Goals of sedation:

1. Patient safety
2. Patient comfort

Conscious Sedation

- Minimal Sedation (anxiolysis)
- Moderate Sedation
- Deep Sedation
- Anesthesia

Minimal Sedation (Anxiolysis)

- Patients respond normally to commands
- Cognitive function and coordination may be impaired
- Ventilatory and cardiovascular functions are unaffected

Moderate Sedation

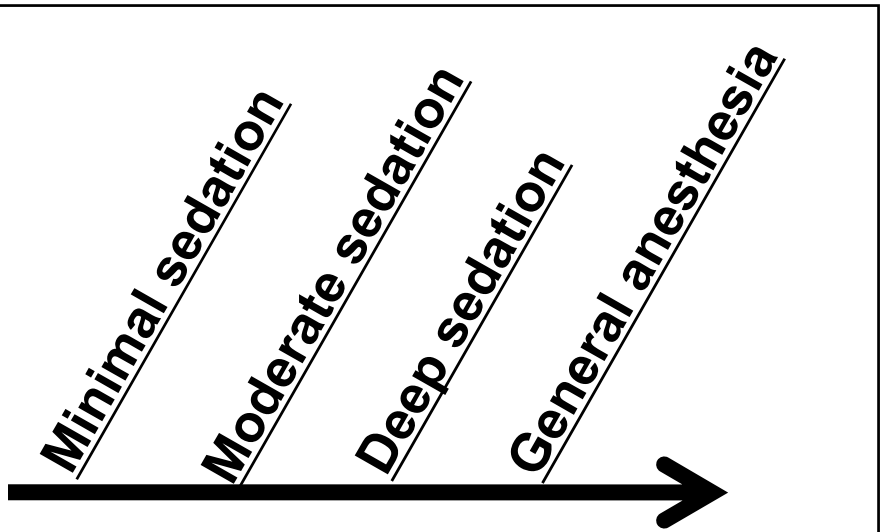
- Depressed consciousness
- Patients respond purposefully to verbal commands
- No interventions are required to maintain airway
- Spontaneous ventilation is adequate
- Cardiovascular function is usually maintained

Deep Sedation

- Depressed consciousness
- Patients cannot be easily aroused but will respond after repeated or painful stimuli
- Ventilatory function may be impaired
- May required airway assistance
- Spontaneous ventilation may be inadequate
- Cardiovascular function is usually maintained

General anesthesia

- Patients are not arousable even with painful stimuli
- Ventilatory function is often impaired
- Often require airway assistance
- May require mechanical ventilation
- Cardiovascular function may be impaired



The sedation plan must be clearly articulated among all members of the procedure team

Pre-sedation history

- Cardiac conditions
- Pulmonary conditions
- Renal disease
- Hepatic disease
- Endocrine disorders
- Head trauma
- Prior surgical or airway issues
- Prior intubation
- Stridor
- Snoring
- Sleep apnea
- Previous reactions to sedative medications

STOP-BANG

S – Snore: have you been told you snore
T – Tired: are you tired during the day
O – Obstruction: do you stop breathing at night
P – Pressure: do you have high blood pressure
B – BMI: is your BMI greater than 28
A – Age: 50 or over
N – Neck: circumference greater than 17 inches
G – Gender: male

<u>Yes to 3 or more = increased risk for sleep apnea</u>

Other key elements of the history:

- Current medications
- Allergies
- Pregnancy status
- Last oral intake
- Need for isolation for infections
- Alcohol, tobacco, and drug use

Physical examination

- Cardiac exam
- Pulmonary exam
- Ability to lay in the proper procedure position
- Airway assessment

ASA Physical Status

P1 - normal healthy patient
P2 – mild systemic disease
P3 – severe systemic disease
P4 – severe systemic disease that is a constant threat to life
P5 – moribund and likely to die
P6 – brain dead organ donor

When to consider anesthesia consult?

