بسم الله الرحمن الرحيم

# Scoring Systems in the ICU

- Severity of illness scoring systems are developed to evaluate delivery of care & provide prediction of outcome of groups of critically ill patients who are admitted to ICUs.
- Scoring systems consists of two parts: a severity score, which is a number (generally the higher this is, the more severe the condition) & a calculated probability of mortality.

# Scoring Systems in the ICU

- Scoring system as clinical decision support
- Severity scales important to predict
- Patient outcome,
- Comparing quality-of-care
- Stratification for clinical trials.
- Essential part of improvement in clinical decisions and in identifying patients with unexpected outcomes

# Types of Scoring Systems Commonly Used Adult ICU Scoring Systems

- First-day scoring systems
  - Acute Physiology and Chronic Health Evaluation (APACHE)
  - Simplified Acute Physiology Score (SAPS)
  - Mortality Prediction Model (MPM)
- Repetitive scoring systems
  - Organ System Failure (OSF)
  - Sequential Organ Failure Assessment (SOFA)
  - Organ Dysfunction and Infection System (ODIN)
  - Multiple Organ Dysfunction Score (MODS)
  - Logistic Organ Dysfunction (LOD)

# Severity scoring systems

- outcome risk prediction
- organ dysfunction scoring systems,
- Outcome risk prediction scoring systems can provide an assessment of disease severity and risk stratification between groups of patients and can assist clinicians in objectively quantifying individual patient disease severity, disease progression, and response to therapy. These tools can help nurses identify individuals requiring higher levels of nursing care and inform nursing workload and staffing decisions, which can positively impact care quality, care costs, and patient outcomes.

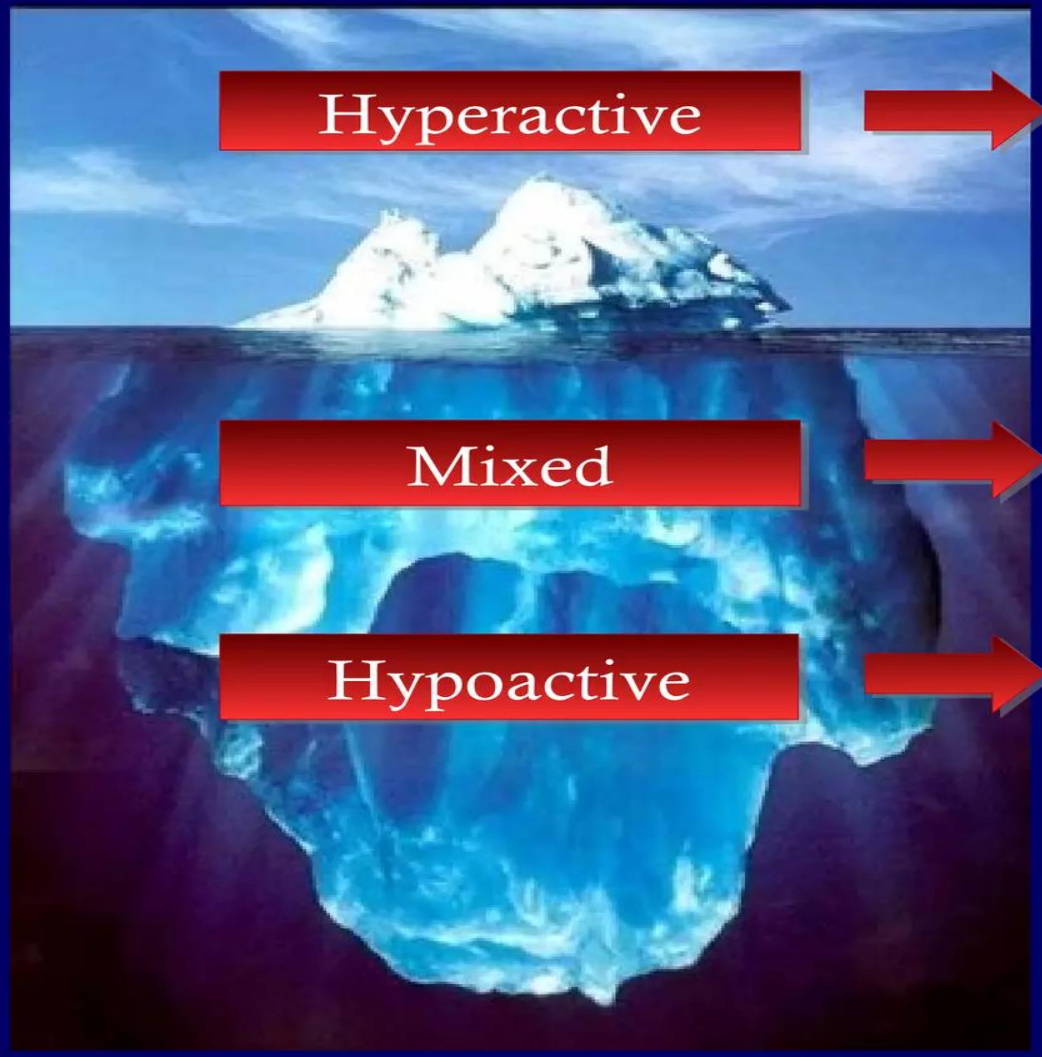
- Quality Considerations.
- Awareness of the strengths and limitations associated with ICU severity scoring system data provide critical care nurses engaged in evaluating ICU care processes, resource utilization, and ICU patient outcome data and quality control protocols that drive quality improvement and reduce health care costs.
- Research Considerations.
- Severity scoring system data are commonly used in clinical research and quality improvement studies

In summary, clinical severity scoring systems are commonly used in critical care and  these tools can inform mortality prediction and risk stratification, resource utilization, and optimization of patient outcomes. Critical care nurses, as valued members of the multidisciplinary care team, are exposed to the information provided by severity scoring systems in their practice and in their evaluation of research.

# Delirium

- Delirium, 'acute confusional state',
- 'toxic or metabolic encephalopathy', 'acute brain failure',
- Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria as an acute change in attention and awareness that develops over a relatively short time interval and associated with additional cognitive deficits such as memory deficit, disorientation, or perceptual disturbances. It is a common phenomenon, occurring in 20% to 70% of hospitalized patients.

# How is Delirium Categorized?




- **1.6% of cases, "ICU psychosis"**, agitation, restlessness, pulling lines and tubes emotional lability

- **54.1% % of cases**

- **43.5% of cases, "encephalopathy"**, often unrecognized, withdrawal, apathy, lethargy, decreased responsiveness, may be misdiagnosed as depression.
- Far more common, likely due to sedating medications

# Why does delirium matter?

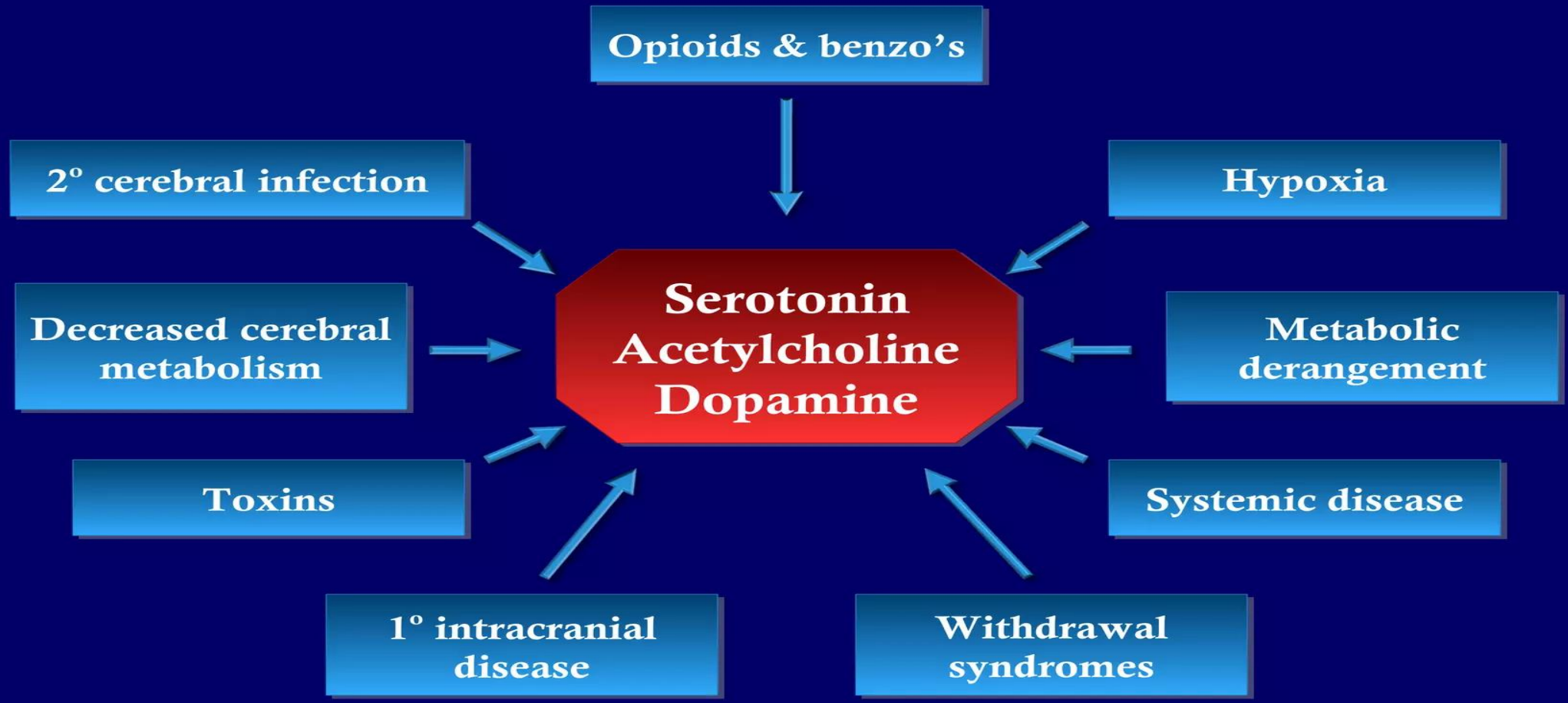
- Increased reintubation risk (OR=3)
- Increased ICU & hospital stay* (up to 10 days extra)
  - Each day in delirium increases risk of longer stay by 20%
- Increased mortality in ICU & out to 6 months** (OR=3)
  - Each day spent in delirium increases risk of death by 10%
- Increased ICU & hospital costs***
- 10-24% risk of long-term cognitive impairment
- Increased dementia risk
- Reduced functional status at 3 & 6 months

