

Altered Mental Status

Brad Sobolewski, MD, MEd

Terminology

ALTERED MENTAL STATUS...

is not a diagnosis in
and of itself

is due to an underlying
disease process

Lethargic

Depressed consciousness resembling a deep sleep from which a patient can be aroused but into which they immediately return

Normal

GCS 15

AMS

GCS <15 but >3

Coma

GCS 3

Obtunded = Stuporous

Not totally asleep but demonstrates greatly diminished responses to external stimuli

Coma

A transient state of complete unawareness and unresponsiveness

IRRITABILITY

The state of being abnormally responsive to slight stimuli

DELIRIUM

Acute confusional state characterized by confusion, disordered speech and hallucinations

Differential Diagnosis

A

Alcohol

E

Encephalopathy, Electrolytes

I

Insulin, Intussusception

O

Overdose

U

Uremia

T

Trauma

I

Infection

P

Psychiatric

S

Seizure, Shock, Stroke

PRIMARY CNS DISORDERS

Focally affect the brain by exerting external pressure (bleed/mass) or causing elevated ICP

SYSTEMIC ABNORMALITIES

1. Alter neural activity through decreased availability of substrates (hypotension, oxygen, glucose)
2. Altered intracellular metabolism (hypo/hyperthermia)
3. Introducing extraneous toxins (ingestions, liver/kidney failure)
4. Other conditions (lupus, Wilson's)

HYPOXIA

Hypercapnia cerebral vasodilation and increased CBF

Hypocapnia cerebral vasoconstriction and decreased CBF

CBF can increase 2-fold during periods of hypoxia

O₂ sat ≠ cerebral oxygen delivery

HYPOXIA

Mild symptoms

Difficulties with complex learning tasks

Reductions in short-term memory

Moderate symptoms

Cognitive and motor disturbances

Severe symptoms

Fainting, coma, seizures, cessation of brain stem reflexes, and brain death

HYPOGLYCEMIA

Autonomic symptoms

Glucose 40 - 70 mg/dL

Sweating, weakness, tachycardia, tremor, and feelings of nervousness and/or hunger

Neuroglycopenia

10 - 50 mg/dL

Lethargy, irritability, confusion, uncharacteristic behavior, hypothermia, seizure and coma

HYPOTHERMIA

Mild 32-35°C (90-95°F)

Peripheral signs

Consciousness is typically preserved

HYPOTHERMIA

Moderate 28-32°C (82-90°F)

Slurred speech, clumsy, agitated and impaired thinking

Confusion and lethargy as core body temp drops

HYPOTHERMIA

Severe hypothermia $\leq 28^{\circ}\text{C}$ (82°F)

No more shivering - muscle rigidity and flushed skin

Stupor then coma with fixed and dilated pupils

HYPERTHERMIA

Children with heat exposure and elevated body temperature ($\geq 40^{\circ}\text{C}$ [104°F]) with CNS abnormalities should be treated as victims of heat stroke

CNS symptoms

Impaired judgment, inappropriate behavior, delirium, hallucinations, ataxia, dysarthria, or coma

