

Altered Mental Status

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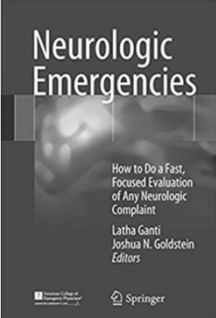
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Outline

- Scope of Lecture
- Definition
- Challenges

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Scope

- Acute and subacute changes in mental status

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Scope

- Acute and subacute changes in mental status
- Acute and subacute changes are more likely to be precipitated by a life-threatening illness

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Definition

- Any change in a patient's baseline mental status

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Definition

- Any change in a patient's baseline mental status
 - A VERY broad definition

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Definition

- Any change in a patient's baseline mental status
 - A VERY broad definition
 - A difficult chief complaint in many ways

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Challenges

- The scope is extremely broad

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Challenges

- The scope is extremely broad
- Patient is poor historian

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Challenges

- The scope is extremely broad
- Patient is poor historian
- Physical exam often not helpful

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Challenges

- The scope is extremely broad
- Patient is poor historian
- Physical exam often not helpful
- Labs and imaging often not helpful

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Challenges

- The scope is extremely broad
- Patient is poor historian
- Physical exam often not helpful
- Labs and imaging often not helpful
- May be nothing or life threatening!

17

Challenges

- The scope is extremely broad
- Patient is poor historian
- Physical exam often not helpful
- Labs and imaging often not helpful
- May be nothing or life threatening!
- So many terms/scales

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Definitions

- **Coma**: unresponsive to any stimuli

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Definitions

- **Coma**: unresponsive to any stimuli
- **Stupor**: only arouse with vigorous and continuous stimuli

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Definitions

- **Coma**: unresponsive to any stimuli
- **Stupor**: only arouse with vigorous and continuous stimuli
- **Delirium**: acute disturbance of consciousness accompanied by an acute loss of cognition (but not better explained by dementia)

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Definitions

- *What is delirium and how do you assess it?*

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Delirium

- **Hypoactive Delirium**
 - Appear drowsy or somnolent
 - Subtle and often missed!

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Delirium

- **Hypoactive Delirium**
 - Appear drowsy or somnolent
 - Subtle and often missed!
- **Hyperactive Delirium**
 - Obvious presentation

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Delirium

- Hypoactive Delirium
 - Appear drowsy or somnolent
 - Subtle and often missed!
- Hyperactive Delirium
 - Obvious presentation
- **Mixed-Type Delirium**
 - Presents with both features

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Delirium scales				
Scale	Advantage	Disadvantage	Sensitivity* (%)	Specificity* (%)
CAM [18]	Validated in ED setting, widely used	Takes 5–10 min, heavily reliant on subjective impression	86	93
hCAM [19]	Takes less than 2 min to complete. Validated in ED setting	Validated in single center	78–84	96–97
CAM-ICU [20]	Takes less than 2 min to complete. Validated in ED setting	Validation results mixed in noncritically ill patients	18–76	98–99
3D-CAM [21]	Excellent diagnostic accuracy	Takes 3 min to complete, single-center validation	93	96
4AT [22]	Takes less than 2 min to complete	Only validated in medical inpatients from Italy	90	84
DDT-Pro [23]	Validated in noncritically ill patients	Only validated on traumatic brain injury patients	100	94
SQID [24]	One question test	Relies on caregiver, friend, or family member. Validated in oncology patients.	80	71
mRASS [25]	Takes only 10 s, validated in older ED patients	Moderate inter-rater reliability, heavily reliant on subjective impression	82–84	85–88

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Delirium

http://eddelirium.org

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Dementia

- Gradual and associated with gradual loss of cognition

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A Stepwise Approach

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Stepwise Approach

- Severity
 - “ABCs and 5 S’s”

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Stepwise Approach

- Severity
 - “ABCs and 5 S’s”
 - The 5 S’s:
 1. Sugar
 2. Stroke
 3. Sepsis
 4. Seizure
 5. Sonorous Respirations (Opiate Intoxication)

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Stepwise Approach

- Severity
 - “ABCs and 5 S’s”
- Stabilize
 - Address vital signs and combativeness

