



Acutely Depressed Mental Status in Children

National Pediatric Nighttime Curriculum

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Objectives

- Be able to recognize children with acutely depressed mental status
- Know the major causes of acutely depressed mental status in children
- Initiate the workup for depressed mental status in children
- Initiate management of depressed mental status in children



Definitions

■ **Coma:**

- Unarousable unresponsiveness
- The most profound state of depressed mental status

■ **Stupor, Lethargy, Difficult to Arouse, Obtunded:**

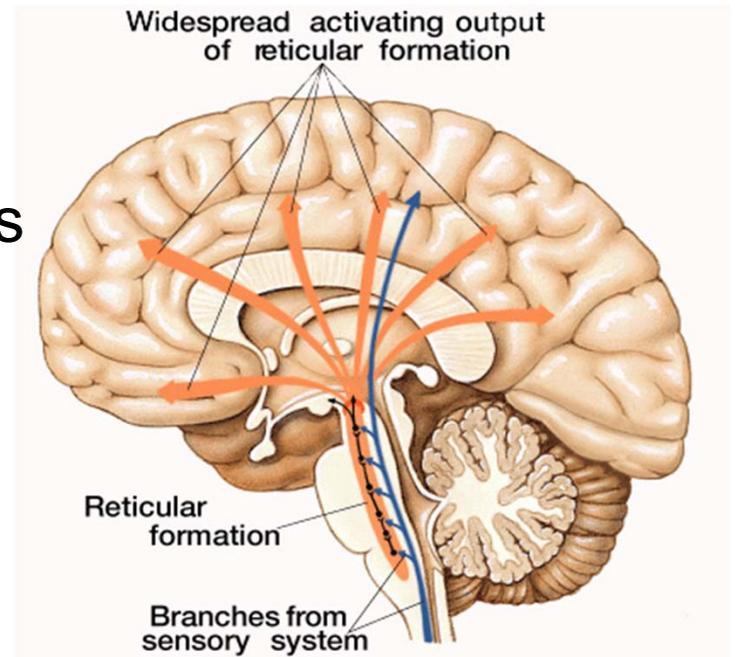
- All of these terms are imprecise and describe a decreased level of consciousness
- May be marked by absence of spontaneous movement and diminished responsiveness to stimulation
- Awareness is generally impaired before arousal

■ **Brain Death (1-18 y.o.):**

- Criteria include coma, apnea, and absent brainstem reflexes
- Brain death specifically implies no opportunity for recovery

Physiology

- **Arousal:** The physiology of arousal is dependent on the reticular activating system (RAS). The RAS is a poorly localized network of cells in the brainstem with projections to the thalamus, hypothalamus and cortex.
- **Awareness:** Awareness is mediated by the cerebral cortex in widely distributed neuronal networks. Awareness is the product of cortical function that resides within both hemispheres and then projects down to the thalamus and then out, for either motor or sensory functions.



From C.J. Long, Visual Slide Presentation

Etiology of Non-Traumatic Pediatric Coma from UK Prospective Study

From: C P Wong, R J Forsyth, T P Kelly, J A Eyre. Incidence, aetiology, and outcome of non-traumatic coma: a population based study. Arch Dis Child 2001;84:193–199