* Ely et al, Intensive Care Med 2001; 27: 1892-1900

** Ely et al, JAMA 2004; 291: 1753-62

*** Milbrandt et al, CCM 2004; 32: 955-62

# Why does delirium happen?



# Risk Factors for Delirium

- Older age
- Cognitive impairment
- Visual impairment
- Alcohol abuse
- Respiratory disorder
- Illness severity
- Terminal illnesses
- Comorbidity
- Infection
- Major surgery (e.g., complex abdominal, hip fracture, and cardiac surgery)

## Factors of critical illness

1. Acidosis
2. Anemia
3. Infection/sepsis
4. Hypotension
5. Metabolic disturbances
6. Respiratory disease
7. High severity of illness

## Iatrogenic factors

1. Immobilization
2. Medication (opoids, BDZ)
3. Sleep disturbances

## Drugs believed to cause or prolong delirium or confusional states*

| Analgesics |
| --- |
| Nonsteroidal anti-inflammatory agents |
| Opioids (especially meperidine) |
| **Antibiotics and antivirals** |
| Acyclovir |
| Aminoglycosides |
| Amphotericin B |
| Antimalarials |
| Cephalosporins |
| Cycloserine |
| Fluoroquinolones |
| Isoniazid |
| Interferon |
| Linezolid |
| Macrolides |
| Metronidazole |
| Nalidixic acid |
| Penicillins |
| Rifampin |
| Sulfonamides |

| Corticosteroids |
| --- |
| **Dopamine agonists** |
| Amantadine |
| Bromocriptine |
| Levodopa |
| Pergolide |
| Pramipexole |
| Ropinirole |
| **Gastrointestinal agents** |
| Antiemetics |
| Antispasmodics |
| Histamine-2 receptor blockers |
| Loperamide |
| **Herbal preparations** |
| Atropa belladonna extract |
| Henbane |
| Mandrake |
| Jimson weed |
| St. John's Wort |
| Valerian |

| Anticholinergics |
| --- |
| Atropine |
| Benztropine |
| Diphenhydramine |
| Scopolamine |
| Trihexyphenidyl |
| **Anticonvulsants** |
| Carbamazepine |
| Levetiracetam |
| Phenytoin |
| Valproate |
| Vigabatrin |
| **Antidepressants** |
| Mirtazapine |
| Selective serotonin reuptake inhibitors |
| Tricyclic antidepressants |
| **Cardiovascular and hypertension drugs** |
| Antiarrhythmics |
| Beta blockers |
| Clonidine |
| Digoxin |
| Diuretics |
| Methyldopa |

| Hypoglycemics |
| --- |
| **Hypnotics and sedatives** |
| Barbiturates |
| Benzodiazepines |
| **Muscle relaxants** |
| Baclofen |
| Cyclobenzaprine |
| **Other CNS-active agents** |
| Disulfiram |
| Cholinesterase inhibitors (eg, donepezil) |
| Interleukin-2 |
| Lithium |
| Phenothiazines |

* Not exhaustive, all medications should be considered.

UpToDate

# Diagnosis & monitoring

- Intensive Care Delirium Screening Checklist (ICDSC) and the Confusion Assessment Method for the ICU (CAM-ICU)
- Using ICDSC, each patient is assigned a score from 0 to 8; a cut-off score of 4 has sensitivity 99% and specificity 64% for identifying delirium

**The Intensive Care Delirium Screening Checklist**

| Checklist Item | Description |
|---|---|
| Altered level of consciousness[a] | |
| A | No response |
| B | Response to intense and repeated stimulation |
| C | Response to mild or moderate stimulation |
| D | Normal wakefulness |
| E | Exaggerated response to normal stimulation |
| Inattentiveness | Difficulty following instructions or easily distracted |
| Disorientation | To time, place, or person |
| Hallucination-delusion-psychosis | Clinical manifestation or suggestive behavior |
| Psychomotor agitation or retardation | Agitation requiring use of drugs or restraints, or slowing |
| Inappropriate speech or mood | Related to events or situation, or incoherent speech |
| Sleep/wake cycle disturbance | Sleeping <4 hours/day, waking at night, sleeping all day |
| Symptom fluctuation | Symptoms above occurring intermittently |
| Total score | 0 to 8 |

# Treating/Preventing delirium

- Monitoring
- Non-pharmacological interventions
- Reduction in deliriogenic medications
- Pharmacological interventions

- Treatment of the underlying cause
- Correction of potential electrolyte disturbances
- Removal of offending pharmacological agents
- Maintain proper sleep/wake cycles
- Manage pain
- Address sensory impairments (hearing, vision)
- Encourage family visits and frequent reorientation.
- Early mobilization
-

- Antipsychotics
- Dexmedetomidine
- Short-acting benzodiazepines (BDZs).

*Non-pharmacological interventions*

Behavioral strategies. reorientation useful in cooperative patients with delirium and patient and family training.

Mobilization. Early ICU mobility therapy can accelerate MV weaning, ICU length of stay, and delirium duration. Use of restraints. Careful use of soft restraints only if and after behavioral and pharmacological interventions fail if reasonably possible. The use of restraints should be used for the shortest possible time and should be focused to deter a specific behavior that is impeding the delivery of care.

# prevention

- A=Assess, prevent and manage pain
- B=Both Spontaneous Breathing Trials and Spontaneous Awakening Trials
- C=Choice of sedation and analgesia
- D=Delirium: assess, prevent and manage
- E=Early mobility and exercise
- F=Family engagement and empowerment
-

# Sedation in ICU

# ICU Sedation

- ICU sedation is a complex clinical problem
- Current therapeutic approaches all have potential adverse side effects
- Agitated patients are often hypertensive, increase stress hormones, and require more intensive nursing care

# The Need for Sedation

- Anxiety
- Pain
- Acute confusional status
- Mechanical ventilation
- Treatment or diagnostic procedures
- Psychological response to stress

# Goals of sedation in the ICU

- Patient comfort
- Control of pain
- Anxiolysis and amnesia
- Blunting adverse autonomic and hemodynamic responses
- Facilitate nursing management
- Facilitate mechanical ventilation
- Avoid self-extubation
- Reduce oxygen consumption

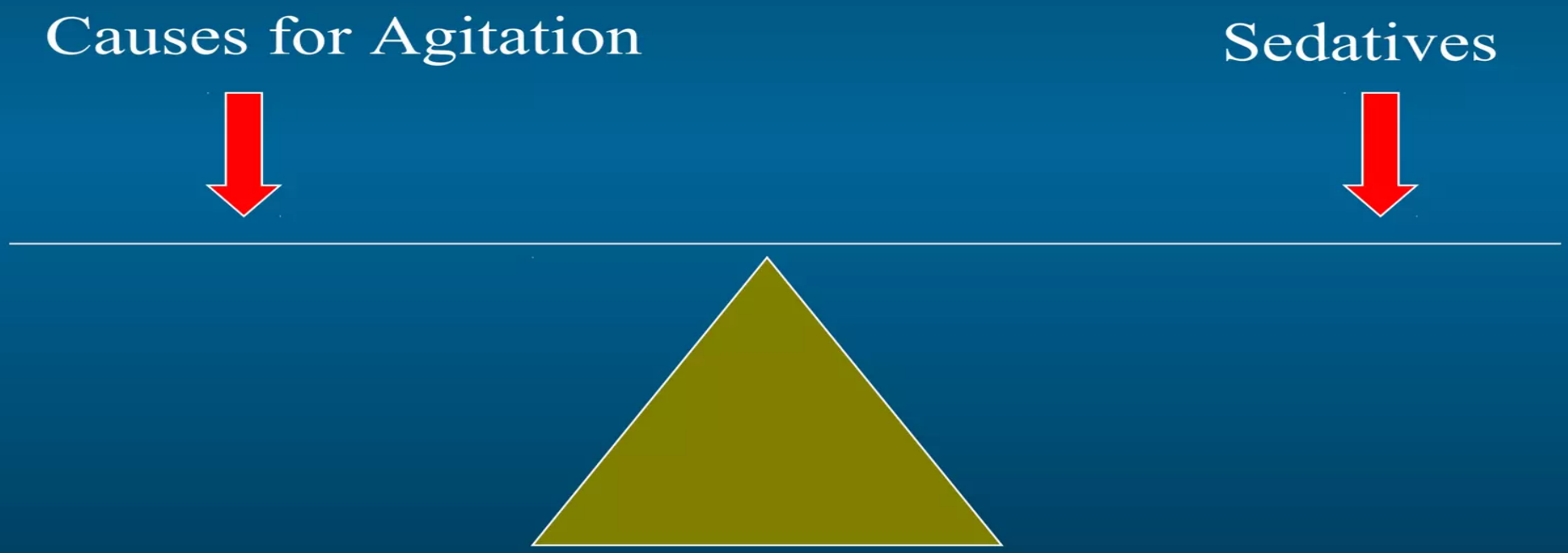
# Characteristics of an ideal sedation agents for the ICU