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Agitation

Agents For Acute Agitation in the Emergency Department

Agent	Formulation	Dose (mg)	Onset of Action (min)	Max daily dose (mg)
Lorazepam	IV	2	2-3	12
	IM	2 - 4	3-5	12
Midazolam	IV	2 - 5	1-5	15
	IM	5	5-10	15
Haloperidol	IV	5 - 10	5-10	20 - 30
	IM	5 - 10	15-20	20 - 30
Droperidol	IV	2.5 - 5	3-10	15
	IM	2.5 - 10	3-10	15
Olanzapine	IM	5 - 10	15	30
	PO	5 - 10	30-60	30
Ketamine	IM	4-5/kg	3-4	1000
	IV	0.5-1/kg	0.5	5/kg

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Stepwise Approach

- Severity
 - “ABCs and 5 S’s”
- Stabilize
 - Address vital signs and combativeness

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Stepwise Approach

- Severity
 - “ABCs and 5 S’s”
- Stabilize
 - Address vital signs and combativeness
- History and Physical
- Differential Diagnosis
- Labs/Imaging
- Disposition

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Stepwise Approach

- History

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Stepwise Approach

- History
 - Best obtained from someone else

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Stepwise Approach

- History
 - Best obtained from someone else
 - Timing: Acute is worse, abrupt may suggest stroke

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Case Report
Locked-in syndrome responding to thrombolytic therapy*

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ARTICLE INFO ABSTRACT

Article history:
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Locked-in syndrome (LIS) is an exceedingly rare condition that has been described as a fate worse than death. Unfortunately, exam findings can be subtle and imaging is poorly sensitive, often leading to a delay in diagnosis. We present a case of a 70-year-old female who presented to our emergency department after developing respiratory distress followed by sudden unresponsiveness. She was diagnosed with LIS and had an immediate and remarkable improvement after administration of tissue plasminogen activator (tPA). Patients presenting with sudden onset altered mental status require a very careful physical exam, even if deemed comatose, and should be considered for emergent imaging for stroke. Fortunately, our patient recovered well and was discharged home in good condition.

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Stepwise Approach

- History
 - Best obtained from someone else
 - Timing
 - Associated Symptoms: Recent seizures, recent neurologic complaints, recent infectious symptoms

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Stepwise Approach

- History
 - Best obtained from someone else
 - Timing
 - Associated Symptoms
 - Medications: Needs to be obtained first-hand, look for recent changes/additions/discontinuations

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American Geriatrics Society 2015 updated Beers Criteria for potentially inappropriate medication use in older adults

Guideline Developer(s)
American Geriatrics Society

Date Released
2015 Nov

Full Text Guideline
American Geriatrics Society 2015 updated Beers Criteria for potentially inappropriate medication use in older adults.

Recommendations

■ **Major Recommendations**
Definitions of quality of evidence (high, moderate, low) and strength of recommendation (strong, weak, insufficient) are provided at the end of the "Major Recommendations" field.

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Stepwise Approach

- History
 - Best obtained from someone else
 - Timing
 - Associated Symptoms
 - Medications:
 - Antibiotomania? Clarithromycin/Fluroquinolones
 - Metronidazole encephalopathy

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Stepwise Approach

- History
 - Best obtained from someone else
 - Timing
 - Associated Symptoms
 - Medications
 - Social History:
 - Many elderly patients are abusers of sedative hypnotics
 - Also consider physical abuse

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Stepwise Approach

- Physical Exam
 - Complete neurologic exam
 - Right parietal lobe infarcts can cause AMS without any focal findings
 - Aphasia can be confused with AMS
 - Gait: Wernicke's?
 - If suspected, consider thiamine administration 500mg IV before glucose

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Stepwise Approach

- Physical Exam
 - Complete neurologic exam
 - Right parietal lobe infarcts can cause AMS without any focal findings
 - Aphasia can be confused with AMS
 - Gait: Wernicke's?
 - Tone: Serotonin syndrome, malignant hyperthermia, NMS

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Stepwise Approach

- Physical Exam
 - Complete neurologic exam
 - Ocular Exam

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Ocular Exam	
Mydriasis	Sympathomimetic Anticholinergic
Miosis	Opiate Pontine Stroke
Horizontal Nystagmus	Drug Intoxication Peripheral Nervous System Lesion[81]
Vertical Nystagmus	Central Nervous System Lesion [81] Wernicke's encephalopathy
Rotary Nystagmus	Drug Intoxication Central Nervous System Lesion
Exophthalmos	Grave's Disease (Hyperthyroid)
Ophthalmoplegia	Wernicke's Encephalopathy Increased Intracranial Pressure
Proptosis	Retrolbulbar hematoma Orbital Cellulitis
Scleral Icterus	Hepatic Failure
Gaze Deviation	Seizure Oculogyric Crisis
Visual Field Deficit	Central retinal artery occlusion Occipital Lobe Infarct

