depression if given alone at normal sedative ranges
- Anti-convulsant
- Anti-spasmodic
Diazepam

- Painful IV injection
- Relatively fast onset
- Increased response to a given dose or prolonged duration of action occurs with
  - Liver disease
  - Renal failure
  - Hypoalbuminemia
  - Patients taking cimetidine
  - Elderly patients
  - Very long elimination half life and active metabolites

- Effects
  - Airway compromise at >0.3 mg/kg
  - Cardiovascular depression at >0.5 mg/kg
  - Somnolence within 0.5 - 1 hr and up to 6-8 hrs after PO dose
Midazolam (Versed)

- Water soluble – does not burn on injection
- Very fast onset
- Increased response to a given dose or prolonged duration of action occurs with:
  - Liver disease
  - Renal failure
  - Hypoalbuminemia
  - Patients taking ketoconazole, erythromycin, diltiazem, verapamil, and cimetidine
  - Elderly patients
- Short acting: normal mentation after 4 hrs.
- AGENT OF CHOICE FOR PROCEDURAL/TEST SEDATION

- Effects:
  - 2-3 times more potent than diazepam
  - More potent amnestic agent than diazepam
  - Airway compromise (often mimics respiratory depression) at >0.15 mg/kg
  - Cardiovascular depression at >0.2 mg/kg
Lorazepam (Ativan)

- Slow onset (10 minutes)
- Increased response to a given dose or prolonged duration of action occurs with:
  - Liver disease
  - Renal failure
  - Hypoalbuminemia
  - Patients taking clozapine and haloperidol
  - Elderly patients
- Long acting
- FDA says to avoid in outpatient endoscopic procedures

**OUR SUGGESTION IS NOT TO USE THIS DRUG FOR PROCEDURAL OR TEST SEDATION**
### Sedative Dosing

<table>
<thead>
<tr>
<th></th>
<th>Dose</th>
<th>Times</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diazepam</strong></td>
<td><strong>IV</strong>: 1-5 mg titrate</td>
<td><strong>IV Onset</strong>: 3-5 min</td>
</tr>
<tr>
<td></td>
<td><strong>PO</strong>: 1-5 mg titrate</td>
<td><strong>Duration</strong>: 2-8 hr</td>
</tr>
<tr>
<td></td>
<td><strong>IM</strong>: 1-5 mg titrate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max 5 mg for elderly and debilitated</td>
<td></td>
</tr>
<tr>
<td><strong>Midazolam</strong></td>
<td><strong>IV</strong>: 0.5-1 mg until desired effect is achieved.</td>
<td><strong>IV Onset</strong>: 1-2 min</td>
</tr>
<tr>
<td></td>
<td><strong>PO</strong>: 0.5-0.8 mg/kg</td>
<td><strong>Duration</strong>:</td>
</tr>
<tr>
<td></td>
<td><strong>IM</strong>: 0.02-0.1 mg/kg</td>
<td>IV PEAK EFFECT 5 min</td>
</tr>
<tr>
<td></td>
<td>Max 50 mg</td>
<td>IV Recovery 30-40 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV Total recovery 6 hr</td>
</tr>
</tbody>
</table>
Flumazenil

- Specific benzodiazepine competitive antagonist
- Should NOT be used to routinely reverse sedation
- May precipitate withdrawal syndrome if used in patients taking chronic benzodiazepines
- IV 8-15 mcg/kg onset 1-2 minutes, reverses CNS effects in 6-8 minutes
- Action is shorter than benzodiazepine effects. Therefore all patients who receive reversal agents must be monitored at least 2 hours after the last dose of flumazenil
- May cause:
  - seizures, cardiac arrhythmias and death
  - anxiety, dizziness, sweating and emotional liability
Flumazenil Dosing