- Lack of respiratory depression
- Analgesia, especially for surgical patients
- Rapid onset, titratable, with a short elimination half-time
- Sedation with ease of orientation and arousability
- Anxiolytic
- Hemodynamic stability
- **The optimal level of sedation for most patients is that which offers comfort while allowing for interaction with the environment**

# The Challenges of ICU Sedation

- **Assessment of sedation**
- Altered pharmacology
- Tolerance
- Delayed emergence
- Withdrawal
- Drug interaction

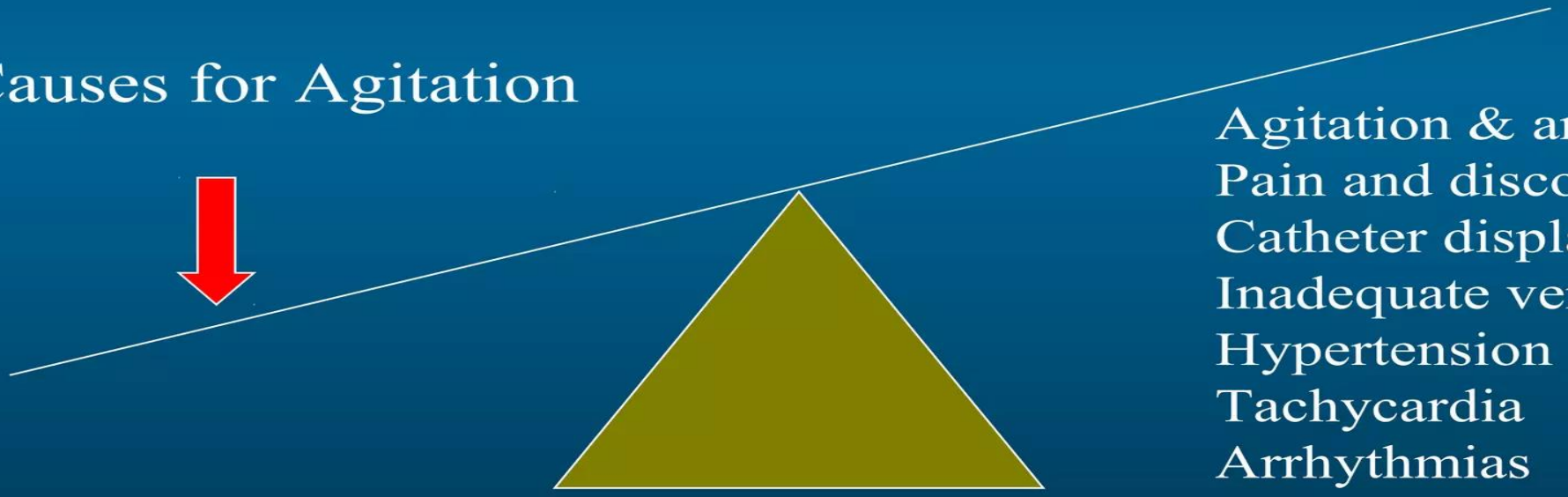
# Sedation



# Undersedation

Sedatives

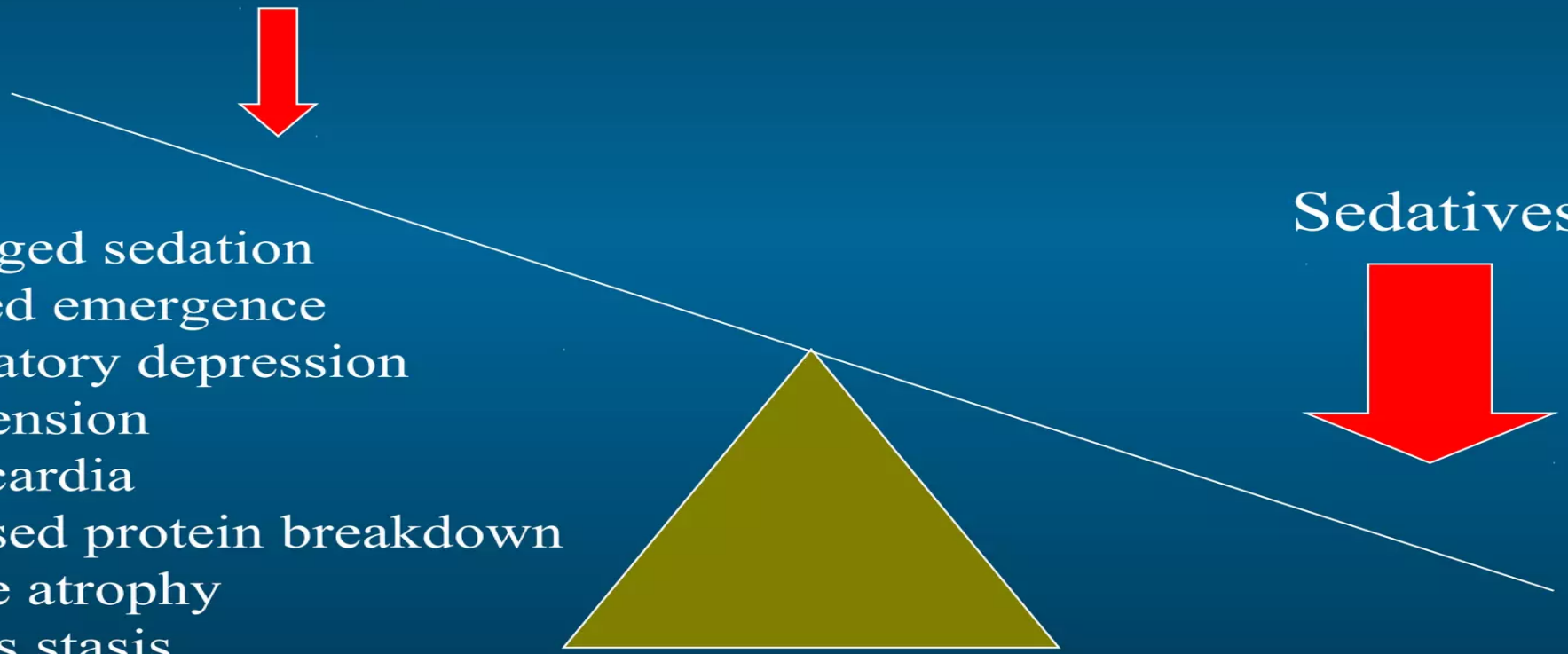
Causes for Agitation



Agitation & anxiety
Pain and discomfort
Catheter displacement
Inadequate ventilation
Hypertension
Tachycardia
Arrhythmias
Myocardial ischemia
Wound disruption
Patient injury