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Stepwise Approach

- Physical Exam
 - Complete neurologic exam
 - Ocular Exam
 - GU Exam
 - Fournier's Gangrene, Prostatitis, GI bleed

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Stepwise Approach

- Physical Exam
 - Complete neurologic exam
 - Ocular Exam
 - GU Exam
 - Skin Exam
 - Findings of liver disease, infection, drug patches

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Stepwise Approach

- Differential Diagnosis

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A SUICIDE ATTEMPT BY NAIL GUN

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CASE REPORT

A 51-year-old female presented to our emergency department by emergency medical services for a reported self-inflicted nail gun injury to the head that occurred 5 h prior to arrival. The patient reported that she attempted suicide by firing a nail gun into her scalp, but believed that a nail was never ejected from the gun. She then returned the nail gun to the store from which she purchased it. Several hours later, she decided that she needed to be evaluated even though she remained asymptomatic. On arrival, she was awake, alert, and hemodynamically stable. She had a normal neurologic examination and a Glasgow Coma Scale score of 15. On secondary survey, she had a < 1 cm linear abrasion (Figure 1) with minimal surrounding erythema just superior and posterior to the right temple. No other penetrating injury sites were noted. A noncontrast computed tomography (CT) scan of the head (Figures 2 and 3) was performed. The CT revealed an approximately 10-cm nail entering the right frontal bone perpendicular to the frontal horn of the right ventricle, with the tip of the nail terminating in the ventricle itself and no associated hemorrhage. After initiation of broad-spectrum antibiotics and obtainment of patient consent, she was taken to the operating room with neurosurgery, where a small craniectomy was performed with the nail being removed along the original tract. Postoperatively, the patient recovered

well without any neurologic deficits. She was transferred to inpatient psychiatry and, ultimately, home.

DISCUSSION

Nail guns, easily obtainable from home improvement stores, can fire projectiles with velocities approaching


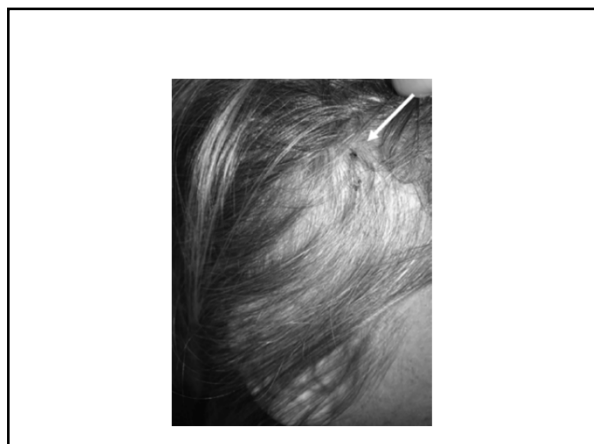
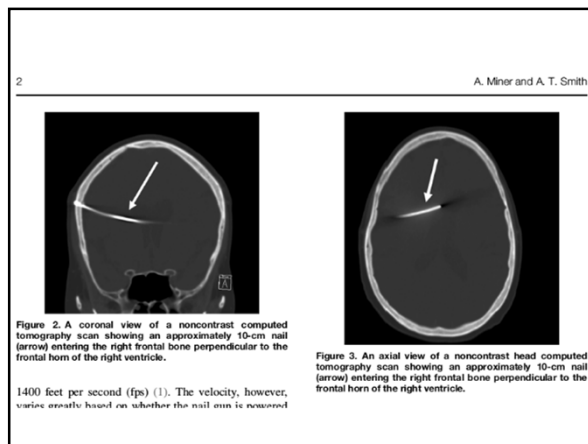


Figure 1. The site of the nail gun injury (arrow).

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A. Miner and A. T. Smith

Figure 2. A coronal view of a noncontrast computed tomography scan showing an approximately 10-cm nail (arrow) entering the right frontal bone perpendicular to the frontal horn of the right ventricle.

Figure 3. An axial view of a noncontrast head computed tomography scan showing an approximately 10-cm nail (arrow) entering the right frontal bone perpendicular to the frontal horn of the right ventricle.