<table>
<thead>
<tr>
<th>Flumazenil</th>
<th>Dose</th>
<th>Times</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>IV:</strong> 0.2 mg, may repeat up to 4 times q60 sec</td>
<td><strong>Onset:</strong> 1-2 min</td>
</tr>
<tr>
<td></td>
<td><strong>Max:</strong> 1 mg</td>
<td><strong>Peak in 6-8 min</strong></td>
</tr>
<tr>
<td></td>
<td>May repeat treatment regimens at 20 minute intervals with max 1 mg/dose and 3 mg/hr</td>
<td><strong>Duration:</strong> 30-60 min</td>
</tr>
<tr>
<td></td>
<td><strong>IM/SC:</strong> 0.1-0.2 mg, Max 1 mg</td>
<td></td>
</tr>
</tbody>
</table>
Analgesics
Opioid Definition

- All drugs, natural or synthetic, that bind to opiate receptors
  - Agonists: morphine, fentanyl
  - Agonists-Antagonists: nalbuphine
  - Antagonists: naloxone
- Opioid agonists increase pain threshold by altering the perception of noxious stimuli
- Opioids are more effective if given before the stimulus occurs
Opioid CNS Effects

- Analgesia
- Sedation
- Euphoria, occasionally dysphoria
- Miosis (small pupils)
- Nausea and vomiting
- Depressed cough
Opioid Cardiovascular Effects

- Bradycardia
- Hypotension
- Histamine release (morphine)
Opioid Respiratory Effects

- Dose dependent respiratory depression: decreased respiratory rate
- Increased CO2 retention
- Decreased cough reflex
- Bronchospasm due to histamine release (morphine)
Other Opioid Effects

- Urinary retention
- Chest wall rigidity (may make ventilation difficult)
- Miosis
- Biliary tract spasm
- Pruritus
- Decreased GI motility (delayed gastric emptying, ileus and constipation)
Opioid Overdose

- Signs and symptoms
  - Respiratory depression
  - Hypotension
  - Loss of consciousness

- Treatment
  - Ventilatory support
  - Intravascular volume
  - Naloxone titration
Morphine

- Naturally occurring opioid
- Lipid insoluble: slow onset
- Hepatic metabolism
- 15% excreted unchanged by kidney
- Causes histamine release: bronchospasm and hypotension
Morphine

- Decreased metabolism in liver failure
- Decreased excretion of morphine and its active metabolites in renal failure (increased effects and present up to 7 days)
- Larger effect in the elderly for a given dose
Meperidine (Demerol)

- 1/10 potency of morphine
- 90% hepatic metabolism
- Metabolite normeperidine can cause seizures with prolonged (days) use. This risk is increased if there is renal failure
Fentanyl

- 75-100 times more potent than morphine
- Highly lipid soluble:
  - Faster analgesic effect
  - Faster onset of respiratory depression
- Short acting
- End of action unrelated to liver or renal function
Opioid Dosing

<table>
<thead>
<tr>
<th>Drug</th>
<th>Adult Dosing</th>
<th>Onset/Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine sulfate</td>
<td>IV: 1-2 mg increments Max 15-20 mg</td>
<td>Onset: 3-5 min Peak: 10-15 min</td>
</tr>
<tr>
<td>Meperidine</td>
<td>IV: 10 mg increments Max 50-150 mg</td>
<td>Onset: 3-5min Peak: 10-15 min</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>IV: 0.5 ug/kg increments Max: 2 ug/kg</td>
<td>Onset: 1-3 min Peak: 3-5 min</td>
</tr>
</tbody>
</table>

- Titrate to Effect
- Decrease Doses 25% with Benzodiazepines
Opioid Dosing Caveats

- Maximum doses are for those not on chronic opioids
- Titrate to effect at all times
  - Wakefulness
  - Respiratory rate
  - Level of Analgesia
- Must make sure that treating “pain” is not treating hypoxemia induced combativeness
- THIS IS A COMMON CAUSE OF DEATH IN SEDATION ANALGESIA
Opioid Drug Interactions