- Significant co-morbid disease
- Significant sleep apnea
- History of airway problems during sedation
- History of adverse reaction to sedation
- High risk airway
- Chronic opioid or sedative use

Coding and billing for sedation

- For the physician doing <u>both</u> the procedure and the sedation:
  - ✓ 99152: Initial 15 minutes of sedation services
  - ✓ 99153: Each subsequent 15 minutes of sedation services
- For the physician doing <u>only</u> the sedation:
  - ✓ 99156: Initial 15 minutes of sedation services
  - ✓ 99157: Each subsequent 15 minutes of sedation services

Airway Assessment

John S. Rogoski, DO
Assistant Professor
Clinical Anesthesiology
The Ohio State University Wexner Medical Center

Four Types of Difficulty

- Difficult to bag/mask ventilate/oxygenate
- Difficult laryngoscopy
- Difficult intubation
- Difficult to perform cricothyroidotomy

How Does the ASA Define the Difficult Airway?

- Difficult mask ventilation
  - Impossible for an unassisted anesthesiologist to prevent or reverse signs of inadequate ventilation during positive pressure mask ventilation

How Does the ASA Define the Difficult Airway?

- Difficult rigid laryngoscopy
  - It is not possible to visualize any portion of the vocal cords with conventional laryngoscopy
- Difficult intubation
  - proper insertion of an endotracheal tube requires more than 3 attempts or greater than 10 minutes

Causes of Difficulty

- Anatomical
  - Obesity
  - Short neck
  - Protruding teeth, long high arched palate
  - Receding mandible
  - Decreased distance between occiput and spinous process
  - Increased alveolar-mental distance

Causes of Difficulty

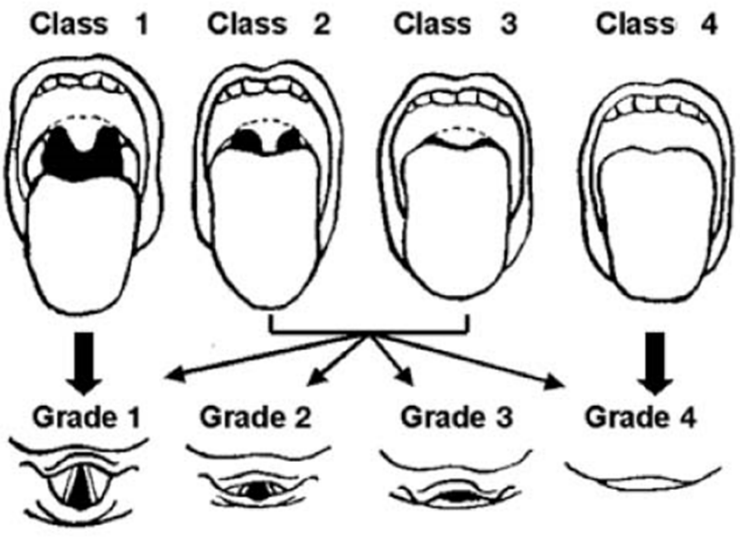
- Acquired
  - Acute neck swelling: trauma, infection, post-operative bleeding
  - Restricted jaw opening: Trismus, fibrosis, rheumatoid arthritis, mandibular fracture
  - Restricted neck movement: osteoarthritis, scarring, C-spine tumor, ankylosing spondylitis

Predicting Difficult Bag & Mask Ventilation

- B - bearded
- O - obese /obstetric
- N - no teeth
- E - elderly
- S - snores/sleep apnea

Predicting Difficult Intubation Mallampati Classification

- Class 1: view of the entire posterior oropharynx to the bases of the tonsillar pillars
- Class 4 : no view of the posterior oropharynx or uvula



Korean J Pediatr. 2010 October; 53(10): 863–871.
Published online 2010 October 31

Predicting Difficult Intubation 3 - 3- 2 Rule

- 3 finger mouth opening
- 3 fingers mentum to hyoid distance
- 2 fingers hyoid to thyroid

Predicting Difficult Intubation

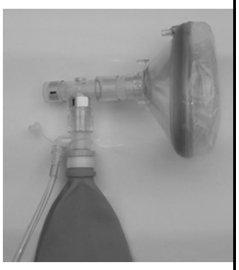
- Review medical record, history
- Assess
  - teeth especially protruding incisors
  - patent nares
  - open mouth & extend tongue (mallampati)
  - protrude mandible
  - thyromental distance, submental space
  - neck - short, thick ?, overall mobility & sniffing position
  - body habitus