# Oversedation

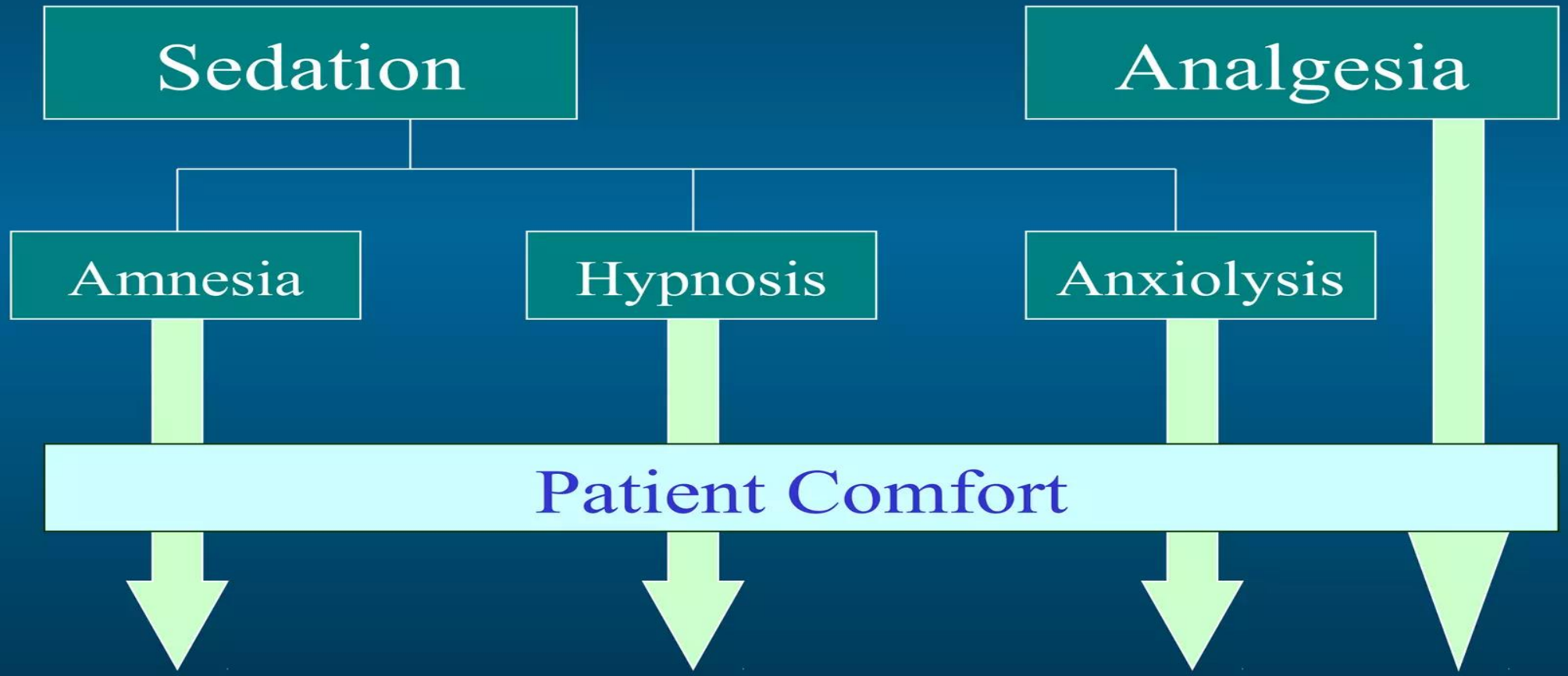
Causes for Agitation



Sedatives

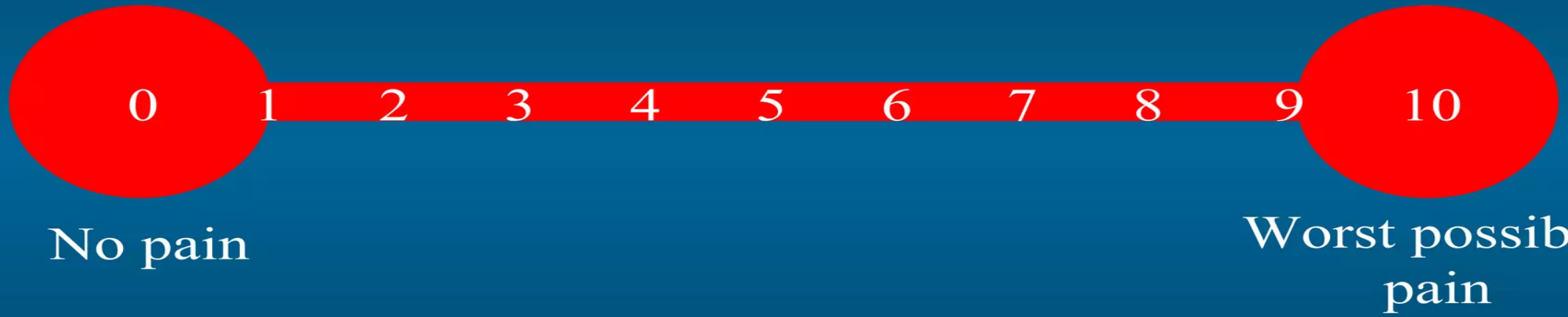
Prolonged sedation
Delayed emergence
Respiratory depression
Hypotension
Bradycardia
Increased protein breakdown
Muscle atrophy
Venous stasis
Pressure injury
Loss of patient-staff interaction
Increased cost

# Set Treatment Goal



# Assess Pain Separately

# Visual Pain Scales



# Signs of Pain

- Hypertension
- Tachycardia
- Lacrimation
- Sweating
- Pupillary dilation

# Principles of Pain Management

- Anticipate pain
- Recognize pain
  - Ask the patient
  - Look for signs
  - Find the source
- Quantify pain
- Treat:
  - Quantify the patient's perception of pain
  - Correct the cause where possible
  - Give appropriate analgesics regularly as required
- Remember, most sedative agents do not provide analgesia
- Reassess

# Nonpharmacologic Interventions

- Proper position of the patient
- Stabilization of fractures
- Elimination of irritating stimulation
- Proper positioning of the ventilator tubing to avoid traction on endotracheal tube

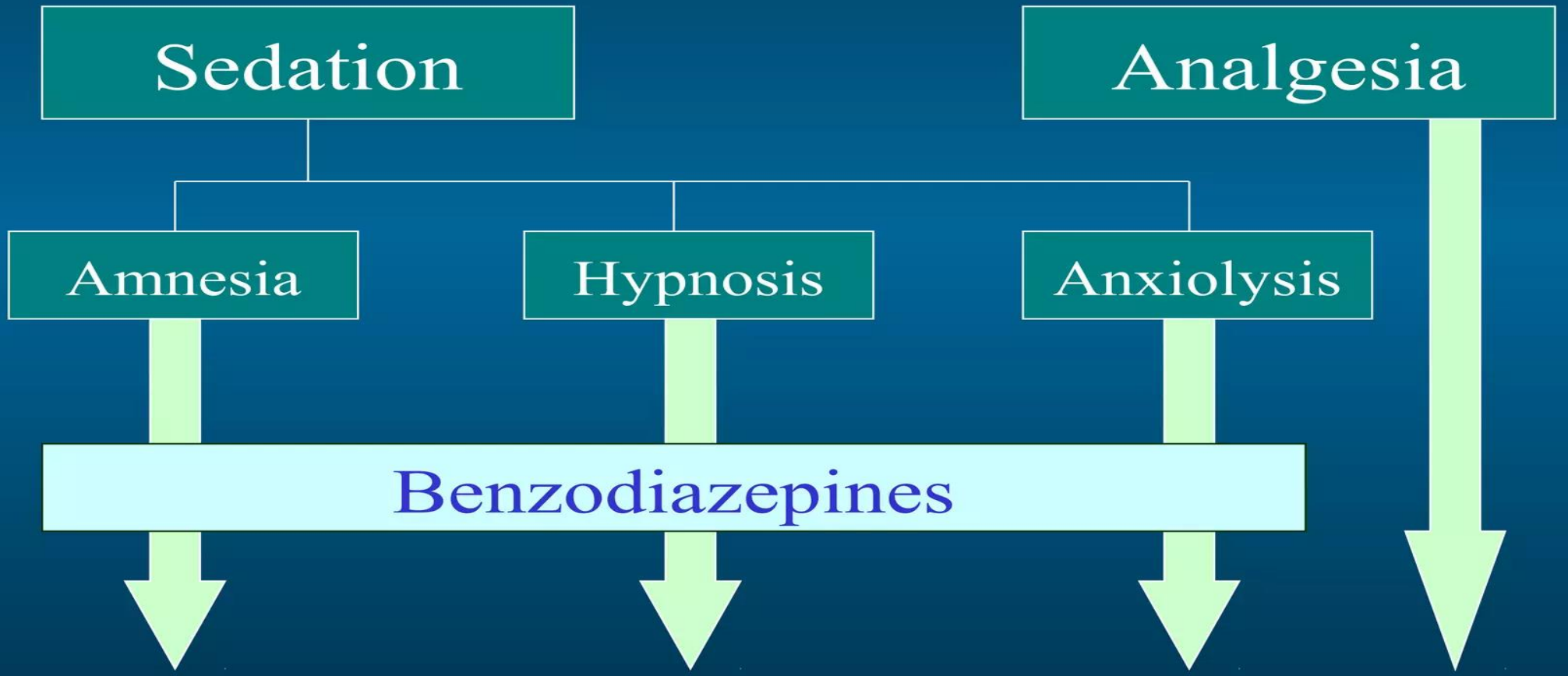
# Medications

- Benzodiazepines
- Propofol
- Opioids

$\forall \propto$-2 agonists

- Ketamine
- Etomidate

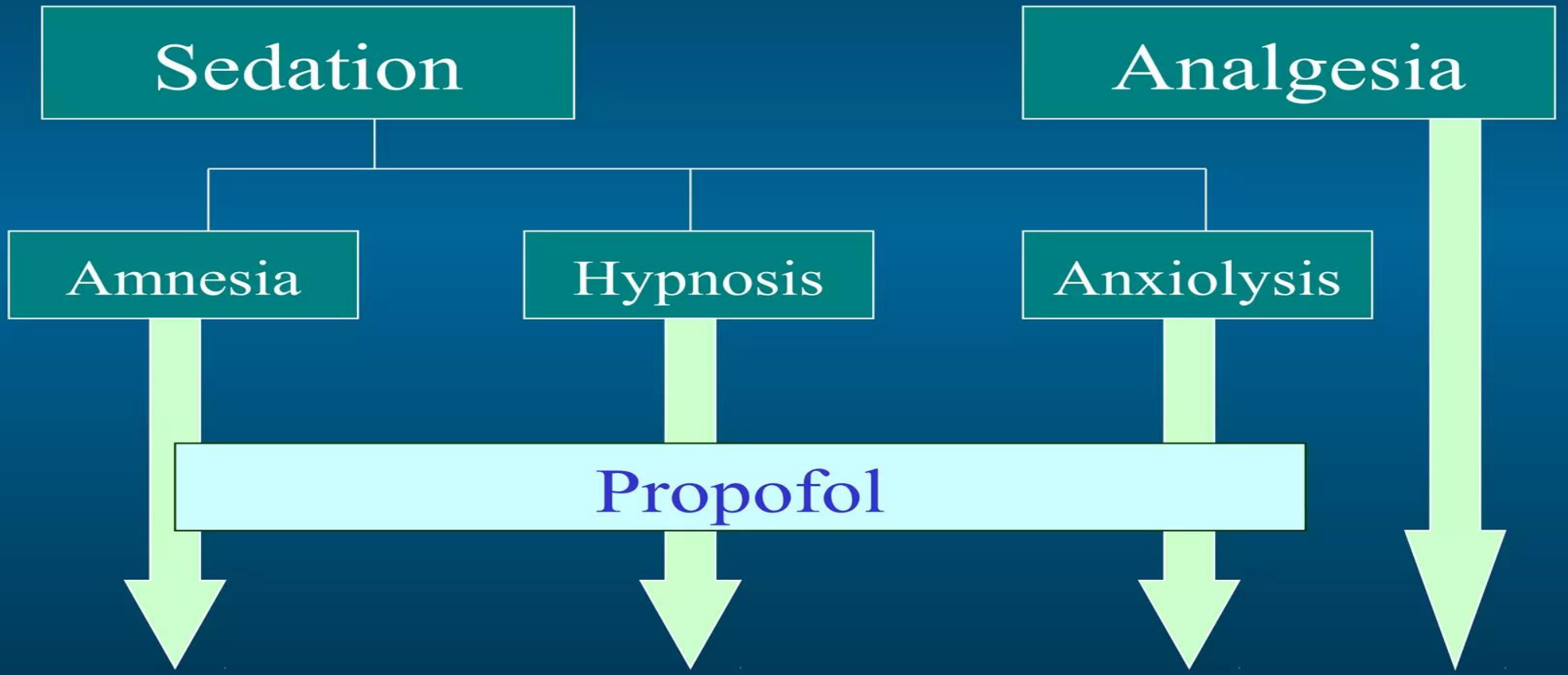
# Choose the Right Drug



# Benzodiazepines

| | Onset | Peaks | Duration |
|---|---|---|---|
| Diazepam | 2-5 min | 5-30 min | >20 hr |
| **Midazolam** | **2-3 min** | **5-10 min** | **30-120 min** |
| Lorazepam | 5-20 min | 30 min | 10-20 hr |