- Additive CNS depression when combined with other CNS active agents
- Vagolytic drugs counteract bradycardia
- MAO inhibitors and tricyclic antidepressants increase duration of action, respiratory depression and incidence of seizures
- Meperidine should not be given concomitantly with MAOIs
Opioid Antagonists: Naloxone

- Competitive antagonist at mu, kappa and sigma receptors, reversing all effects
- Titrate to effect
- Acts within 1-2 mins for 1 hr only
- May cause large sympathetic discharge
  - Severe hypertension and tachycardia
  - Pulmonary edema
  - Cardiac arrest
Opioid Reversal Agents

• Use with extreme caution in patients on chronic opioid therapy as may cause severe physical withdrawal syndrome
• Opioid effects may outlast reversal effects: the action of naloxone lasts 30-45 mins
• Patients receiving reversal should be monitored at least 3 hrs. after last dose
## Opioid Reversal Agents

**Reversal agents:** monitor patients at least 4 hours after administration

<table>
<thead>
<tr>
<th>Drug</th>
<th>Adult Dosing</th>
<th>Onset/Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naloxone</td>
<td>IV: 0.1 to 0.2 mg slow and titrate to response</td>
<td>Onset: 1-2 min, Duration: 30 min when given IV</td>
</tr>
</tbody>
</table>
Local Anesthetics
Local Anesthetics

- Local anesthetics (LA) produce a reversible conduction blockade of nerve impulses: sympathetic, motor and sensory
- If local anesthetics are used for a procedure with sedation-analgesia (SA) knowledge of their side effects and toxicity is required
- LA allergic reactions are rare
Types of LA

- **Amides**
  - Metabolism
    - Hepatic and Lung
    - Slower, more toxic
    - Caution in liver failure
  - Agents
    - Lidocaine
    - Mepivicaine
    - Prilocaine
    - Bupivicaine
    - Ropivicaine
  - Less allergenic

- **Esters**
  - Metabolism
    - Plasma hydrolysis
    - Faster, less toxic
    - Caution if atypical plasma cholinesterase
  - Agents
    - Procaine
    - Chloroprocaine
    - Tetracaine
    - Cocaine
  - More allergenic (related to PABA, found in cosmetics and sunscreen)
# LA Toxicity: Maximum Safe Doses

<table>
<thead>
<tr>
<th>LA Class</th>
<th>mg/kg</th>
<th>70 kg Adult (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Procaine</td>
<td></td>
<td>500</td>
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<tr>
<td>• Chloroprocaine</td>
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<td>• Tetracaine (topical)</td>
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<td>• Lidocaine</td>
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<td>• Mepivicaine</td>
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<td>• Prilocaine</td>
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<td>• Bupivacaine</td>
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<td>• Ropivacaine</td>
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<td>200</td>
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LA with Epinephrine

- Allows a higher safe dose of LA
- Only commercially mixed LA with epinephrine is recommended!
- Epi mixture causes vasoconstriction resulting in longer duration, less bleeding and less systemic LA absorption and toxicity
- Epi mixture has a slower onset than plain LA
- Mixing epi with lidocaine increases max dose from 4 mg/kg to 7 mg/kg
Theory of Systemic LA toxicity

- Excessive absorption of LA can cause toxic plasma levels
- Absorption is determined by
  - Total dose injected
  - Vascularity and blood flow of area injected
  - If epi mixture is used or not
Systemic LA Toxicity: Central Nervous System (CNS)

- CNS signs/symptoms of LA toxicity include:
  - Restlessness, vertigo and tinnitus
  - Slurred speech and peri-oral numbness/tingling
  - Ultimately apnea, tonic-clonic seizures, coma
Systemic LA Toxicity: Central Nervous System (CNS)