Video of Airway Examination

Airway Management

Supplemental Oxygen

- Nasal cannula
- Simple mask
- Non-rebreather mask

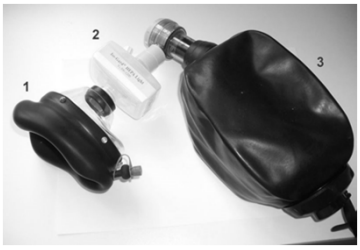


Airway Support

- Jaw thrust
- Nasal airways
- Oral airways

Bag / Mask Ventilation

- Technique dependent
- Mask seal essential
- 2 are better than 1
- Incorporate jaw thrust
- Nasal / Oral airways
- Assist spontaneous ventilation



Video of Airway Maneuvers

Before the procedure

- There must be signed written consent for:
  - The procedure
  - The sedation
- If 2 procedures are planned, get consent for both before giving sedation
- A “time-out” must be performed

Q 5 minutes during the procedure:

- Level of consciousness
- Blood pressure
- Oxygen saturation
- Respiratory rate
- Cardiac rhythm (only required in patients with known heart disease)

Monitoring every 15 minutes until:

- Patient is awake, alert, and oriented
- Recovered protective reflexes
- Vital signs returned to normal
- Oxygen saturation > 95% or at baseline

Post-procedure transport:

- Accompanying personnel trained in sedation monitoring
- Pulse oximeter
- Supplemental oxygen
- Ventilation equipment
- Nasal and/or oral airways
- Emergency drug supplies
- Cardiac monitor (in patients with heart disease)

Post-procedure discharge:

- Instruction sheet
  - No driving
  - No alcohol or sedatives
  - No operating machinery
  - Phone number for questions
- A responsible adult to accompany (taxis do not count!)

Pharmacology of Sedatives and Reversal Agents

Mary Beth Shirk, PharmD, RPh
Clinical Associate Professor
The Ohio State University College of Pharmacy
Specialty Practice Pharmacist, Emergency Medicine
The Ohio State University Wexner Medical Center

Agents for Procedural Sedation

- Opioids
- Benzodiazepines
- Etomidate
- Ketamine
- Methohexital
- Propofol
- Dexmedetomidine

Opioids

- Class II Controlled Substances
- Mu receptor agonists
  - ✓Fentanyl
  - ✓Hydromorphone
  - ✓Morphine
  - ✓Meperidine
- Hepatic metabolism with varying t ½

Opioids
Adverse Effects

- Respiratory depression
- Hypotension
- Miosis
- Decreased GI motility
- Urinary retention

Opioids
Estimated IV Potency

- Fentanyl 75 - 100 ***micrograms***
- Hydromorphone 1.5 mg
- Meperidine 75 mg
- Morphine 10 mg

Fentanyl

- Phenylpiperidine opioid agonist
- Preferred opioid for procedural sedation
- Precautions
  - ✓ Skeletal muscle and chest wall rigidity
    - Dose and administration rate related
    - Reversible with naloxone
  - ✓ Bradycardia
- Black box warning with CYP3A4 inhibitors

Benzodiazepines

- Class IV Controlled Substances
- GABA and Benzodiazepine agonists
  - ✓ Midazolam
  - ✓ Lorazepam
  - ✓ Diazepam
- Hepatic metabolism with varying t ½

Benzodiazepines
Adverse Effects

- Respiratory depression
- Hypotension
- Paradoxical reactions
- Nausea/vomiting
- Hiccoughs

Benzodiazepines
Estimated Potency

- **Diazepam 5 mg**
- **Lorazepam 1 mg**
- **Midazolam 2 mg**

Midazolam

- **Preferred BZD for procedural sedation**
- **CYP3A4 substrate**
- **Elimination t ½ prolonged**
  - ✓**CHF**
  - ✓**Renal function impairment**
  - ✓**Hepatic function impairment**
  - ✓**Obesity**
  - ✓**Elderly**