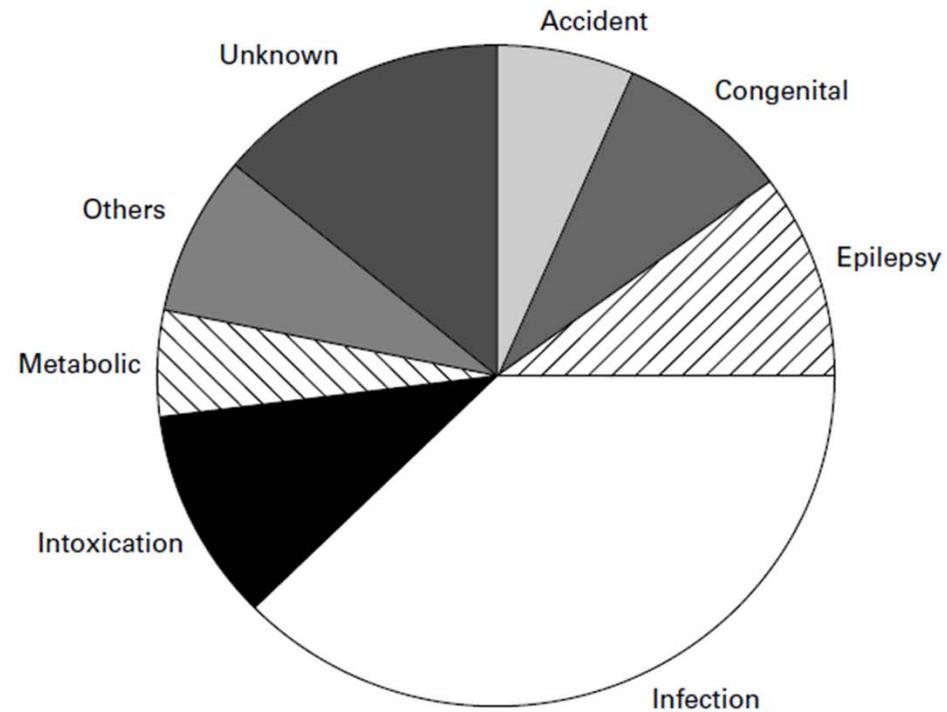


Figure 2 Summary distribution of the primary aetiologies of non-traumatic coma among the 284 children studied (including postmortem information where available in community and hospital deaths).

Table 4 Age specific aetiology

| Age band | Accident | Congenital | Epilepsy | Infection | Intoxication | Metabolic | Others | Unknown | Total |
|-------------|----------|------------|----------|-----------|--------------|-----------|--------|---------|--------|
| Infant | 3.2% | 17.2% | 4.3% | 50.5% | 0.0% | 4.3% | 6.5% | 14.0% | 100.0% |
| 1–5 years | 11.2% | 3.4% | 13.5% | 33.7% | 10.1% | 6.7% | 4.5% | 16.9% | 100.0% |
| 6–12 years | 5.6% | 7.4% | 16.7% | 31.5% | 7.4% | 5.6% | 13.0% | 13.0% | 100.0% |
| 13–16 years | 6.5% | 0.0% | 4.3% | 28.3% | 34.8% | 2.2% | 10.9% | 13.0% | 100.0% |
| Total | 6.7% | 8.2% | 9.6% | 37.9% | 10.3% | 5.0% | 7.8% | 14.5% | 100.0% |



Workup

- Depressed mental status is a medical emergency with a ***broad*** differential
- Determination of etiology is essential for optimal treatment
- Workup requires a systematic approach

Etiology of Depressed Mental Status (from Berger et al)

Nonstructural, Symmetrical

Toxins

Drugs

Metabolic

Infections

Other

Structural, Symmetrical

Supratentorial

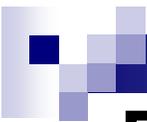
Infratentorial

Structural, Asymmetrical

Supratentorial

Infratentorial

**Broad Differential!
Manageable in Categories**



Focused History

AMPLE History

A: Allergy/Airway

M: Medications

P: Past medical history

L: Last meal

E: Event - What happened?

- Rapid or Gradual Onset?
- Preceding Headache or Neurologic Symptoms?
- Ingestions?
- Vague or inconsistent history from caregiver is suspicious for non-accidental trauma.

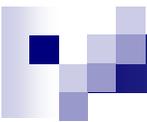


Focused Physical Exam (suggested by Michelson et al.)

- **ABC's (including cardio-respiratory exam)**
- **Vitals**
- **Neurologic examination**
 - Brief and to the point
 - Differentiate structural from non structural causes
 - Assess: Level of consciousness/responsiveness, Motor responses, Brainstem reflexes
- **Meningismus / Nuchal Rigidity**
 - Brudzinski's sign - Involuntary hip & knee flexion with forced neck flexion
 - Kernig's sign - involuntary knee flexion with forced flexion of the hip
- **Fundoscopy**
 - Papilledema suggests increased ICP of more than several hours duration.
 - Retinal hemorrhages in an infant are a sign of non-accidental trauma
- **Skin**
 - Bruising may suggest trauma, rashes may suggest infection

Pediatric Glasgow Coma Scale

| | Infant < 1 yr | Child 1-4 yrs | > 4 years |
|---------------|-----------------------------|--|-----------------------|
| EYES | | | |
| 4 | Open | Open | Open |
| 3 | To voice | To voice | To voice |
| 2 | To pain | To pain | To pain |
| 1 | No response | No response | No response |
| VERBAL | | | |
| 5 | Coos, babbles | Oriented, speaks, interacts, social | Oriented and Alert |
| 4 | Irritable cry, consolable | Confused speech, disoriented, consolable | Disoriented |
| 3 | Cries persistently to pain | Inappropriate words, inconsolable | Nonsensical speech |
| 2 | Moans to pain | Incomprehensible, agitated | Moans, unintelligible |
| 1 | No response | No response | No response |
| MOTOR | | | |
| 6 | Normal spontaneous movement | Normal spontaneous movement | Follows commands |
| 5 | Withdraws to touch | Localizes pain | Localizes pain |
| 4 | Withdraws to pain | Withdraws to pain | Withdraws to pain |
| 3 | Decorticate flexion | Decorticate flexion | Decorticate flexion |
| 2 | Decerebrate extension | Decerebrate extension | Decerebrate extension |
| 1 | No response | No response | No response |