INFECTIONS

Lead to global CNS dysfunction

Meningitis, encephalitis, focal infections

Antibiotics and antivirals

M. pneumoniae, C. pneumoniae and EBV can cause severe impairment of mental status with or without meningoencephalitis

Many drugs can cause AMS

TOXINDROMES

Toxidrome	Mental status	Pupils	Vital signs	Other manifestations	Examples of toxic agents
Sympathomimetic	Hyperalert, agitation, hallucinations, paranoia	Mydriasis	Hyperthermia, tachycardia, hypertension, widened pulse pressure, tachypnea, hyperpnea	Diaphoresis, tremors, hyperreflexia, seizures	Cocaine, amphetamines, cathinones, ephedrine, pseudoephedrine, phenylpropanolamine, theophylline, caffeine
Anticholinergic	Hypervigilance, agitation, hallucinations, delirium with mumbling speech, coma	Mydriasis	Hyperthermia, tachycardia, hypertension, tachypnea	Dry flushed skin, dry mucous membranes, decreased bowel sounds, urinary retention, myoclonus, choreoathetosis, picking behavior, seizures (rare)	Antihistamines, tricyclic antidepressants, cyclobenzaprine, orphenadrine, antiparkinson agents, antispasmodics, phenothiazines, atropine, scopolamine, belladonna alkaloids (eg, Jimson Weed)
Hallucinogenic	Hallucinations, perceptual distortions, depersonalization, synesthesia, agitation	Mydriasis (usually)	Hyperthermia, tachycardia, hypertension, tachypnea	Nystagmus	Phencyclidine, LSD, mescaline, psilocybin, designer amphetamines (eg, MDMA ["Ecstasy"], MDEA)
Opioid	CNS depression, coma	Miosis	Hypothermia, bradycardia, hypotension, apnea, bradypnea	Hyporeflexia, pulmonary edema, needle marks	Opioids (eg, heroin, morphine, methadone, oxycodone, hydromorphone), diphenoxylate
Sedative-hypnotic	CNS depression, confusion, stupor, coma	Miosis (usually)	Hypothermia, bradycardia, hypotension, apnea, bradypnea	Hyporeflexia	Benzodiazepines, barbiturates, carisoprodol, meprobamate, glutethimide, alcohols, zolpidem
Cholinergic	Confusion, coma	Miosis	Bradycardia, hypertension or hypotension, tachypnea or bradypnea	Salivation, urinary and fecal incontinence, diarrhea, emesis, diaphoresis, lacrimation, GI cramps, bronchoconstriction, muscle fasciculations and weakness, seizures	Organophosphate and carbamate insecticides, nerve agents, nicotine, pilocarpine, physostigmine, edrophonium, bethanechol, urecholine
Serotonin syndrome	Confusion, agitation, coma	Mydriasis	Hyperthermia, tachycardia, hypertension, tachypnea	Tremor, myoclonus, hyperreflexia, clonus, diaphoresis, flushing, trismus, rigidity, diarrhea	MAOIs alone or with: SSRIs, meperidine, dextromethorphan, TCAs, L-tryptophan

CNS: central nervous system; LSD: lysergic acid diethylamide; MAOI: monoamine oxidase inhibitor; SSRI: serotonin reuptake inhibitor; TCA: tricyclic antidepressant.

PSYCHIATRIC CAUSES

Unless there is a past history of the exact same behavior it is dangerous to assume that the cause of AMS is psych

Differential is broad

Medical > psych

If unsure do a workup

PSYCHIATRIC CAUSES

Acute onset psychosis

- Disruption in thinking, accompanied by delusions or hallucinations
- **Delusions** false, fixed beliefs that cannot be resolved through logical argument
- **Hallucinations** false perceptions that have no basis in external stimuli

PSYCHIATRIC CAUSES

Patients may feign unconsciousness

Catatonic patients preserve ability to maintain posture

‘Fakers’ usually:

- Avoid hitting their face with a falling arm
- Resist eyelid opening
- Raise HR to auditory or painful stimuli
- Intact DTR, oculovestibular and oculocephalic reflexes

PSYCHIATRIC CAUSES

Brief hallucinations can occur in “normal” situations:

- Falling asleep and waking
- Bereavement
- Sleep deprivation
- Caffeine

TABLE 19.2 DIFFERENTIATING FEATURES OF ORGANIC AND PSYCHIATRIC PSYCHOSIS^a

Evaluation feature	Organic psychosis	Psychiatric psychosis
Onset	Acute	Gradual
Pathologic autonomic signs ^b	May be present	Absent
Vital signs	May be abnormal	Normal
Orientation	Impaired	Intact
Recent memory	Impaired	Intact
Intellectual ability	May be impaired	Intact
Hallucinations	Visual	Auditory
<p>^aChildren with both functional and organic psychoses will have impaired reality testing, inappropriate affect, thought disorder, poor behavior control, and disturbed relating ability. ^bIncrease or decrease in heart rate, respiratory rate, blood pressure, and temperature; miosis or mydriasis; and skin color changes.</p>		



LIFE THREATENING CAUSES OF AMS

Epidural hematoma

Cerebral edema

Bain neoplasms

Cerebral infarctions

CSF shunt malfunction

Meningitis/encephalitis

Toxic ingestions

Hypotension

Hypoxia

Sepsis

Management

S

Problem with ABCs?

T

Need meds or fluids now?

S

Meet any of the following criteria?

- Intubated or apnea
- CPR
- Severe respiratory distress
- SpO₂ < 90%
- Acute mental status changes
- Unresponsive?

?