Etomidate

- Not currently controlled substance
- Nonbarbiturate benzylimidazole hypnotic
- 0.1 – 0.3 mg / kg IVP *over 30-60 seconds*

Etomidate

- Inhibits 11-β hydroxylase
- Blocks cortisol production
- Myoclonus (up to 33%)
- Injection site pain (30-80%)
  - ✓ Propylene glycol
- Minimal effect on hemodynamics
- Decreases ICP and seizure threshold

Ketamine

- Class III Controlled Substance
- NMDA receptor antagonist and PCP derivative
- Analgesic properties appealing
- IM or IV administration
- 0.5 – 2 mg/kg IVP *over at least 60 seconds*

Ketamine

- **Respiratory drive maintained**
- **Three concentrations available**
  - ✓**10 mg/mL**
  - ✓**50 mg/mL**
  - ✓**100 mg/mL (dilute if administered IV)**

Ketamine

Emergence reaction (12 - 50%)

- ✓Severity varies
- ✓Less common in < 15 yrs and > 65 yrs
- ✓Less frequent with IM administration
- ✓Minimize verbal, tactile, visual stimulation during recover
- ✓?pretreat with BZD or butyrophenone

Ketamine

- Emergence reaction (12- 50%)
- Hypersalivation ? pretreat?
- Nystagmus
- Increases ICP/IOP
- Minimal affect on BP/HR or increase
- Increased skeletal muscle tone

Methohexital

- **Class IV controlled substance**
- **Ultrashort acting IV barbiturate anesthetic**
- **pH of 1% solution is 10-11**
- **Contraindicated in porphyria**
- **Hypotension**
- **Respiratory depression**
- **Dose 0.25 – 1 mg/kg *at <10mg/5 seconds***
- **500 mg vials!**

Propofol

- Currently not controlled substance
- Patient can transition in unpredictable fashion to deeper level of sedation
- At OSUWMC physician must be credentialed for deep sedation
- Cardiovascular depressant – hypotension!

Propofol

- Contraindicated if
  - ✓egg allergy (?)
  - ✓soy intolerance (?)
  - ✓peanut allergy (?)
- 0.5 - 1 mg/kg IV *over 2-3 min* once then
  0.5 mg/kg *every 3-5 min* if needed

Dexmedetomidine

- **"relatively selective" alpha$_2$ adrenergic agonist**
- **FDA approval in 2008**
  - ✓ **Sedation of nonintubated patients prior to and/or during surgical and other procedures**
- **Limited published experience for procedural sedation (ablation, hysteroscopy, etc)**

Dexmedetomidine

- Hypotension 54% vs 30% (Placebo)
  - ✓ SBP<80 or DBP <50 or ⇩ >30% from baseline
  - ✓ 72% in ≥ 65yo patients (n=131)
- Bradycardia/sinus arrest 14% vs 4% (Placebo)
  - ✓ <40BPM or ⇩ >30% from baseline

Approaches Being Explored

- **Alternative routes of administration**
  - ✓ **Intranasal**
  - ✓ **Nebulized**
- **Alternative combinations of medications**
  - ✓ **Ketamine + Propofol**
  - ✓ **Ketamine + Dexmedetomidine**

	Onset (Min)	Peak (Min	Duration (Min)	Elimination
Fentanyl	Immed	Immed	30-60	Hepatic
Midazolam	1-2	2-2.5	30	Hepatic + (Renal)
Etomidate	<1	1	3-5	Hepatic
Ketamine	1	1	15-20	Hepatic Active Metabolite
Methohexital	Immed	Immed	10-20	Hepatic
Propofol	½	1	3-10	Hepatic
Dexmedetomidine			4 hours	Hepatic

	Amnestic	Analgesic	Anxiolytic
Benzodiazepines	+	-	+
Opioids	-	+	-/+
Etomidate	+	-	+
Ketamine	+	+	Dissociative properties
Methohexital	-	-	+
Propofol	+/-	-	+
Dexmedetomidine	+	+	+