# Choose the Right Drug



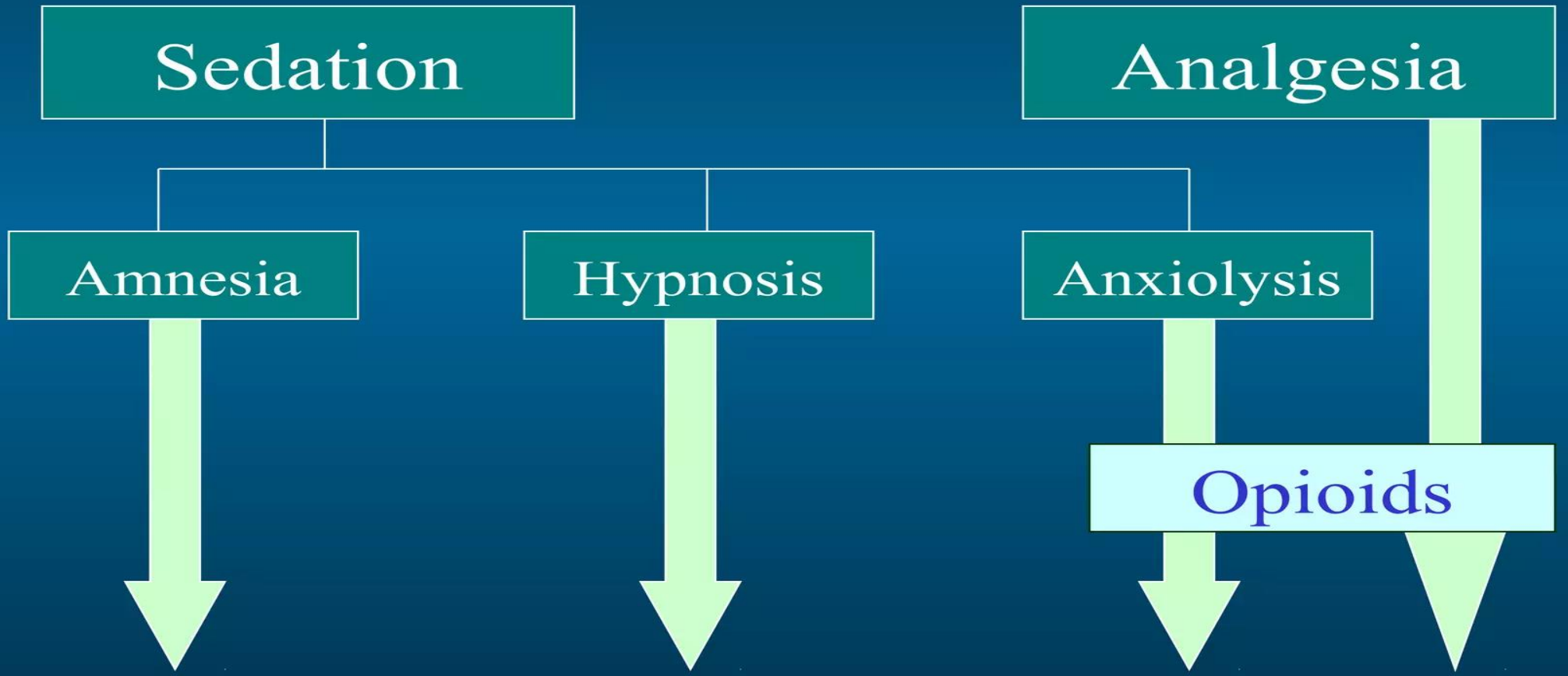
# Propofol

| | Onset | Peaks | Duration |
|---|---|---|---|
| Propofol | 30-60 sec | 2-5 min | short |

# Propofol Dosing

- 3-5 μg/kg/min antiemetic
- 5-20 μg/kg/min anxiolytic
- 20-50 μg/kg/min sedative hypnotic
- >100 μg/kg/min anesthetic

# Choose the Right Drug



# Pharmacology of Selected Analgesics

| Agent | Dose (iv) | Half-life | Metabolic pathway | Active metabolites |
|---|---|---|---|---|
| **Fentanyl** | **200 µg** | **1.5-6 hr** | **Oxidation** | **None** |
| Hydromorphone | 1.5 mg | 2-3 hr | Glucuronidation | None |
| **Morphine** | **10 mg** | **3-7 hr** | **Glucuronidation** | **Yes (Sedation in RF)** |
| Meperidine | 75-100 mg | 3-4 hr | Demethylation & hydroxylation | Yes (neuroexcitation in RF) |
| Codeine | 120 mg | 3 hr | Demethylation & Glucuronidation | Yes ( analgesia, sedation) |
| Remifentanil | | 3-10 min | Plasma esterase | None |
| Keterolac | | 2.4-8.6 hr | Renal | None |

# Opioids

| | Lipid Solubility | Histamine Release | Potency |
|---|---|---|---|
| Morphine | +/- | +++ | 1 |
| Hydromorphone | + | + | 5 |
| Fentanyl | +++ | - | 50 |

# Ketamine

Acts by stimulation of NMDA receptors

- Releases catecholamines – can cause tachycardia
- Bronchodilator – may be used to treat severe acute asthma
- Produces nightmares – so combine with benzodiazepines
- Dose : 25 -30 mg IV bolus followed by 10 – 30 mg /hr infusion