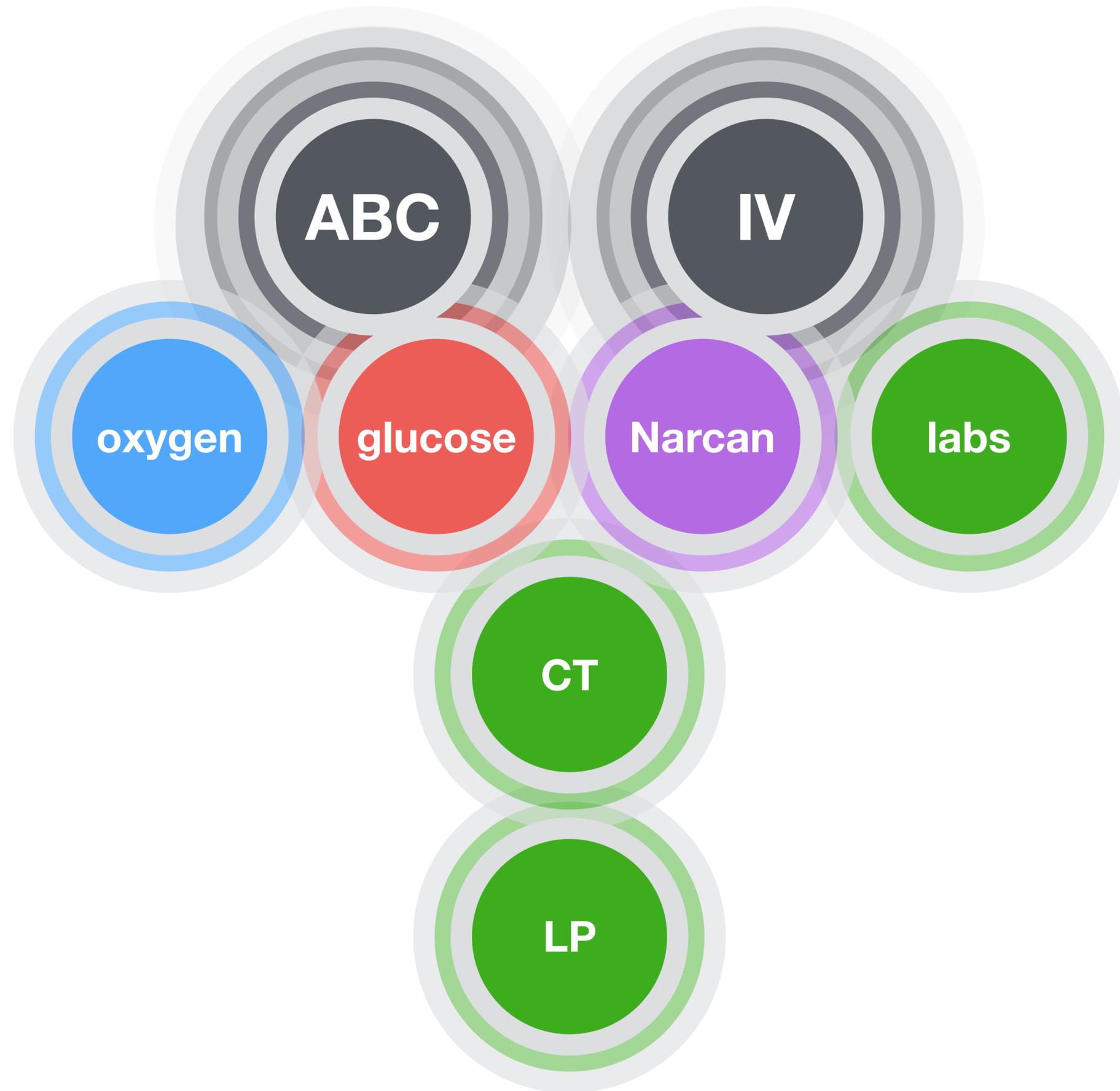
YOUR JOB

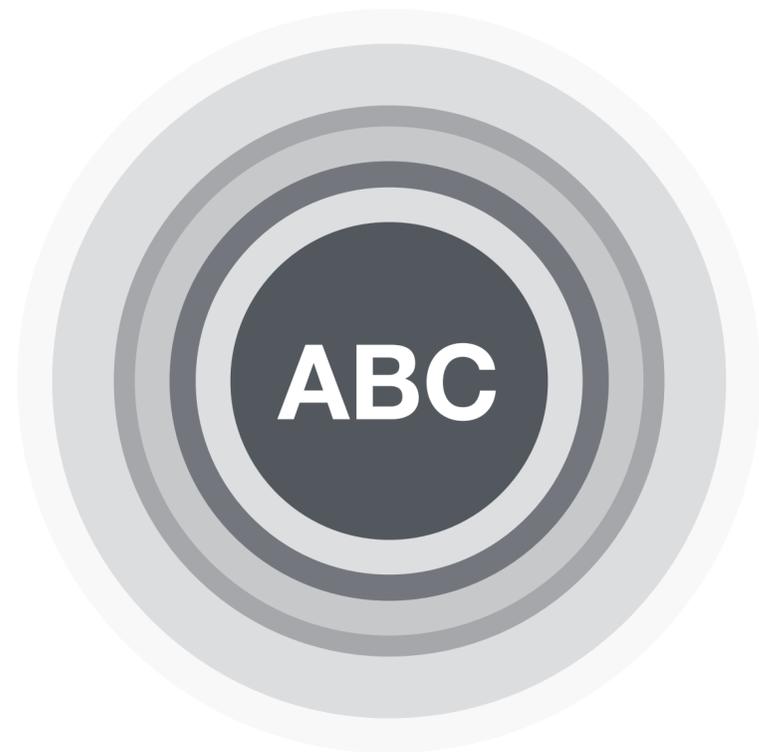
Rapid cardiopulmonary assessment

Secondary survey with attention to pupils,
GCS, mental status and signs of trauma