- Treatment of LA toxicity includes:
  - Supportive Therapy
    - Airway, Breathing, Circulation
    - Supplemental O2, bag/mask ventilation, check blood pressure and heart rate
    - Consider calling for help early, including the code team or anesthesia for intubation
  - Consider treatment of seizures with barbiturates or benzodiazepines (e.g., midazolam) if not self-limited
Systemic LA Toxicity: Cardiovascular

- Cardiovascular signs/symptoms of LA toxicity include:
  - Severe hypotension due to vascular dilation and cardiac depression
  - Cardiac dysrhythmias due to decreased automaticity and disordered conduction
  - Bupivicaine is the most cardiotoxic local anesthetic
Additional Complications when using LA mixed with Epinephrine

- Epinephrine toxicity can manifest as tachycardia, dysrhythmias and hypertension
- Epinephrine mixtures can cause complications in patients with angina, dysrhythmias, hypertension, or utero-placental insufficiency
- NEVER inject in areas with no collateral blood flow - digits, penis, nose, etc.
Sedation-Analgesia Recovery
The Recovery Phase

- From termination of procedure or test until discharge criteria are met
- The period immediately post-procedure is the most dangerous time. Stimuli have ceased and sedation-analgesia is unopposed by pain.
- All hospital areas that practice sedation-analgesia must have a post-procedure recovery area with all equipment and monitoring as required for SA available
- The procedure room may also be a recovery area
Post-procedural Monitoring I

- Continuous attendance by someone with current privileges in sedation-analgesia must occur until discharge
- Continuous monitoring and documentation every 15 minutes of:
  - BP, HR and rhythm
  - SpO2 and oxygen supplementation
  - RR
  - level of consciousness (I-IV)
Post-Procedural Monitoring II

- The frequency of VS must adjust to patient status. Documentation every 5 min is resumed and the rescue procedure is initiated if any of the following are noted:
  - Decreased level of consciousness (Level 3)
  - Respiratory depression (RR < 10)
  - SpO2 <90% despite supplemental oxygen
Post-Procedure Transportation

- In transporting patient from procedure room to recovery area:
  - Administer supplemental O2
  - Privileged SA provider will accompany patient
  - Report shall be given to the accepting nursing staff and between attendings:
    - Patient history, procedure, sedation administered and any complications or side effects
Patient Transportation

• If patient is transferred to another area the same standards of care and monitoring apply until discharge criteria is met
• Patient may be admitted to a monitored hospital unit with the same standards and availability of equipment and personnel
Discharge Criteria

- Patient is awakened by verbal commands
- Patient is appropriately oriented
- Recovery of protective reflexes
- VS are stable: pre-sedation baseline
- PAR score of 9-10 or equivalent to pre-sedation
- SpO2 95% or patient achieves baseline SpO2 value on room air
- A “patient discharge to floor/home” order is required by a licensed independent practitioner to discontinue monitored care
Discharge Criteria: Outpatients

- Able to tolerate PO intake and ambulate independently or at pre-procedure status
- Discharge patient in the care of a responsible adult
- Verbal and written information regarding activity level, medications, sign/symptoms of complications and course of action in the case of complications or an emergency
- This must be documented in the medical record
Discharge Criteria: Variants

- Any case requiring unexpected hospital admission or upgrade to a special monitored unit (PARU, ICU, stepdown) requires documentation of events and a written plan by the attending responsible for the sedation.
- This increased level of needed care must be documented in Quantros as an incident report and on the Outcomes Evaluation Tool completed for each sedation case.
SA Respiratory Complications I

- Respiratory failure/arrest
  - Excessive sedation may cause respiratory failure/arrest
  - Monitoring hallmarks include: decreased respiratory rate, decreased tidal volume, hypoxia, cyanosis, cardiac arrhythmias, restlessness, agitation and even seizures
  - CO2 retention can potentiate the respiratory depression of sedative drugs
  - Treatment includes: OXYGEN, stimulation, assisted ventilation (mask/intubation), consideration of reversal agents, initiation of the rescue protocol
SA Airway Complications I