INDICATION: Intubation in SHOCK and ASTHAMA

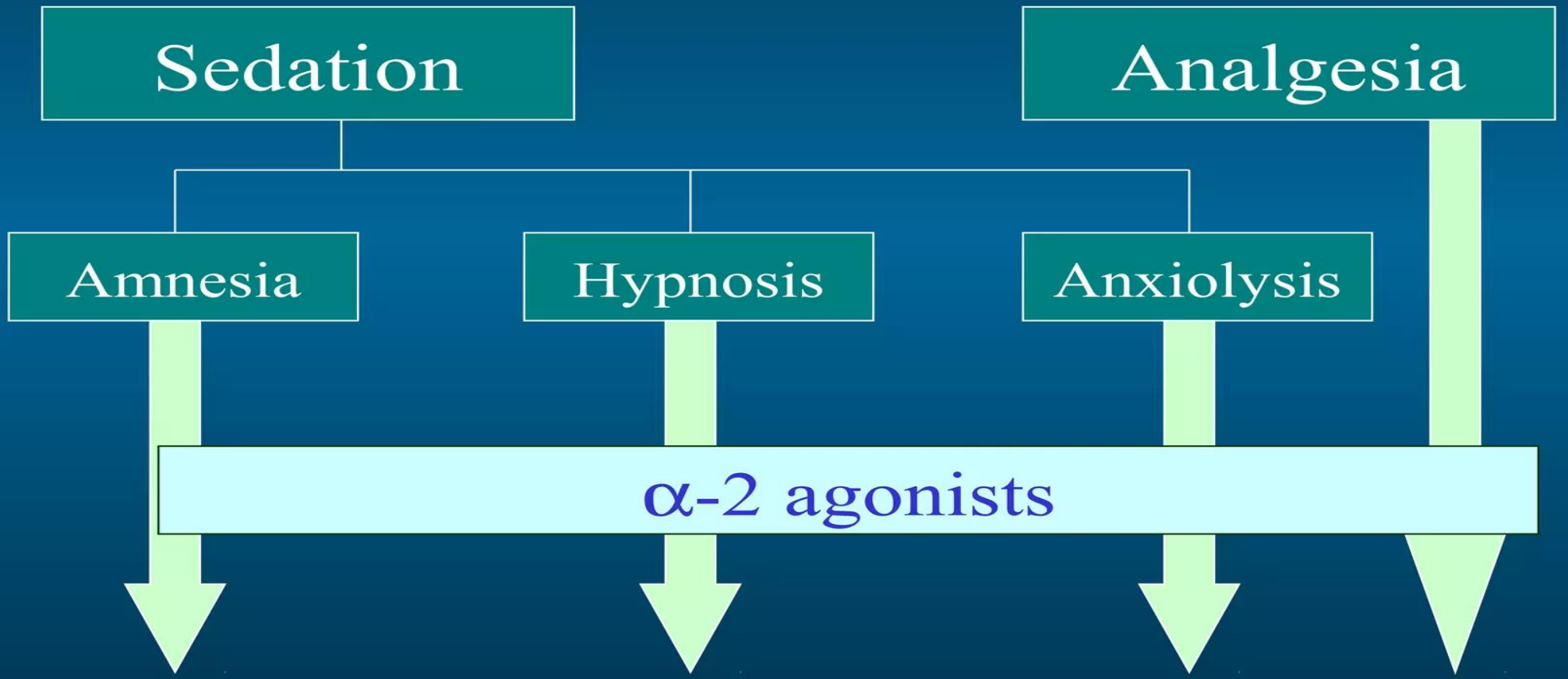
# ETOMIDATE

**Indication : Intubation in SHOCK patients**

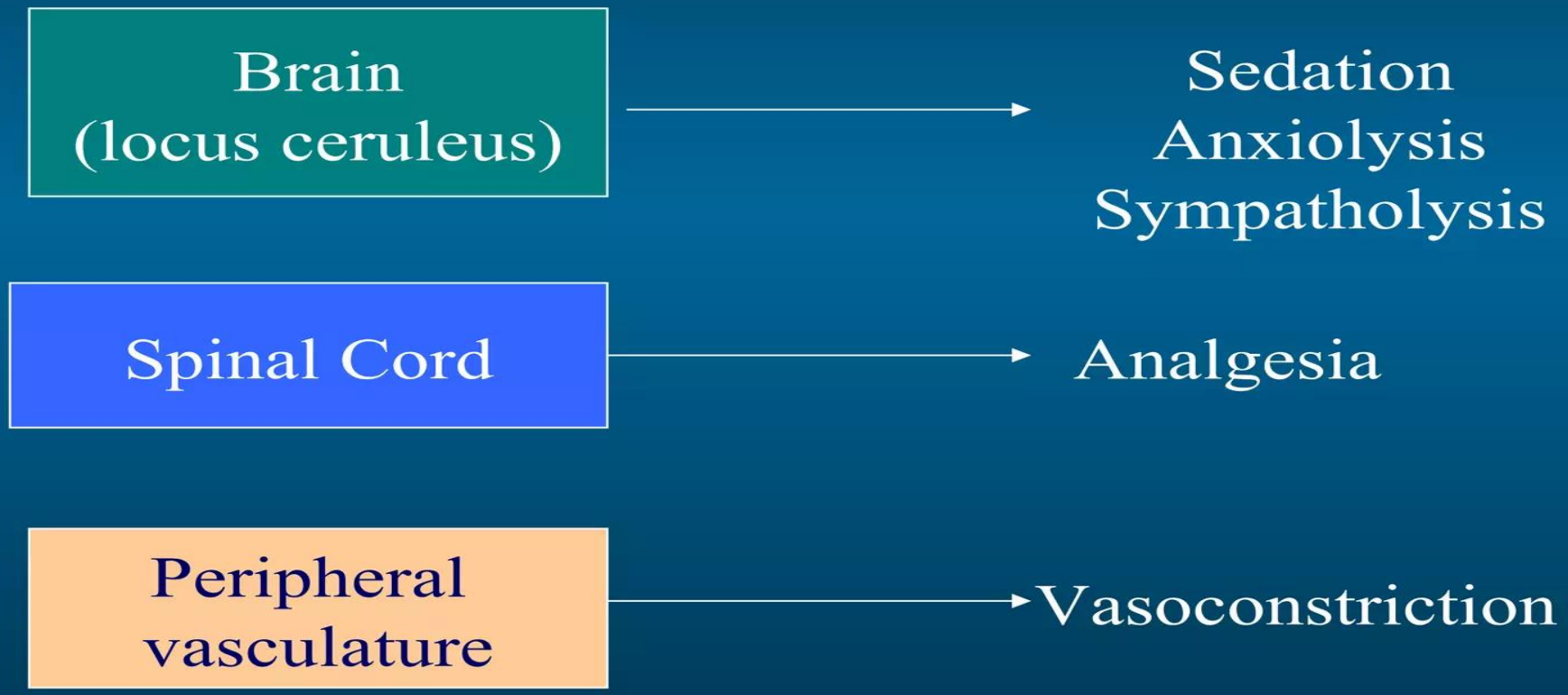
# Problems with Current Sedative Agents

| | Midazolam | Propofol | Opioids |
|---|---|---|---|
| Prolonged weaning | X | - | X |
| Respiratory depression | X | - | X |
| Severe hypotension | X | X | - |
| Tolerance | X | - | X |
| Hyperlipidemia | - | X | - |
| Increased infection | - | X | - |
| Constipation | - | - | X |
| Lack of orientation and cooperation | X | X | X |

# Choose the Right Drug



# Alpha-2 Receptors



# DEX: Dosing

Loading infusion
0.25-1 µg/kg
(10-20 min)

Maintenance infusion
0.2-0.7 µg/kg/hr

# Dexmedetomidine

Does not significantly affect respiratory drive, safer for use in non intubated patients, however can cause loss of oropharyngeal muscle tone, hence need to watch for airway obstruction.

