Altered Mental Status

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Objectives

- Define altered mental status
- Determine initial assessment and diagnostic approach for altered mental status
- Develop differential diagnosis
- Discuss etiologies and key features of altered mental status
Definitions

• Broadly defined as change in LOC and cognitive function
  – Consciousness made up of both content and arousal
  – Content: higher level of cortical function, allows for awareness of self and environment
  – Arousal: level of alertness, as evidenced by spontaneous eye opening, stimulation to wake, inattention
    • Determined by BS, thalamus, and hypothalamus
  – Cognitive function: includes reasoning, memory, attention, language (all lead to obtaining knowledge)
Incidence

- 10% of all ED visits are for AMS
- Of those 10%, half get admitted into the hospital
- Given large population of pts presenting to ED, assessment and diagnosis is key
Assessment

• Four step initial evaluation process
1. Obtain VS, temperature, and glucose level
2. Gather history (pay special attention to PMH, timeline, and current medication regimen)
3. Physical assessment (focal deficit, s/s of infection)
4. Obtain serum/urine dx (lytes, CBC, LFTs, UA, UDS)
Diagnostics

• Depends heavily on initial assessment findings
• Guidelines vary on when to obtain head CT/MRI
  – 0.93 + predictive value for normal CT/MRI if focal findings are not seen on physical exam
  – Focal findings include: unilateral weakness/numbness/paresthesia, aphasia, vision loss
  – Given this still leaves 7% it is recommend to get CT/MRI if AMS is accompanied by HA with emesis, >60yo, s/p trauma, hx of malignancy, and seizures
Diagnostics

• Lumbar puncture
  – Less than 5% of all meningitis cases present while in the hospital (applies to non NSGY pts only)
  – 95% of patients that presented to the ED with meningitis had AMS, fever, and neck stiffness
  – If immunocompromised may not mount fever or could be hypothermic
  – ALWAYS get CT before LP!
Diagnostics

• EEG
  – Repetitive motor activity, nystagmus, and gaze deviation increase predictive value for + EEG
    • Also obtain if seizure history or unexplained AMS
  – Two studies showed 1/3 of NICU pts will have nonconvulsive seizures and 1/10 in MICU pts
  – 2h EEG will capture 56% of seizures
  – 24h 88% of seizures
Differentials

- A- alcohol, acidosis
- E- electrolytes, endocrine, encephalitis
- I- infection
- O- opiates
- U- uremia
- T- trauma, tumor
- I- insulin
- P- pharmacy, perfusion
- S- stroke, seizure
Etiology & Important Facts

A- Alcohol

• Wernicke's Encephalitis
  – Secondary to chronic ETOH, diet lacking thiamine
  – ETOH ↓ brains ability to metabolize cerebral glucose
  – s/s: acute memory loss, disorientation, ataxia, nystagmus
  **Give thiamine before glucose
  – Glucose will further deplete thiamine and increase LA production, thus leading to worsening encephalitis
Etiology & Important Facts

A- Acidosis

• So many kinds!
  – Respiratory, DKA, LA, metabolic
  – s/s are determined by etiology (pay particular attention to bicarb on BMP, if abnormal obtain ABG)
  – Respiratory: elevated CO2, first line of treatment is bipap is patient is appropriate
  – DKA: determine etiology (noncompliant, infection), IVF and insulin
  – LA: why are they not being perfused (check, heart, lungs, abd, infection)
  – Metabolic: check serum BMP to rule out gap vs. non gap acidosis
    • MUDPILES
Etiology & Important Facts

E- Electrolytes

• Hyponatremia
  – Secondary to SIADH, CSW, dehydration, volume overload, aldosterone deficiency
  – s/s: fatigue, HA, N/V, lethargy, muscle spasticity, irritable, coma, seizures
  – Na <130 have a 11.2% mortality vs. 0.19% of those with normal Na levels
  – Na <120 have a 25% increase in mortality vs. Na >120
  ** If chronic hyponatremia (>48h) do not correct more than 12mmol in 24H!
  ** Can lead to irreversible cerebral pontine myelinolysis
Etiology & Important Facts
E- Electrolytes

• Hypernatremia
  – Secondary to DI, hypovolemia
  – s/s: decreased skin turgor, hypotension, N/V, muscle jerks, nystagmus, lethargy, confusion, seizures
  – Determine etiology if DI: central (pituitary tumor, midbrain infarct) vs. nephrogenic
Etiology & Important Facts

E- Endocrine

• Hypothyroidism/Myxedema Coma
  – Secondary to noncompliance, infection, initial dx
  – s/s: bradycardia, hypothermia, irregular respirations, confusion, weakness
  – Follow up TSH and free T4 levels

