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**Evaluating ED Patients Who  
Present with AMS & Coma:  
A Systematic Approach**

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**Global Objectives**

- Improve coma pt outcome
- Know how to quickly evaluate coma risk
- Determine how to use empiric meds
- Provide rationale for ED neuroimaging
- Facilitate disposition, improve pt outcome
- Improve Emergency Medicine practice

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**Session Objectives**

- Present a relevant patient case
- Discuss key clinical questions
- State key learning points
- Review the coma evaluation procedure
- Discuss the procedure of empiric meds
- Evaluate the patient outcome and ED documentation

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**A Clinical Case**

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## EMS Presentation

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- 54 year old EMS call for “found down”
- Pt in street
- Possible seizure
- Unresponsive
- Glucose normal
- No other history available

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## ED Presentation

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- Pt unresponsive
- Vitals: BP 220/110 HR 110 RR 16
- Afebrile
- No trauma
- Normal cardiopulmonary, abdomen
- Minimal twitching of R face noted

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## Key Clinical Questions

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- How to evaluate this unresponsive pt?
- What is the differential diagnoses?
- What are the etiologies of coma?
- What tests must be performed?
- What neuroimaging to be obtained?
- What therapies must be provided?

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## AMS & Coma: *Key Concepts*

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## Stupor & Lethargy

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- Stupor definition:
  - A state of reduced or suspended sensibility, a daze
  - Decreased responsiveness
  - Similar to lethargy
- Reduced GCS, but above 8

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## Acute Delirium

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- Delirium definition:
  - Mental confusion
  - Clouded consciousness
  - Disorientation, hallucinations
  - Delusions, anxiety
  - Incoherent speech
- GCS generally above 8

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## Coma

- **Coma definition:**
  - Extreme alteration in mental status
  - Unresponsive
  - Similar to being unconscious
- **Markedly low GCS, 8 or less**

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## Coma Pathophysiology

- **Bilateral cerebral cortex dysfunction**
  - Toxic/metabolic
  - Mass lesion, increased ICP
  - Cerebral ischemia, infarct
- **Brainstem suppression of reticular activating system (RAS)**
  - Ischemia, infarct

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## Coma Etiologies

- **Hypoperfusion/ischemia**
- **Toxic/metabolic**
- **Increased ICP**
  - Chronic space-occupying lesion
  - Acute hemorrhage
- **Infection**
- **Seizure**
- **Psychogenic fugue state**

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## Coma Etiologies

- **T trauma, temperature**
- **I infections**
- **P psychiatric, porphyria**
- **S space-occupying lesion, stroke, SAH**

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## Coma Etiologies

- **A alcohol, other toxins**
- **E endocrine**
- **I insulin (DM complications)**
- **O oxygen deficiency, opiates**
- **U uremia, renal disorders**

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## Coma Pt Treatment Priorities

- **Assess ABCs, vitals**
- **Provide empiric therapies**
- **Assess for signs of likely etiology**
  - Trauma, toxic, infection, ischemia, tumor
- **Conduct a systematic neurological exam**
- **Obtain neuroimaging**
- **Consider EEG monitoring**

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## A Perspective on Procedures

- Critically ill ED patients
- Coma is a true medical emergency
- Limited time and resources
- A need to diagnose and act
- “Emergency physicians take a surgeon’s approach to medical emergencies.”
- We do procedures

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## Empiric Therapies: The Procedure

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## Empiric Therapies: Principles

- Airway management:
  - Nasal or oral airway, ventilate, prepare for RSI
- Oxygen therapy
- Obtain an accucheck, administer glucose
- Fluid bolus for hypotension
- Naloxone if evidence of narcotic use/abuse
- Judicious flumazenil use for benzo abuse
- Thiamine in alcohol abuse

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## Empiric Therapy

- Control the airway, ventilate

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## Empiric Therapy

- Control the airway, ventilate
- Do a bedside glucose determination
  - Provide D50 for hypoglycemia
  - Avoid hyperglycemia