Recommended Agents at OSUWMC

- **Midazolam ± fentanyl agents of choice**
- **Propofol limited to physicians credentialed in deep sedation**
- **Meperidine not for routine use**
- **Alternative agents used by physician experienced in their use**

Dose

- No universally safe & effective dose
- Variable dose requirements
  - ✓ Age (especially >65 yrs)
  - ✓ Weight
  - ✓ Medical condition
  - ✓ Medication history
  - ✓ Previous requirements during procedures
  - ✓ Goal depth of sedation

Dose

- Combination agents have added risks/benefits
- TITRATE
  - ✓ Small incremental doses
  - ✓ *Sufficient time must elapse* between doses to evaluate effect of previous dose
  - ✓ Time between doses longer for nonintravenous routes

Fentanyl: Typical Initial Regimen*

- **25-100 micrograms SLOW IVP**
- **IVP over *at 1 - 2 minutes***
- **Dilute to permit slower administration**
- ***Additional doses in 2 minutes if needed***
- **Administer prior to midazolam if using combination regimen**

***Dose is highly variable**

Midazolam: Typical Initial Regimen*

- **0.2 – 2.5 mg IVP**
- **IVP over *at least 2 minutes***
- **Dilute to permit slower administration**
- ***Additional dose(s) in 3 minutes* if needed**
- **Administer after opioid if using combination regimen**

***Dose is highly variable**

JCAHO & Medication Administration During Procedures

- Sterile technique!
- Proper product labeling
  - ✓Label: drug name, strength, and amount
  - ✓Single individual process and immediate administration = no label
  - ✓Two individual process = product verification with vial and label

JCAHO & Medication Administration During Procedures

- Document waste of Controlled Substances
- Complete charting
  - ✓Medication
  - ✓Dose
  - ✓Route
  - ✓Time of administration
  - ✓Who administers

Reversal Agents

- Used to reverse sedatives or treat overdose
- Half lives can be shorter than sedative
- Can precipitate withdrawal symptoms
- May not completely reverse all complications of sedatives

Flumazenil

- Onset of action 1-2 minutes
- Half life 41-79 minutes
- Flumazenil use requires 90 min monitored recovery time
- Hepatic clearance

Flumazenil

- Adverse Effects
  - ✓ Seizures
  - ✓ Panic attacks and emotional lability
  - ✓ Withdrawal symptoms
  - ✓ Dizziness
- Reversal of Procedural Sedation
  - ✓ 0.2mg IVP q 1 min prn to MAX of 1mg
  - ✓ Repeat every 20 min as needed

Naloxone

- Opiate receptor antagonist
- Onset of action 2-3 minutes
- Half life 30-81 minutes
- Naloxone use requires 90 min monitored recovery time
- Duration of effect varies (45min – 4 hrs)
- Hepatic clearance

Naloxone

- **Dosing**
  - ✓ **0.1 – 0.2 mg IVP every 1-2 minutes**
  - ✓ **Doses up to 2 mg may be required**
  - ✓ **May need to redose if naloxone wears off before opiate**
- **Adverse Effects**
  - ✓ **Opiate withdrawal**
  - ✓ **Pulmonary edema**
  - ✓ **Acute hypertension and dysrhythmias**
  - ✓ **Seizures**

Moderate and Deep Sedation

Deep sedation

- Emergency medicine
- Pulmonary medicine
- Critical care
- Oral maxillary facial surgery
- Or demonstrated advanced airway expertise and intubation skill

Case #1: 50 year-old man undergoing screening colonoscopy

Case #2: 60 year-old woman with COPD exacerbation and respiratory failure requiring intubation

Case #3: 50 year-old man with HIV on anti-retroviral medications needs a colonoscopy

Case #4: 23 year-old undergoing dental procedure requires oxygen then develops bradycardia

Case #5: 21 year-old man with pneumothorax needs a chest tube

Case #6: patient with atrial fibrillation needs external cardioversion

Case #7: after TEE, patient develops cyanosis, headache, and SaO2 = 85%. Blood looks brown