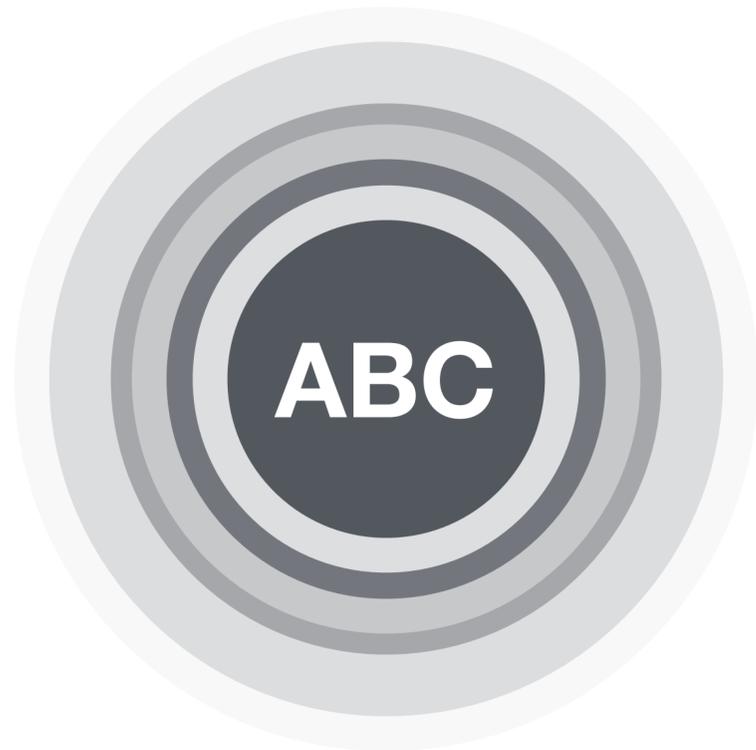
**A general approach to the
assessment and management of**

**Altered
Mental
Status**





Your assessment should include interventions needed to address ABC related problems