- Aspiration
  - Nausea, vomiting and decreased protective airway reflexes can occur during SA
  - Pulmonary aspiration of gastric contents leads to a chemical pneumonitis
  - Loose teeth may cause foreign body aspiration
  - Treatment is supportive: supplemental O2, intubation-ventilation if required and patient placement in a monitored environment
  - The risk may be decreased with administration of a non-particulate antacid (e.g., Bicitra) and gastric emptying therapy (metaclopramide) drugs immediately prior to sedation/analgesia or acid reducing drugs (proton pump inhibitors, ranitidine, etc.) six hours before
SA Airway Complications II

- **Airway Obstruction**
  - Sedation causes muscle relaxation, including oropharyngeal muscles, leading to airway collapse and lack of effective ventilation (inadequate tidal volume)
  - Although the patient frequently “appears” to be breathing while chest and abdominal muscles contract there is little or no air movement. Monitor respiratory rate AND quality. If in doubt, look and feel (hand in front of mouth and nose to feel quantity of air movement)
  - Treatment: jaw thrust, oral/nasal airway, consider positive pressure ventilation
SA Airway Complications III

• Laryngospasm
  – Stimulation of the lower airway with secretions/foreign bodies can cause the vocal cords to close, allowing no ventilation. Patient may again “appear” to breathe due to abdominal/chest muscle contraction with no effective volume exchange
  – Treatment includes positive pressure ventilation and initiation of the rescue procedure
SA Airway Complications IV

- Negative Pressure Pulmonary Edema
  - During upper airway soft tissue obstruction or laryngospasm, the patient attempts to inspire with increasing force. This may expose the lung to excessive negative pressure forces, drawing fluid into the alveoli. Clinically, the patient presents with acute hypoxemia and non-cardiogenic pulmonary edema.
  - Treatment includes: supplemental O2, fluid restriction, diuretics, and possibly mechanical ventilation with PEEP.
SA Cardiovascular Complications

- **Hypotension**
  - 30% drop in baseline BP
  - Causes include
    - Excessive sedation
    - Cardiac: pump/rhythm failure
    - Hypovolemia
    - Acidosis: respiratory/cardiac
    - Sepsis related to procedure
    - Drug reaction
  - In healthy adults, initial treatment is volume resuscitation 10ml/kg balanced salt solution over 10 minutes
  - Consult supervising physician
SA Cardiovascular Complications

- Hypertension
  - 30% increase in baseline BP
  - Causes include
    - Pain: sympathetic discharge
    - Respiratory depression: CO2 retention
    - Fluid overload
    - Urinary retention
    - Drug related (LA with epi)
    - Anti-hypertensive drug withdrawal (NPO)
  - Treatment best addresses underlying etiology
  - If needed or if BP excessive (>200mmHg) pharmacologic control of BP
  - Consult supervising physician
SA Neurological Complications I

- Pressure on nerves due to positioning may cause neurologic deficits most commonly in the distribution of ulnar, median and peroneal nerves. Elderly, obese and diabetic patients are at higher risk of nerve injury.
- Any pre-existing neurologic deficits must be documented in the pre-sedation evaluation
- Eye protective reflexes are decreased. Eyes must be protected and clear from foreign bodies to avoid corneal abrasions and blindness due to pressure
Nausea and Vomiting

• Sedation-analgesia can cause nausea and vomiting. Patients at risk include those with:
  – History of nausea, motion sickness or chemotherapy
  – Younger patients and female patients
  – Procedures on gonadal organs, pharynx, or vestibulococular system
Nausea and Vomiting