1400 feet per second (fps) (1). The velocity, however, varies greatly based on whether the nail gun is reversed

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Stepwise Approach

- Differential Diagnosis in 5 Categories
 1. Vital Sign Abnormalities
 2. Toxic/Metabolic
 3. Structural
 4. Infectious
 5. Psychiatric

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Precipitating Causes for Altered Mental Status	
Vital Sign Abnormalities <ul style="list-style-type: none"> • Hypertensive Encephalopathy • Inadequate Pain Control • Hypotension (shock) • Hypo- or hyperthermia • Hypoxemia 	Neurologic <ul style="list-style-type: none"> • Cerebrovascular accident • Intracerebral hemorrhage • Subarachnoid hemorrhage • Subdural / epidural hematoma • Non-convulsive status epilepticus • Brain mass ± edema • Hydrocephalus • Locked-in Syndrome • Seizure • Posterior Reversible Encephalopathy Syndrome • Thiamine deficiency (Wernicke's encephalopathy)
Toxic <ul style="list-style-type: none"> • Medications and medication changes • Recreational drug use or withdrawal (shock) • Neuroleptic Malignant Syndrome • Serotonin syndrome 	Infectious <ul style="list-style-type: none"> • Sepsis • Meningitis / encephalitis
Metabolic: electrolytes, endocrine, hepatic <ul style="list-style-type: none"> • Hepatic or renal failure • Hypo- and hypernatremia • Hypo- and hypercalcemia • Hypoglycemia / hyperglycemia • Thyroid dysfunction • Hypoxemia • Hypercarbia • Dehydration • Adrenal insufficiency • Corticoid-producing condition 	Psychiatric <ul style="list-style-type: none"> • Mania • Psychosis • Depression • Anxiety • Catatonia

Table 2. Precipitating Factors for Altered Mental Status. Adapted from Pun et al., Fearing et al., and the American Psychiatry Association Delirium Guidelines.

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Stepwise Approach

- Differential Diagnosis in 5 Categories
 1. Vital Sign Abnormalities
 2. Toxic/Metabolic
 3. Structural
 4. Infectious
 5. Psychiatric

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Stepwise Approach

- Vital Sign Abnormalities
 - Should be considered life threatening as they are causing end organ dysfunction of the brain

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Stepwise Approach

- Vital Sign Abnormalities
 - Should be considered life threatening as they are causing end organ dysfunction of the brain
 - Address before moving on

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Stepwise Approach

- Toxins
 - Prescription AND OTC medications
 - Environmental Toxins (CO, Jimson weed, marijuana gummy bears)
 - Withdrawal

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Stepwise Approach

- Metabolic
 - Glucose
 - Hypoglycemia can mimic anything
 - DKA/HHS

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Stepwise Approach

- Metabolic
 - Sodium

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Stepwise Approach

- Metabolic
 - Sodium
 - The most common electrolyte disorder

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Stepwise Approach

- Metabolic
 - Sodium
 - The most common electrolyte disorder
 - Most common cause in outpatients is thiazide use

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Stepwise Approach

- Metabolic
 - Sodium
 - The most common electrolyte disorder
 - Most common cause in outpatients is thiazide use
 - Usually not the cause unless < 120 mEq/L

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Stepwise Approach

- Metabolic
 - Calcium
 - Most common cause in outpatients is primary hyperparathyroidism
 - Most common cause in inpatients is malignancy

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Stepwise Approach

- Metabolic
 - BUN
 - When > 100 mg/dL, mental status changes may develop and uremia is likely present

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Stepwise Approach

- Metabolic
 - Hyperthyroid
 - Tachycardia, mania, sweating
 - Thyroid Storm

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Stepwise Approach

- Metabolic
 - Hyperthyroid
 - Tachycardia, mania
 - Thyroid Storm
 - Hypothyroid
 - Lethargy, dry skin, enlarged thyroid, irritability, cold sensitivity, etc.
 - Myxedema coma: most severe complication- multisystem organ failure

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Stepwise Approach

- Metabolic
 - Adrenal Insufficiency
 - Often missed early
 - Dark Skin Pigmentation
 - Hyponatremia with Hyperkalemia
 - Cardiovascular Collapse
 - Sepsis not responding to treatment

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Stepwise Approach

- Metabolic
 - Hepatic
 - Hepatic encephalopathy
 - Cerebral Edema
 - High risk of ICH

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Stepwise Approach

- Infectious
 - Systemic
 - SOFA score has shown that AMS is an independent predictor of ICU stay and hospital mortality