AIRWAY

Assess for potency and ability to maintain

Watch for deterioration

RSI for intubation

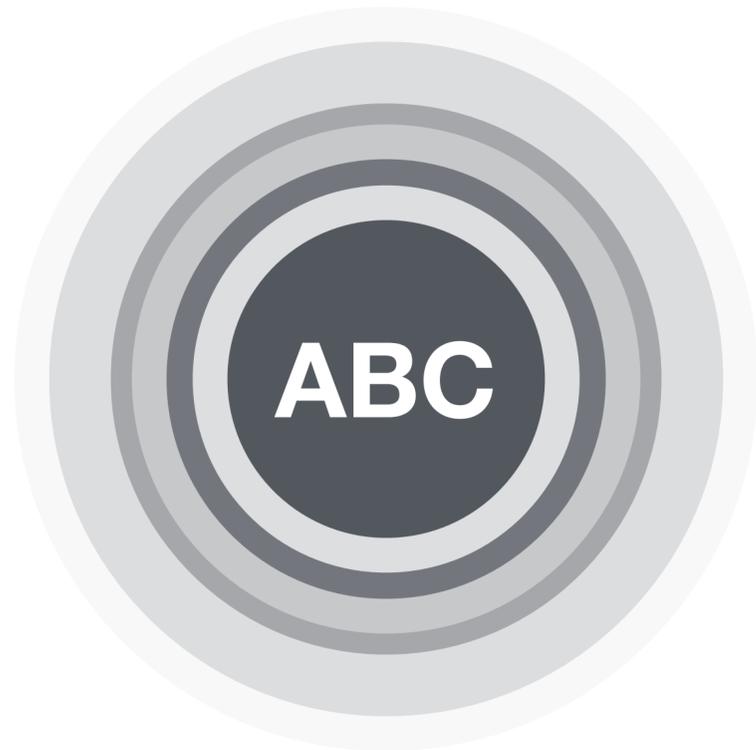
BREATHING

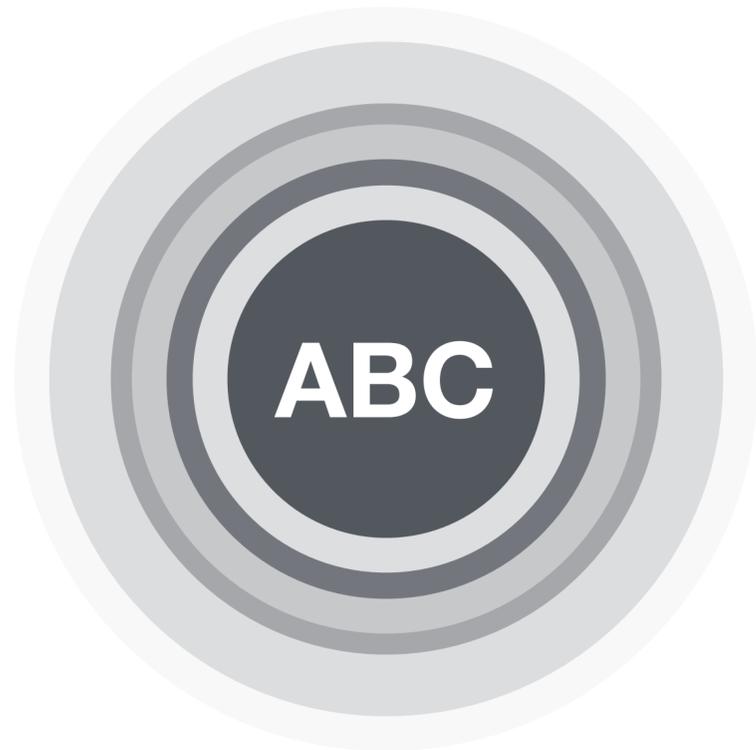
Ventilation may be impaired by declining respiratory drive or muscle dysfunction