- Treatment may be therapeutic or prophylactic
  - Single therapy most effective - 5 HT3 blockers like granisetron (Kytril) 0.1mg or ondansetron (Zofran) 4 mg
  - Other antiemetics: phenothiazines (promethazine = phenergan, initial dose 6.25 mg), anticholinergics, butyrophenones, benzamides (Tigan), steroids
  - Gastric antacids/prokinetics: H2 receptor blockers, proton pump inhibitors, metoclopramide, cisapride
Sedation-Analgesia Airway Rescue Procedure
Rescue Procedure Protocol

• Any emergency occurrence from initiation of sedation-analgesia until discharge criteria are met:
  – loss of protective reflexes
  – lack of patient purposeful response to repeated verbal/pain stimuli (unanticipated level III or IV sedation)
  – Unstable vital signs (new dysrhythmias, hypo - hyper - tension, respiratory failure, low SpO2 despite supplemental oxygen, etc.)
Treatment of Respiratory Compromise

• The following should be done in the event that a patient undergoing moderate sedation unexpectedly loses his or her ability to independently maintain ventilation:
  – First, stimulate the patient. Discontinue the procedure, call for help, alert the attending overseeing the care
  – Provide jaw lift and provide supplemental oxygen via oxygen mask
  – If still not breathing, ensure there is an open airway and bag-valve-mask ventilate. Use nasal or oral airways if necessary
  – Consider reversal Agents
Opening Airway
Head Tilt-Chin Lift
Opening Airway
Jaw Thrust Without Head Tilt
Opening Airway Oral Airways
Oral Airway Sizing

- The proper length of the airway should approximate the distance between the chin and the angle of the jaw
Opening Airway
Inserting Oral Airway
Opening Airway
Inserting Oral Airway

• The oral airway works by separating the tongue and the back of the throat. Use a tongue depressor to position the oral airway behind the tongue. DO NOT simply push the oral airway into the mouth. Doing so will merely exacerbate the airway obstruction.
During Rescue, the Qualified Sedation-Analgesia Personnel Must:

- Stay with patient and halt the procedure
- Notify responsible attending immediately
- Begin interventional measures: airway, breathing, circulation
- Initiate ACLS as needed
- Return to documentation of every 5 minutes VS
- Consider reversal agents
- Activate the center’s code blue system or notify anesthesia services for assistance as required

- CALLING FOR HELP IS NOT A SIGN OF WEAKNESS
Sedation-Analgesia Quality Improvement
Sedation Analgesia Credentialing

For New Credentialing

- Completion of the Sedation Analgesia Course and satisfactory completion of the post-course test
- Completion of ASA video
- ACLS or PALS certification
- Completion of Physician Sedation/Analgesia Privileges form
- RN and ARNP completion of Adult Sedation/Analgesia Competency

For Renewal

Same as for new credentialing plus the following:

- Physician, dentist, oral surgeon completion of at least 10 sedation procedures over 2 years as documented in Pre Anesthesia Evaluation in EHR or Pre and Post Procedure Sedation/Analgesia form C-424Sp
- Completion of Physician Sedation/Analgesia Privileges form
- RN and ARNP completion of Adult Sedation/Analgesia Competency
Sedation Analgesia Credentialing

- Sedation analgesia course update includes:
  - Viewing the online course and ASA video
  - Receiving a passing score of at least 80% on the online test
Quality Management Database

- Qualified sedation-analgesia personnel must fill out the sedation analgesia QPS (Quality and Patient Safety) Sedation/Analgesia Form electronically for every SA case.
- Electronic form is located on the netportal/content directory (E-Form Index).
- Specific indicators must be monitored.
Continuous Quality Improvement

• This is based on a review of the data obtained from the QPS Sedation-Analgesia Form.
• When pre-determined adverse criteria are met, a review and corrective action must be undertaken.
Clinical Departments

- The Chairperson of the appropriate department is responsible for adherence of his or her staff to these guidelines.
- The Chairperson or his/her designee must conduct yearly quality assurance reviews of personnel and procedures.
Hospital Review

• A yearly report of the Outcomes Data will be presented in writing to the Chair of the Department of Anesthesiology
Clinical Events That Require Review