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Stepwise Approach

- Infectious
 - Systemic
 - SOFA score has shown that AMS is an independent predictor of ICU stay and hospital mortality
 - Neurologic
 - Meningitis, Encephalitis
 - Anti-NMDA Encephalitis

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Stepwise Approach

- Neurologic
 - Intracranial hemorrhage
 - Traumatic hemorrhage
 - Locked-in Syndrome
 - Non-Convulsive Status Epilepticus

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Stepwise Approach

- Psychiatric
 - A diagnosis of exclusion

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Stepwise Approach

- Psychiatric
 - A diagnosis of exclusion
 - **20%** have a medical problem causing or exacerbating their psychiatric condition

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Stepwise Approach

- Psychiatric
 - A diagnosis of exclusion
 - 20% have a medical problem causing or exacerbating their psychiatric condition
 - Psychiatric patients have a high rate of medical comorbidities
 - Largely undiagnosed and untreated

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Stepwise Approach

- Psychiatric
 - Atypical presentations of common medical problems are common
 - Changes in vision appear to be most predictive of a medical illness causing, or at least contributing to, their symptoms

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Stepwise Approach

Features Concerning for a Medical Cause of a Psychiatric Presentation
Changes in Vision [47]
Abnormal ocular exam (miosis, mydriasis, nystagmus)
No prior psychiatric history
Vital sign abnormalities
Older age without previous psychiatric history
Altered level of arousal
Visual hallucinations [47]
Medical Comorbidities [47]

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Stepwise Approach

- Labs

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Stepwise Approach

- Labs
 - Most should have a *CBC/BMP*

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Stepwise Approach

- Labs
 - Most should have a *CBC/BMP*
 - Urinalysis
 - Yes, but ***be careful!***

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Stepwise Approach

- Labs
 - Most should have a *CBC/BMP*
 - Urinalysis
 - Yes, but *be careful*
 - Asymptomatic bacteriuria is common and overtreated

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Stepwise Approach

- Labs
 - Most should have a *CBC/BMP*
 - Urinalysis
 - Yes, but *be careful*
 - Asymptomatic bacteriuria is common and overtreated
 - Bacteria can be in the urine with a systemic infection

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Stepwise Approach

- Labs
 - Toxicologic Screen
 - Serum ETOH/APAP/ASA levels

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Stepwise Approach

- Labs
 - Toxicologic Screen
 - Serum ETOH/APAP/ASA levels
 - Consider serum osmolality too

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Stepwise Approach

- Labs
 - Toxicologic Screen
 - Serum ETOH/APAP/ASA levels
 - Consider serum osmolality too
 - Urine Drug Screen?
 - Prone to false positives, not particularly sensitive, and rely on multiple factors for detection

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Stepwise Approach

- Labs
 - LP?
 - If you think about it, you should probably do it
 - Save CSF

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Stepwise Approach

- Imaging

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Stepwise Approach

- Imaging
 - CXR
 - Hypoxia, fever, cough, respiratory symptoms
 - Free air?

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Stepwise Approach

- Imaging
 - EEG
 1. No cause
 2. Any history of seizure or seizing before arrival

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Stepwise Approach

- Imaging
 - EEG
 1. No cause
 2. Any history of seizure or seizing before arrival
 - **Incidence in patients with AMS is 8-30%**

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Stepwise Approach

- Imaging
 - Noncontrast Head CT
 - Routine in AMS?
 - Controversial, but if impaired level of consciousness, consider
 - Always if concerned or trauma, deficit, anticoagulants

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Stepwise Approach

- Imaging
 - CT Angiography
 - Excellent for stenosis, aneurysms, dissections

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Stepwise Approach

- Imaging
 - MRI
 - If no cause is found, MRI can be helpful, particularly for strokes and tumor

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Stepwise Approach

- Disposition
 - Stuporous/Comatose = ICU

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Stepwise Approach

- Disposition
 - Stuporous/Comatose = ICU
 - Stroke = Stroke unit (improved mortality and outcomes)

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Stepwise Approach

- Disposition
 - Stuporous/Comatose = ICU
 - Stroke = Stroke unit (improved mortality and outcomes)
 - Poisoning = Discuss with toxicologist

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Stepwise Approach

- Disposition
 - No cause, but resolved = observation vs discharge home (but great followup/supervision plan needed)
 - However, missed delirium in elderly patients carries a higher mortality rate

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