Management (adapted from Thompson and Williams)

- ABCs / PALS
 - Stabilize C-Spine if indicated
 - Intubate for GCS \leq 8
- D10% - 2.5 mL/kg IV
- Lorazepam (0.1 mg/kg) for clinical seizures
- Antidote or reversal agent if known/suspected ingestion
- For Infection
 - Ceftriaxone, Vancomycin
 - Acyclovir
- For increased ICP
 - Mannitol 0.5-1g/kg
- For non-convulsive status epilepticus
 - Lorazepam or Fosphenytoin

Treat Underlying Cause



Labs (adapted from Michelson et al.)

- If cause for depressed mental status is not readily apparent send:

Bedside blood glucose

Urine drug screen

Electrolytes with Ca, Mg

Complete blood count

BUN, creatinine

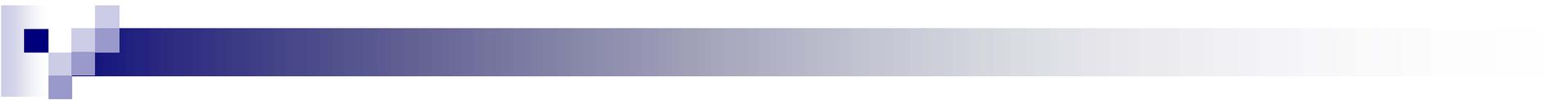
Blood culture

Transaminases

ABG/VBG, ammonia

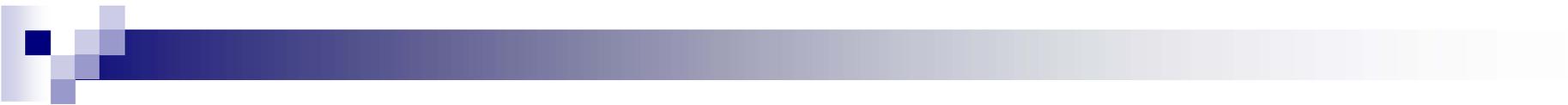
- If suspected metabolic abnormality send:

UA, urine ketones, plasma amino acids, urine organic acids, plasma free fatty acids, carnitine profile, lactate, pyruvate



Diagnostic Studies

- CT is the initial neuro-imaging test of choice.
 - MRI with DWI can be considered as an adjunct.
- LP after increased ICP has been ruled out
- EEG to rule out nonconvulsive status epilepticus should be performed in children with depressed mental status where etiology remains elusive.



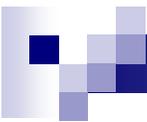
Case 1

A 16 year old girl is brought in unconscious by friends from a party. Physical exam notes the smell of alcohol, tachycardia to 178, fever to 39.8, diaphoresis and BP 185/107. You are called to consult in the ED. What is the most likely etiology of her altered mental status?

MDMA (ecstasy)/Amphetamine intoxication

What if the same patient has absent sweating and dilated pupils?

Anticholinergic Intoxication



Case 2

A 3 year old boy with a past medical history of OTC deficiency is admitted with cellulitis. He is found unresponsive in the child life room. As the pediatrics resident, you are called for urgent evaluation.

Please provide a DDx and workup.

DDx includes hyperammonemia, hypoglycemia, sepsis, ingestion, trauma, or sub-clinical seizures.

Workup should include a focused physical exam, chemistries, free flowing ammonia, glucose, CBC, cultures and possible ABG. Evidence of trauma should prompt an immediate head CT.



References

- Berger, Joseph R. Clinical Approach to Stupor and Coma. In: Neurology in Clinical Practice: Principles of diagnosis and Management, 4th ed, Bradley, WG, Daroff, RB, Fenichel, GM, Jankovic, J (Eds), Butterworth Heinmann, Philadelphia, PA 2004. p.46.
- C P Wong, R J Forsyth, T P Kelly, J A Eyre. *Incidence, aetiology, and outcome of non-traumatic coma: a population based study.* Arch Dis Child 2001;84:193–199
- Michelson D, Thompson L, Williams E. *Evaluation of stupor and coma in children.* UpToDate. 2006.
- Simpson D, Reilly P. Pediatric coma scale. Lancet 1982; 2:450.
- Teasdale G, Jennett B. *Assessment of coma and impaired consciousness. A practical scale.* Lancet 1974,2:81-84 [Glasgow Coma Scale]
- Thompson L, Williams E. *Treatment and Prognosis of Coma in Children.* UpToDate. 2010.