**Pts will present with this as opposed to developing while inpatient

**TSH and free T4 will be abnormal during acute critical illness (i.e. sepsis)
Etiology & Important Facts

E-Endocrine

- Hyperthyroidism/Thyroid Storm
  - Secondary to untreated hyperthyroid or partially treated in the setting of surgery or infection
  - s/s: anxiety, psychosis, tachycardia, N/V, diaphoretic
  - Late stages: stupor, comatose, hypotension
Etiology & Important Facts

E- Encephalitis

• Hepatic Encephalitis (HE)
  – Secondary to the inability of the liver to metabolize ammonia into urea
  – Often times chronic liver failure pts that are infected, have electrolyte disturbances, GIB, or med non compliance
    • s/s: confused, lethargic, agitated, hyperreflexia, asterixis, seizures, hyperventilation
    • Infection: leads to increase tissue catabolism resulting in increase in ammonia
    • ↓ K+ and ↑HCO3 facilitate in the conversion of NH4 to NH3
    • GIB: results in ↑ absorption of ammonia and nitrogen in the gut
Etiology & Important Facts

E-Encephalitis

• Autoimmune and paraneoplastic encephalitis
  – Autoimmune inflammation of the brain but not limited to the limbic system
  – Obtain LP if all other work ups negative and pt continues to be altered
  – Most common types are Anti-CRMP5 (NSC lung CA, thymomas), Anti-Ma2 (germ cell tumors), and Anti-NMDA (teratomas)
  – s/s: psych, psych, psych!!
  – If tumor found resect, if not (and CSF positive for above antibodies) IVIG and high dose steroids
Etiology & Important Facts

I- Infection

• Most common in elderly: UTI and PNA
  – Stat UA on ALL AMS pts
  – s/s: will depend on severity
    • Agitation, lethargy, coma, hypo/hyperthermia, hypotension, seizures
  – Urine, blood, sputum cultures, LP if suspect meningitis
    • Do not delay ABX for LP or cultures if infection suspected
    • Early tx has shown to decrease both morbidity and mortality
  – LP shows WBC/RBC ration >1:700, ↓glucose, ↑neutrophils suspect bacterial
    • ↑lymphocytes suspect viral (10% of viral encephalitis will have no pleocytosis)
Etiology & Important Facts

O- Opiates

• Causes CNS depression
  – Consider in pts with known history as well as elderly
    • ↓ gut absorption rate d/t ↓ gut motility, polypharmacy, ↓ muscle mass
  – s/s: lethargy, respiratory depression, bradycardia, hypothermic, meiosis
  – Caution with narcan!
    • Chronic opiate users will go into instant w/d
    • Lead to emesis and aspiration
Etiology & Important Facts

U- Uremia

• Byproducts accumulate in blood d/t acute/chronic renal failure

• Results in ↓ brain metabolic activity and O2 consumption
  – Level of AMS does not correlate directly to level of azotemia
  – Combination of the two has been shown to be major indicator of HD
  – s/s: appear when GFR <15-20ml/min
    • Decreased attention, irritable, confusion, sensory losses, hallucinations, stupor, apathy, fatigue, edema, hyper/hypotension, asterixis, hyperreflexia, memory loss
Etiology & Important Facts

T - Trauma

- All trauma pts should get a stat head CT
- Fall is #1 cause
- SDH/EDH/ICH
  - s/s: similar for all three
    - Unilateral weakness, HA, N/V, seizures,
    - Pay particular attention to time!
    - SDH more insidious s/s, while EDH and ICH more acute
  - Obtain stat coags, correct coagulopathies, plts if on ASA
  - Stat NSGY consult
Etiology & Important Facts

T- Tumor

• More insidious s/s
• s/s depend on location (see CVA slide), HA, N/V, dizziness, focal weakness, lethargy, ataxia, seizures
• If AMS with hx of CA and focal findings stat head CT
• NSGY consult
• Symptoms after from vasogenic edema
  – Dex IV
Etiology & Important Facts

I- Insulin

- Hypoglycemia
  - Determine in step one of initial assessment
  - Etiology varies: ETOH, LF, RF, increase exogenous insulin, insulinoma, infection
  - Very easy fix
    - Depending on cause may need several doses of d50 or d10/20 gtt
    - Check glucose level 20min after administration
Etiology & Important Facts