Goal O₂ sat >95%

Use ETCO₂

Intubate those who cannot sustain adequate oxygenation or ventilation



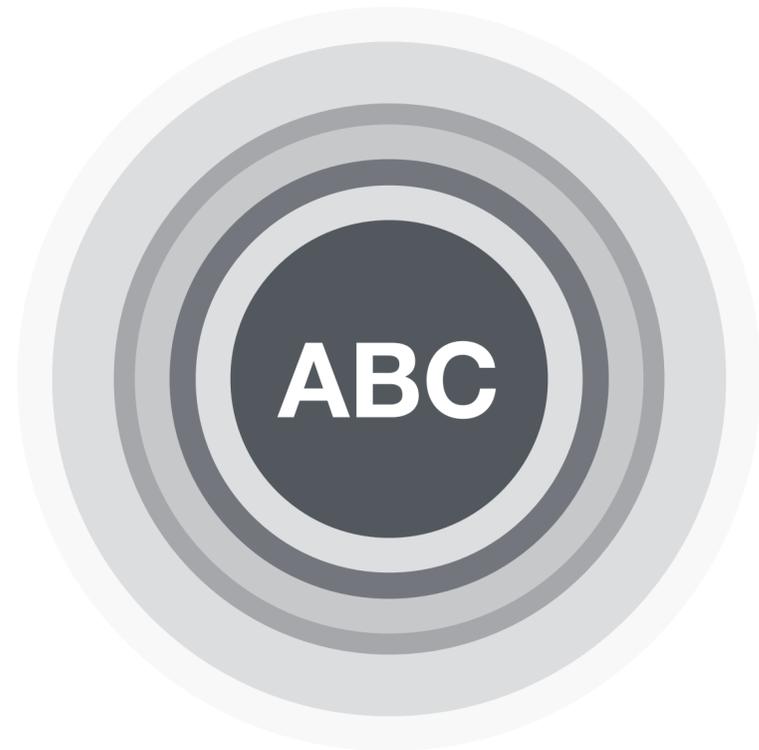


CIRCULATION

Continuous EKG monitoring

Assess for perfusion and identify shock

IV for any patient with abnormal VS



DISABILITY

GCS - repeat as patient changes

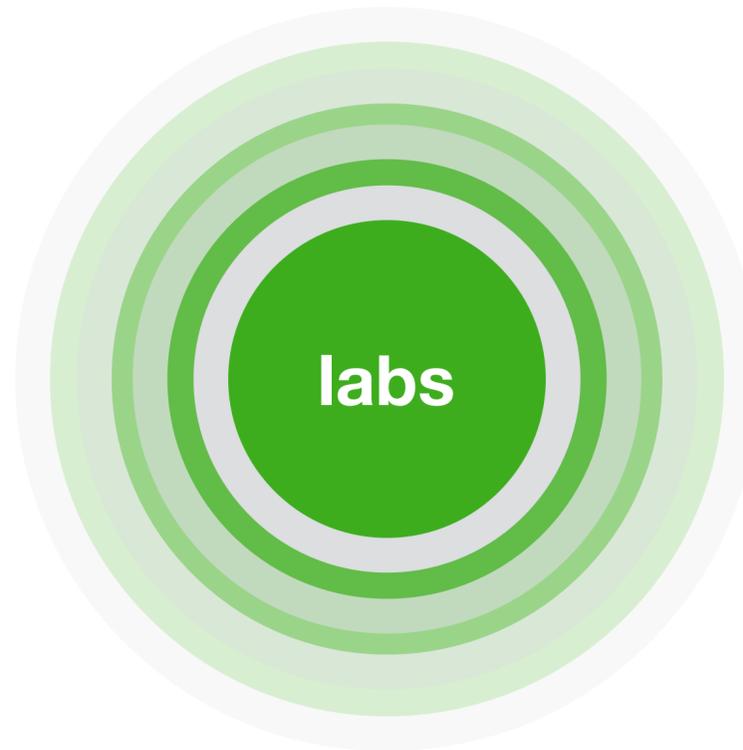
Pupil exam



Pupil response is the most direct
“window to the brain”

Conditions affecting the brain diffusely
spare pupils - except for opiates

Will the result alter the approach to treatment?



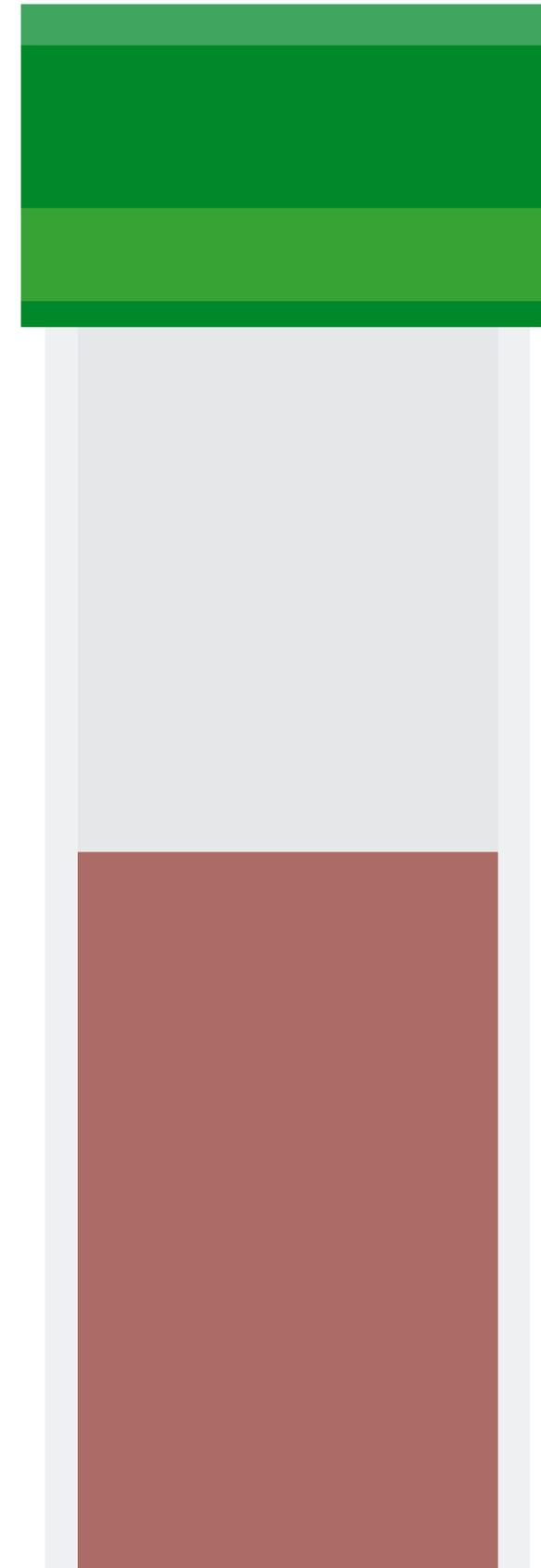
Will it return in time to affect therapy positively?