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## Empiric Therapy

- Control the airway, ventilate
- Do a bedside glucose determination
  - Provide D50 for hypoglycemia
  - Avoid hyperglycemia
- Detect hypoperfusion (Decreased CPP)
  - $CPP = MAP - ICP$  (MAP > 90 mmHg key)
  - NS fluid boluses up to 500 cc each

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## Empiric Therapy

- Assess for narcotic overdose
  - Nalaxone 2 mg IV or sublingual
  - Be prepared to restrain patient

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## Empiric Therapy

- Assess for narcotic overdose
  - Nalaxone 2 mg IV or sublingual
  - Be prepared to restrain patient
- Assess for benzodiazepine overdose
  - Flumazenil 0.2 mg IVP x 5 (max dose 1 mg)
  - If acute ingestion, initial dose OK, no seizure

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## Empiric Therapy

- Assess for narcotic overdose
  - Nalaxone 2 mg IV or sublingual
  - Be prepared to restrain patient
- Assess for benzodiazepine overdose
  - Flumazenil 0.2 mg IVP x 5 (max dose 1 mg)
  - If acute ingestion, initial dose OK, no seizure
- Examine for likely EtOH abuse
  - Thiamine 100 mg IVP or to IVF

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## Coma Patient Evaluation: *The Procedure*

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## Coma Exam: Principles

- Many etiologies are apparent on exam
- Step-wise approach allows for detection
- Follows empiric therapies
- Precedes, directs neuroimaging
- Establishes baseline
- Mental status change then detectable

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## Coma Evaluation Procedure

- Assess the pt's overall mental status

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## Coma Evaluation Procedure

- Assess the pt's overall mental status
- Assess the ABCs (trauma)
  - Airway & gag reflex
  - Breathing pattern and sufficiency
  - Circulation adequacy and hypotension

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## Coma Evaluation Procedure

- Assess the pt's overall mental status
- Assess the ABCs (trauma)
  - Airway & gag reflex
  - Breathing pattern and sufficiency
  - Circulation adequacy and hypotension
- Assess the skin, breath (toxidromes)

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## Coma Evaluation Procedure

- Assess the pt's overall mental status
- Assess the ABCs
  - Airway & gag reflex
  - Breathing pattern and sufficiency
  - Circulation adequacy and hypotension
- Assess the skin, breath (toxidromes)
- Detect posturing following stimulation

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### Decorticate posturing in comatose patient

*Lesion above the red nucleus*

*Lower limbs extend, upper limbs flex following stimulus*

*Activity in the brainstem flexor center, the red nucleus*



B. Decorticate : upper limbs flex, lower limbs extend

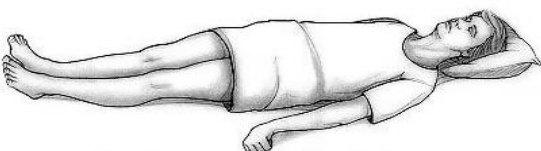


### Decerebrate posturing in comatose patient

*Upper and lower limbs extend following stimulus  
(pain, startle, or auditory)*

*Normal inhibition by cortex on the extensor facilitation part of  
ret form is missing, so extensors hyperactive*

*Lat vest nuclei involved, ablate and extensor posturing reduced*



A. Decerebrate : upper and lower limbs extend



### Clinical Value of Decorticate/Decerebrate Signs

*Decorticate posturing indicates a higher level of brainstem  
injury than decerebrate posturing (a good thing), so*

*Comatose patients who go from decerebrate to decorticate  
(ascending progression of impaired area) have  
a better prognosis than those that go from decorticate to  
decerebrate (descending progression of impaired area).*

*Descending impairment will be fatal if medullary respiratory  
and cardiovascular centers are damaged*

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## Coma Evaluation Procedure