- Reduce need for opioids

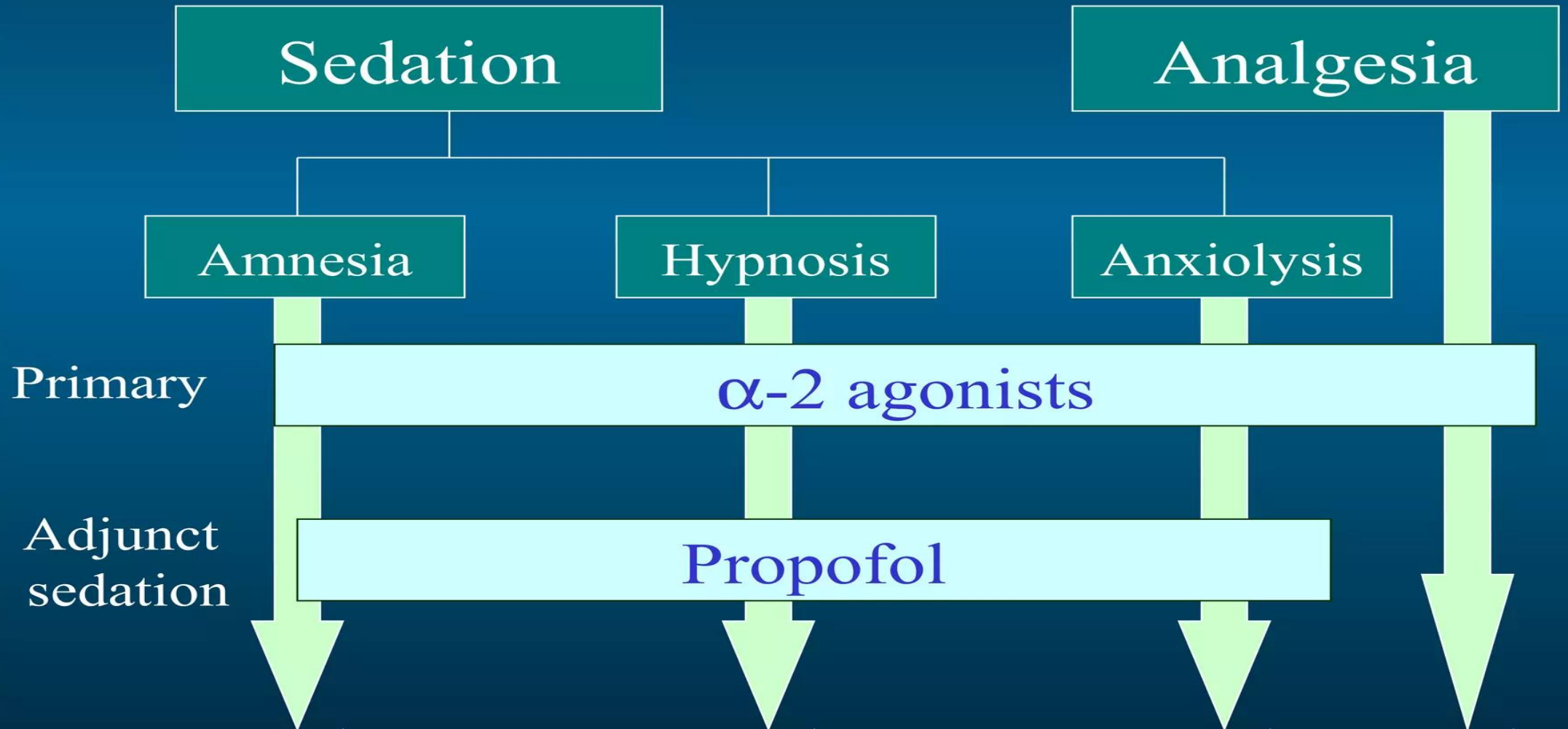
# Opioid + Hypnotic Infusion

Fentanyl + Midazolam or Propofol

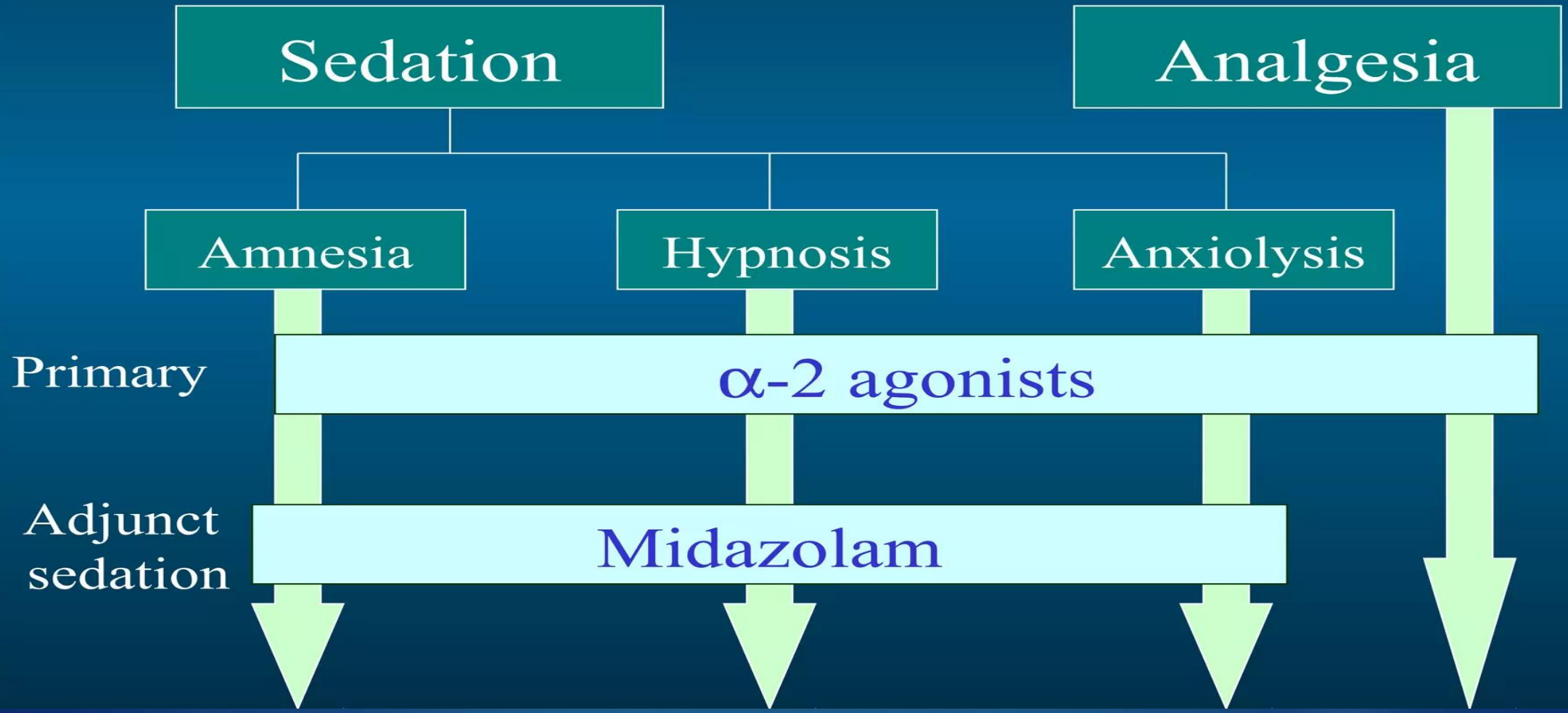
Analgesia

Amnesia
Anxiolysis
Hypnosis

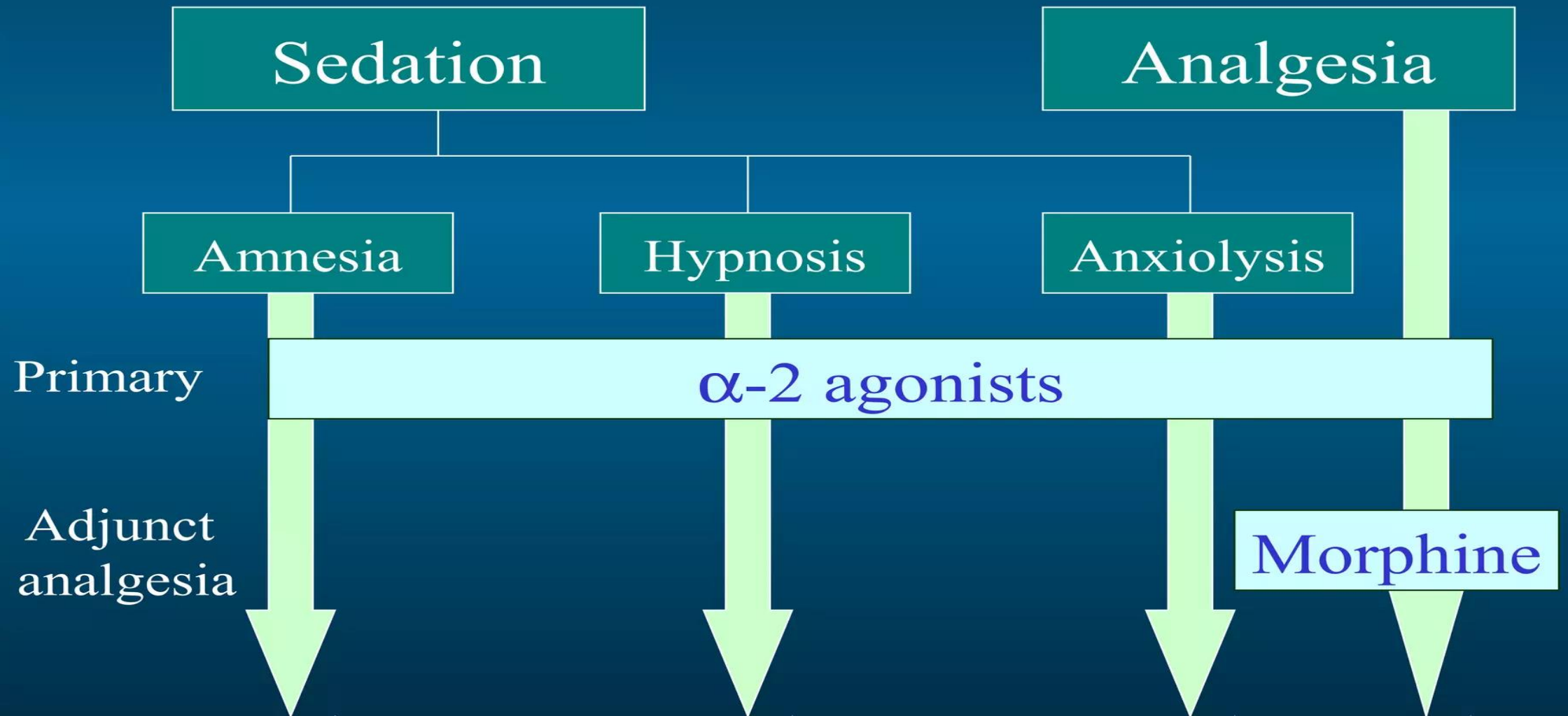
# Choose the Right Drug



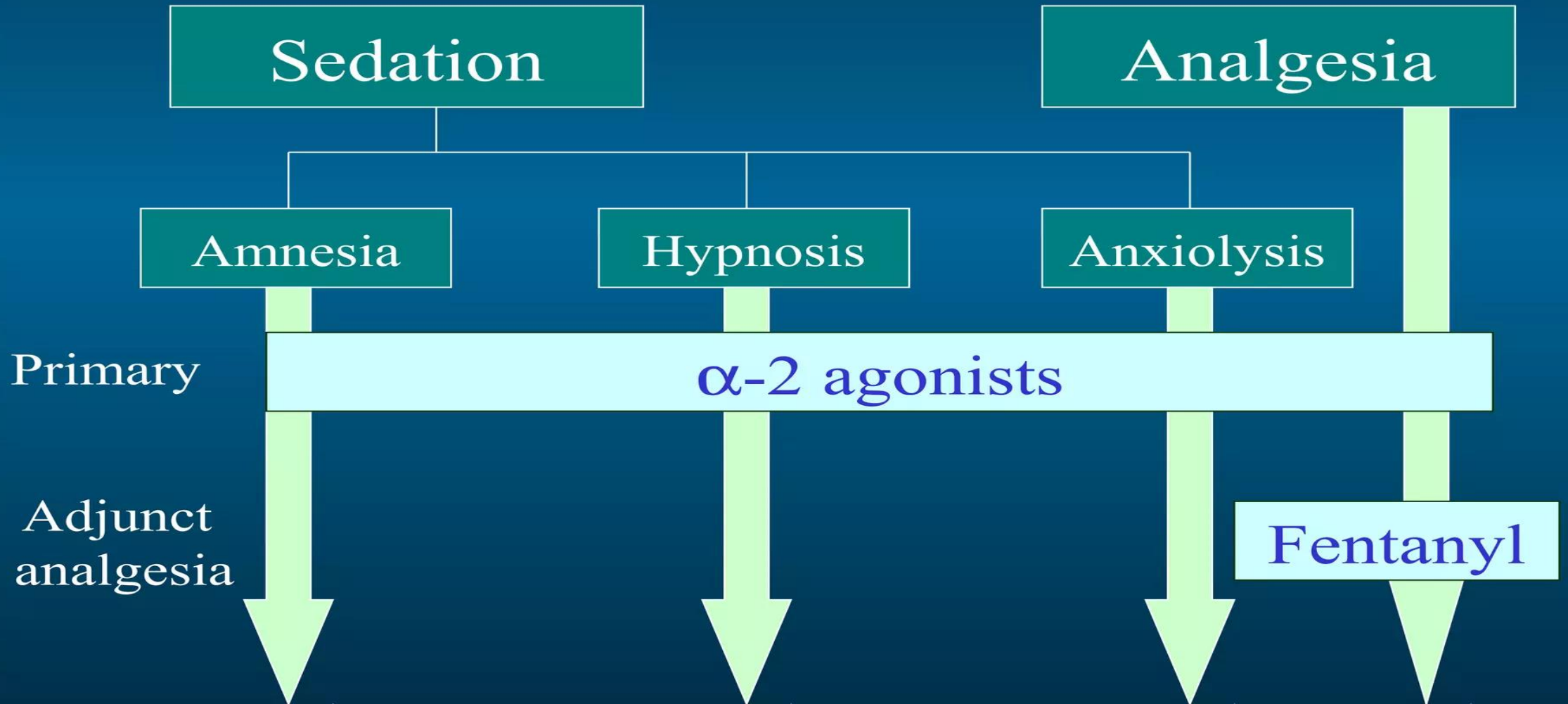
# Choose the Right Drug



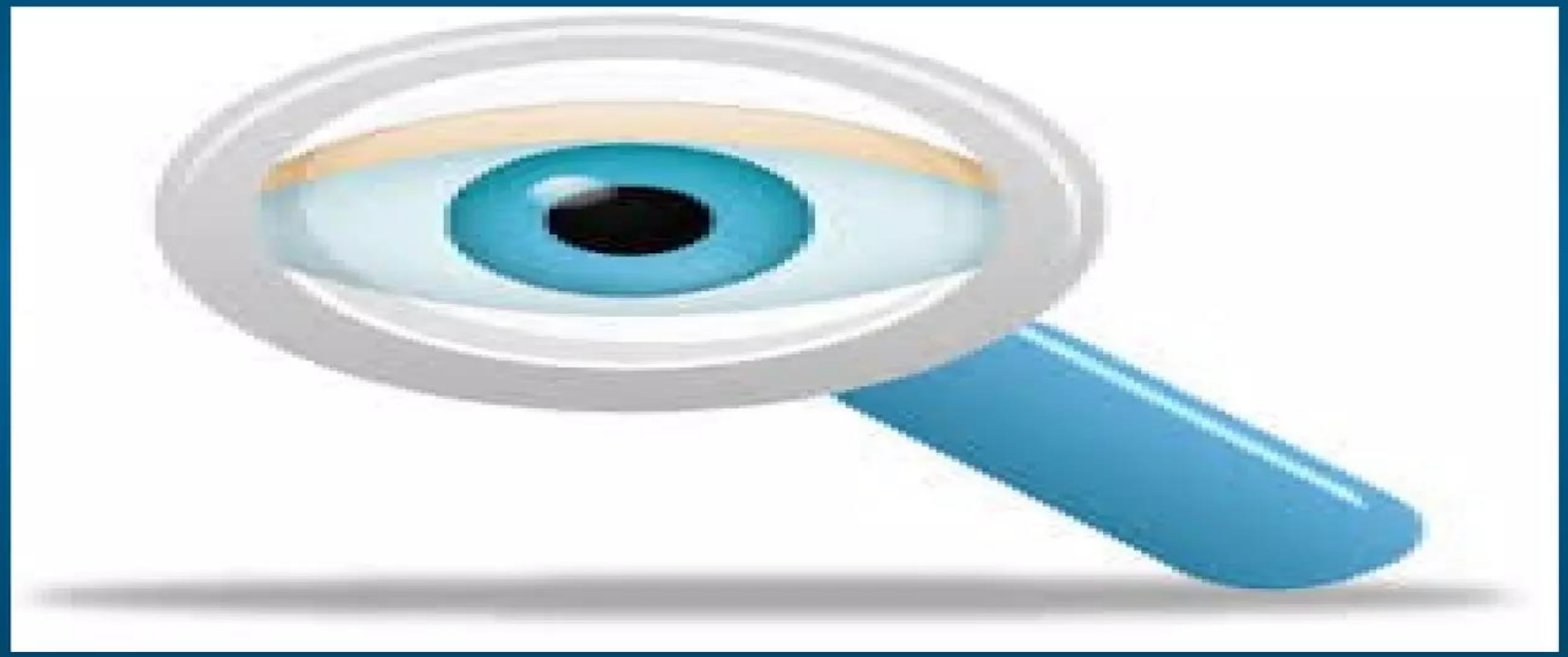
# Choose the Right Drug



# Choose the Right Drug



# MONITORING



# Sedation Scoring Scales

- Richmond Agitation Sedation Scale (RAAS)
- Ramsay Sedation Scale (RSS)
- Sedation-agitation Scale (SAS)
- Observers Assessment of Alertness/Sedation Scale (OAASS)
- Motor Activity Assessment Scale (MAAS)

# RAAS Score

| Richmond Agitation Sedation Scale (RASS) | |
|---|---|
| **Target RASS** | **RASS Description** |
| + 4 | Combative, violent, danger to staff |
| + 3 | Pulls or removes tube(s) or catheters; aggressive |
| + 2 | Frequent nonpurposeful movement, fights ventilator |
| + 1 | Anxious, apprehensive , but not aggressive |
| 0 | Alert and calm |
| - 1 | awakens to voice (eye opening/contact) >10 sec |
| - 2 | light sedation, briefly awakens to voice (eye opening/contact) <10 sec |
| - 3 | moderate sedation, movement or eye opening. No eye contact |
| - 4 | deep sedation, no response to voice, but movement or eye opening to physical stimulation |
| - 5 | Unarousable, no response to voice or physical |

# What Sedation Scales Do

- Provide a semiquantitative “score”
- Standardize treatment endpoints
- Allow review of efficacy of sedation
- Facilitate sedation studies
- Help to avoid oversedation

# What Sedation Scales Don't Do

- Assess anxiety
- Assess pain
- Assess sedation in paralyzed patients
- Predict outcome

# Reassess Need

- Use sedation score as endpoint
- Initiate sedation incrementally to desired level
- Periodically (q day) titrate infusion rate down until the patient begins to emerge
- Gradually increase infusion rate again to desired level of sedation

**Barr, Donner. *Crit Care Clin*. 1995;11827**

# ADVANTAGES

**Sedation titrated to subjective scores is associated with better outcomes**

- decreased use of sedatives
- shorter ICU and hospital length of stay
- shorter stay on vent
- less delirium
- less cognitive dysfunction

•Lighter levels of sedation better than deeper levels