ISTAT +/- Accucheck

Renal panel
Osmolality

Acetaminophen
Salicylate
Ethanol
Urine Drug Screen

BhCG



ACETAMINOPHEN LEVEL

Ingestions are *usually* symptomatic by 4-6 hours except in acetaminophen ingestions

Sporer et al *Am J Emerg Med*, 1996: Retrospective review of 1820 patients with SI or AMS with suspected ingestion - 0.3% had toxic APAP levels not suggested by history, none required NAC

Chan et al *Hum Exp Toxicol* 1995: Retrospective review of 294 Chinese patients, 4/208 with suspected APAP poisoning had elevated but non-toxic levels

In the absence of history however, still get one

If elevated then repeat at 4 hours

SALICYLATE LEVEL

Obtain in the unknown ingestion with AMS

Done nomogram no longer routinely used

Levels > 90-100 mg/dL are usually associated with severe toxicity

May need multiple determinations in massive ingestions or sustained release preparations

**ETHANOL
LEVEL**

Elimination follows zero order kinetics

Rate varies 12-25 mg/dL/h - naive drinkers
10 mg/dL/h

Rough correlation between level and
symptoms

Level <300 mg/dL in a comatose patient
should prompt search for another cause

URINE DRUG SCREEN

Urine metabolites can be seen for 2-3 days

Blood 6-12 hours

Does a toxicology screen affect the management of a patient who has taken overdose?