- Calculate the Glasgow Coma Scale score
  - Eye Opening (4), Verbal (5), Motor (6)
  - 13-15 Mild AMS, 4-8 Coma, 3 Vegetative

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## Coma Evaluation Procedure

- Calculate the Glasgow Coma Scale score
  - Eye Opening (4), Verbal (5), Motor (6)
  - 13-15 Mild AMS, 4-8 Coma, 3 Vegetative
- Detect abnormal reflexes
  - Corneal reflex
  - Babinski (Chaddock)

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## Coma Evaluation Procedure

- Examine the pupils
  - Size and equality
  - Light reactivity, consensual response

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## Coma Evaluation Procedure

- Examine the pupils
  - Size and equality
  - Light reactivity, consensual response
- Perform the Doll's eye maneuver

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## Doll's Eye Maneuver

- Oculocephalic reflex
- Caution with suspected c-spine injury
- Eyes should continue to face to ceiling
- If eyes follow movement of head to side, suspect brainstem involvement in coma

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## Coma Evaluation Procedure

- Examine the pupils
  - Equality
  - Light reactivity
- Perform the Doll's eye maneuver
- Detect evidence of psychogenic coma
  - Protective reflex
  - Propriety reflex

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## Coma Evaluation Procedure

- Look for ongoing seizure activity

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## Coma Evaluation Procedure

- Look for ongoing seizure activity
- Perform cold calorics

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## Cold Caloric Examination

- Oculovestibular reflex
- Normal for slow movement of eyes towards, fast movement away from cold water into ear canal
- If eyes move towards cold water, intact brainstem despite coma
- If no eye movement towards stimulation, suspect brainstem injury

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## Coma Evaluation Procedure

- Look for ongoing seizure activity
- Perform cold calorics
- Document checklist of coma findings
  - Presence of coma, responsiveness, GCS
  - Vital signs, ABCs, empiric therapies
  - Exam findings checklist
  - Likely etiology
  - Likely location of lesion

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## **ED Documentation & Patient Outcome**

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## ED Coma Documentation

- Pt unresponsive to all stimuli cw coma
- Airway adequately controlled
  - Decreased gag reflex
  - OK Airway with nasopharyngeal airway
- Adequate ventilation, pO2 OK 100% NRB
- Hypertension noted, tachycardia
  - Labetalol 20 mg IVP
  - Repeat BP OK

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## ED Coma Documentation

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- No pallor, cyanosis, or cherry red skin
- No abnormal breath or EtOH
- Adequate ventilation, pO2 OK 100% NRB
- Hypertension noted, tachycardia
  - Labetalol 20 mg IVP
  - Repeat BP OK
- No pathologic posturing to stimulation
- Estimated GCS = 3

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## ED Coma Documentation

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- Corneal reflex intact, no upgoing toes bilat
- Pupils midrange, equal, reactive
- Fixed gaze to R, no Doll's eyes noted
- Protective reflex to arm dropping absent
- No propriety reflex noted
- Facial twitching noted on R, likely SE
- Cold caloric not indicated

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## ED Coma Documentation

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- Coma
- Likely etiology subtle status epilepticus
- No toxidrome or intoxication
- Non-focal exam, mass lesion not likely
- No evidence psychogenic seizure
- CT negative, tox screen negative
- Lorazepam, fosphenytoin
- EEG negative in ED

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## Patient Outcome

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- Hx SE, compliant with meds?
- Hx carotid occlusion
- Due to have carotid endarterectomy
- Pt remained unresponsive after EEG
- Admitted for ongoing observation
- Expedited surgery anticipated

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## ED Comatose Patient Exam: *A Retrospective*

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## ED Comatose Patient Exam

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- Address the ABCs
- Quickly assess for coma etiologies
- Perform a systematic neuro exam
- Expedited neuroimaging, consultation
- Documentation of coma checklist
- Definitive care plan established in ED
- Optimized coma patient outcome

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**Questions??**

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