# Neuromuscular Blockade (NMB) (Paralytics) in the Adult ICU

- Used most often acutely (single dose) to facilitate intubation or selected procedures
- Indications
  - Facilitate mechanical ventilation, especially with abdominal compartment syndrome, high airway pressures, and dyssynchrony
  - Assist in control of elevated intracranial pressures
  - Reduce oxygen consumption
  - Prevent muscle spasm in neuroleptic malignant syndrome, tetanus, etc.
  - Protect surgical wounds or medical device placement

- Issues
  - NO ANALGESIC or SEDATIVE properties
  - Concurrent sedation with amnestic effect is paramount analgesic as needed
  - Never use without the ability to establish and/or maintain a definitive airway with ventilation
  - If administering for prolonged period (> 6 - 12 hours), use an objective monitor to assess degree of paralysis

# Potential Contraindications of Succinylcholine

- Increases serum potassium by 0.5 to 1 meq/liter in all patients
- Can cause bradycardia, anaphylaxis, and muscle pain
- Potentially increases intragastric, intraocular, and intracranial pressure
- Severely elevates potassium due to proliferation of extrajunctional receptors in patients with denervation injury, stroke, trauma, or burns of more than 24 hours

- Succinyl Choline : Intubation
- Rocuronium : Intubation
- Vecuronium
- Atracurium
- Cis- Atracurium
- MONITORING – Train of Four

# TAKE HOME MESSAGE

1) Sedation, Analgesia & Paralytics are not a treatment.

   Its just an adjunctive therapy

# GOAL: Analgesia first

2) Never use Paralytics without sedation & Analgesia…

Same way never use sedation without analgesia

3) Use right medications, right dose according to condition of patients

It should be confirm by prescribing doctor

4) Dex + Propofol + Cis-Atra ideal combo but with limitations

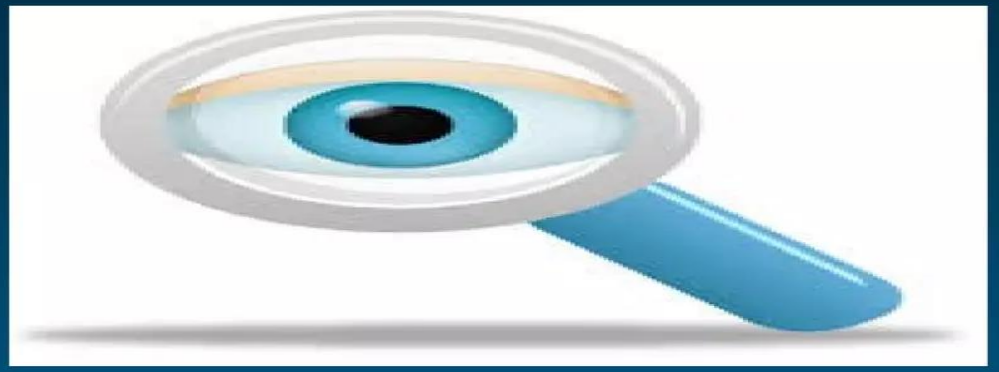
Increase use of Dex & Cis-Atra

Avoid Midazolam as much as possible

5) Etomidate & Succinylcholine / Rocuronium for intubation

*Use Etomidate & Ketamine for patients in Shock

6) Label over infusion pump about medicine, dosage and preparations



- Monitor about under or over sedation
- Monitor Pain score
- Daily sedation inturruption
- Chart target sedation score & inform doctor if its low or high
- Target sedation score has to decide by doctor

# THANK YOU
# FOR
# YOUR ATTENTION