P- Pharmacy

- Amitriptyline
- Bupropion
- Carbamazepine
- Chlorpromazine
- Clonidine
- Clozapine
- Colchicine
- Corticosteroids
- Dicyclomine
- Diphenhydramine
- Doxazosin
- Gabapentin
- Guanfacine
- Ketorolac
- Levetiracetam
- Lorazepam
- Meclizine
- Meperidine
- Metoclopramide
- Methyldopa
- Metronidazole
- Mirtazapine
- Nortriptyline
- Olanzapine
- Opiates
- Oxcarbazepine
- Oxybutynin
- Paroxetine
- Pepcid
- Pregabalin
- Prazosin
- Promethazine
- Reserpine
- Tramadol
- Terazosin
- Zolpidem
Etiology & Important Facts

P- Perfusion

• Anything that decreases cerebral perfusion can alter one's mental status
  – Common etiologies includes:
    • Hypoxia
      – PNA, PE, COPD/asthma exacerbation, hypoventilation (leading to hypoxia), etc
    • Shocks:
      – Distributive: sepsis, neurogenic, anaphylactic, endocrine
      – Cardiogenic: cardiomyopathic, arrhythmic, mechanical
      – Hypovolemia: hemorrhagic, nonhemorrhagic
      – Obstructive: pulmonary vascular, mechanical
Etiology & Important Facts

S- Stroke

• Ischemic or hemorrhagic
  – Secondary to thrombus, emboli, HTN, or amyloid
  – s/s depend on location
    • Abulia: thalamic and frontal
    • Agitation: frontal, PCA, basilar (early s/s), non dominant parietal lobe
    • Aphasia: L temporal/parietal (MCA territory) (agitation as above d/t unable to speak appropriately)
    • R Paralysis: L MCA or internal capsule
    • L paralysis: R MCA or internal capsule
    • Dizziness/ataxia: cerebellar
    • Coma: basilar, hemispheric infarcts, bilateral thalamic
Etiology & Important Facts
S- Stroke

• Timing is key!
  – Intervention up to 4.5h for TPA and 12h for IA
  – Any above findings are focal which require CT/MRI
    • CTA/P if available
    • Stat neurology consult
    • Stroke alert/RRT to be called ASAP
  – If ischemic allow permissive HTN
    • <180 if TPA candidate
    • <220 if not
  – ICH <140 current practice
    • ATACH II trial suggests <180
Etiology & Important Facts

S- Seizures

- Occur in 3% of pts in the medical ICU
  - Study done at mayo showed 35 pts with seizures per 1000 admissions
- Often the first indication of CNS complication
  - Study in San Francisco showed those most likely to have new onset seizures are most commonly due to stroke, drug toxicity, tumors, anoxia, then CNS infection
- Complex, partial, or SE
- s/s: tremors, unilateral shaking (Todd’s paralysis), eye deviation (towards lesion, away from seizure, incontinence, lip smacking, face twitching
- Two main ICU concerns SE and PRES
Etiology & Important Facts

S- Seizures

• SE: convulsive (most common) vs. non convulsive
  – ≥5 minutes of continuous seizures, or
  – ≥2 discrete seizures between which there is incomplete recovery of consciousness
  – Mortality rate 20% usually secondary to anoxia or cardiac arrest
  – Neurological emergency
    • We don’t have 30 minutes!
Etiology & Important Facts
S- Seizures

• PRES
  – Posterior reversible encephalopathy syndrome
  – Pt presents with seizures, HTN, and focal weakness
  – If imagining negative for acute CVA obtain MRI
    • MRI will show patchy and confluent hyperintensities on T2
    • Treat BP! Its reversible!
Case Study

• A 75yo male presents to the ED with a three day history of confusion. His PMH includes: MS (on Interferon), HTN, HLD, DM, lymphoma s/p chemo 2010

• Exam: shows no focal findings, MAE equally and spontaneously, a/o x1, incomprehensible speech, and restless

• VS: 112/72, HR 105, RR 28, TM 101.8
Case Study

• What additional information would you want from the physical exam?
  
  a. Does he have a HA
  b. Does he have nuchal rigidity
  c. What is his glucose
  d. Does he have photophobia
Case Study

• What diagnostics would you perform?
  a. CXR
  b. CT
  c. LP
  d. CBC
  e. All of the above
Case Study

- Why must you obtain a head CT before you perform a lumbar puncture?
  a. To rule out ICH
  b. To rule out ischemic CVA
  c. To rule out intracranial HTN
Case Study

• You suspect meningitis. When do you start antibacterial coverage?
  a. After the LP to ensure accurate cultures
  b. Before the LP
  c. Only if and when the LP cultures come back positive
Case Study

• LP results come back with 121 WBC’s, 12 RBC’s, 95% neutrophils, glucose 22, and proteins 104, and HSV negative

• These findings are consistent with bacterial meningitis

• Continue vanc, cefepime, ampicillin until cultures speciate

• Discontinue acyclovir
References