- Any patient requiring intubation
- SpO2 below 90% for over 5 minutes
- Any life-threatening variation of VS
- Intractable nausea or vomiting
- Any use of reversal agents

- Respiratory or cardiac arrest
- Seizure
- Anaphylaxis
- Unplanned admission to monitored units or hospital setting
- Any case where review is thought beneficial
Pre-Procedure Competency I

- Recognizes components of a history and physical
- Appropriate airway exam and assessment
- Identifies patient ASA status
- Addresses appropriate NPO status
- Recognizes potential cases requiring consultation
- Reviews and identifies plan with appropriate documentation
- Reviews consent and documents risk/benefit discussion
Procedure Competency II

- Knowledge of the pharmacology of drugs being used, including drug dose ranges and routes
- Understanding of the potential complications and possible interventions
- Identifies indications/dosages of reversal agents
- Ability to assess that all required equipment is present
Monitoring Competency I

- Demonstrates knowledge of appropriate monitors and required frequency of measurement
- Interprets monitoring data and intervenes appropriately
- Ability to adjust monitor alarms
- Demonstrates correct responses to alarms
- Correct evaluation of respiratory rate and effort
- Demonstrates airway rescue skills
Monitoring Competency II

- Ability to describe/score/document sedation levels
- Demonstrates knowledge in patient positioning and use of side rails
- Demonstrates knowledge of restraint policy
- Ability to recognize need to rescue and the proper procedure to follow
- Ability to document preprocedure, postprocedure and discharge PAR scores
- Appropriate use of:
  - Assessment Form
  - Sedation Monitoring Form
  - Outpatient Discharge Form
Post-Procedure Competency

- Able to identify discharge criteria
- Knows steps to follow when discharge criteria not met
- Documents correctly discharge information
- Verify patient/companion’s comprehension of discharge orders
- Knowledge of use of Outcome Evaluation Tool
QPS Sedation/Analgesia Form

- QPS Sedation/Analgesia Form must be filled out by the qualified monitoring health care professional
- The data from these forms will be the source for patient care improvement and serve for review on re-credentialing for SA
- At least 10 procedures must be done over 2 years for renewal of SA privileges
QPS Sedation Analgesia Form

• To access form:
  – Open NetPortal Home Page
  – Content Directory
  – Forms@JET
  – Electronic Forms
  – QPS Sedation Analgesia
Click on the link below to watch the video.

**Sedation and Analgesia for Non-Anesthesiologists Video**

This is a mandatory requirement to receive Certificate of Completion.
References

- Centers for Medicare and Medicaid Services. (2009, December 11). Hospital interpretive guidelines: Policy templates and implementation forms. CMS 482.52, 482.52 (a), (b), and (c).
- Joint Commission. (2008, January). Operative or other high-risk procedures and/or the administration of moderate or deep sedation or anesthesia. Comprehensive Accreditation Manual for Hospitals. The Joint Commission on Accreditation of Healthcare Organizations.
- Sample Policy and Procedure Statements. ASA JCAHO Compliance Toolkit. www.asahq.org
- Standards For Basic Anesthetic Monitoring, Committee Standards and Practice Parameters, American Society of Anesthesiologists, approved by House of Delegates with effective date July 1, 2011.
- Statement on Granting Privileges for Administration of Moderate Sedation to Practitioners who are not Anesthesia Professionals. ASA House of Delegates on 10/25/05 and last amended 10/19/11.
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- Centers for Medicare and Medicaid Services. (2009, December 11). Hospital interpretive guidelines: Policy templates and implementation forms. CMS 482.52, 482.52 (a), (b), and (c).
- Continuum Depth of Sedation: Definition of General Anesthesia and Levels of Sedation/Analgesia. ASA House of Delegates on 10/13/99 and last amended 10/29/09. [www.asahq.org](http://www.asahq.org)
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