Even if positive it rarely alters management

Kellermann Ann Emerg Med, 1987

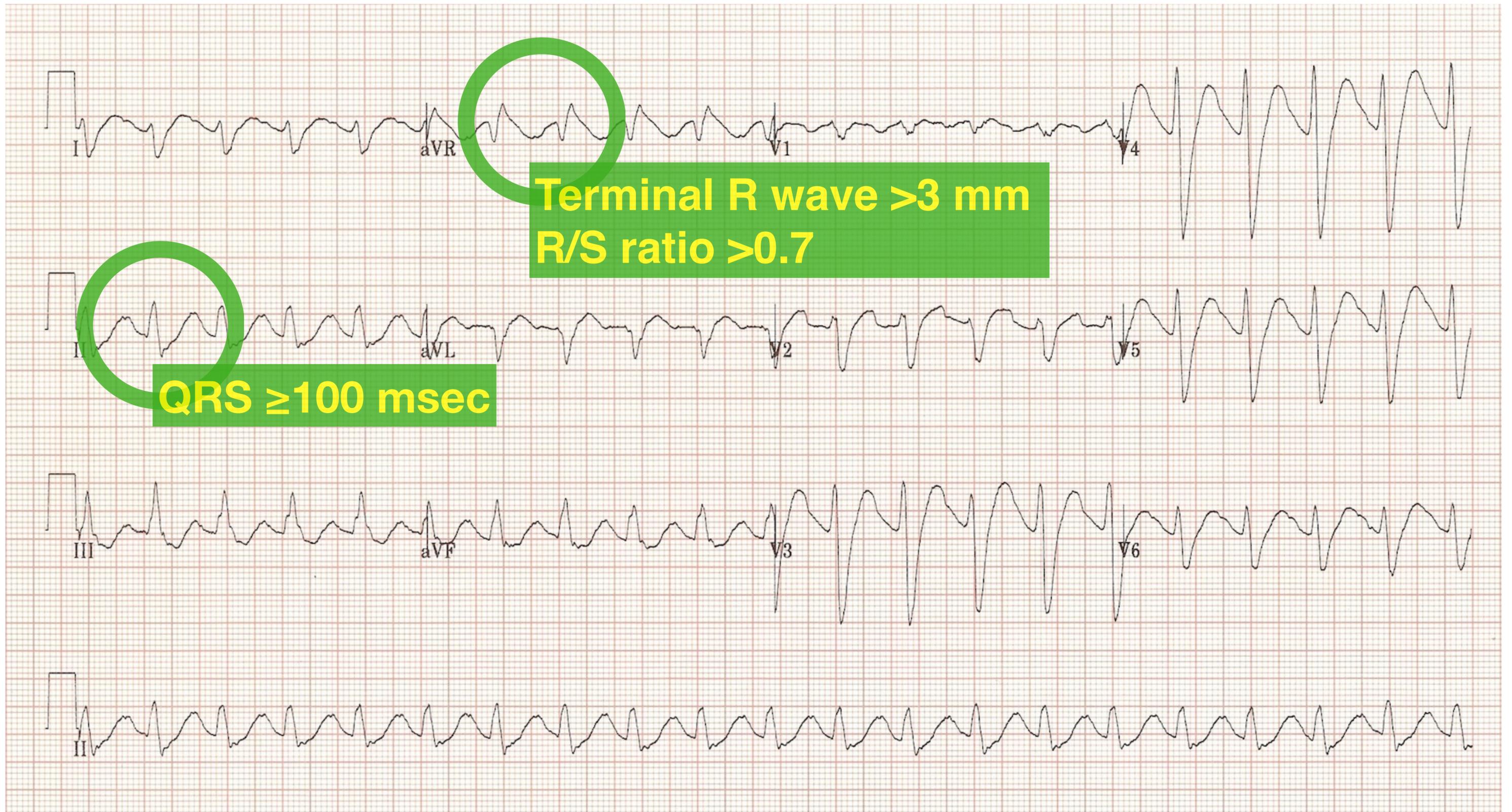
Kellermann Am J Emerg Med, 1988

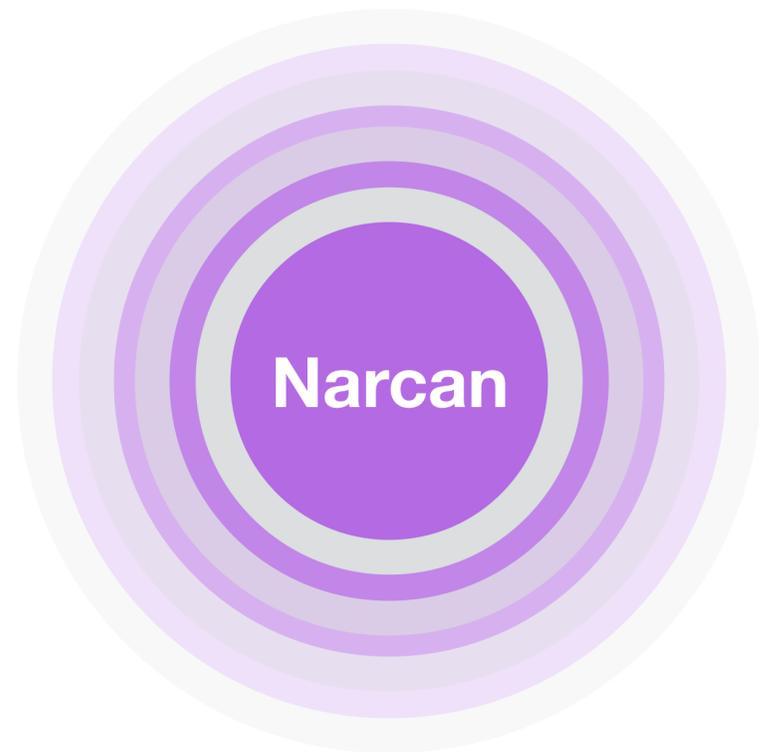
Brett Arch Intern Med, 1988

Belson Pediatr Emerg Care, 1999

Sugarman Pediatr Emerg Care, 1997

Go ahead and order one, but don't base your management on it





μ -opioid receptor competitive antagonist

Give in suspected opiate overdose

IV, IM, IN or SQ

Doesn't save lives - just prevents procedures

OTHER ANTIDOTES

Don't give flumazenil for benzodiazepine OD - precipitates seizures

Physostigmine may transiently improve MS in anticholinergic ingestion

Diphenhydramine for phenothiazine dystonia



If you suspect meningitis/encephalitis

Stable enough?

Is sedation necessary and safe?

Any acute **coma** of unknown etiology

Elevated ICP

Trauma

CSF shunt

Focal neuro findings

Unsupervised child



ANTIBIOTICS

Little harm in giving ceftriaxone +/- vancomycin +/- acyclovir

Try to delay until after LP

PHYSICAL RESTRAINTS

Need regular reassessments and appropriate documentation

CHEMICAL RESTRAINTS

Diphenhydramine, hydroxyzine, lorazepam, midazolam, haloperidol, ziprasidone

PO meds can have similar onset to IM

Other interventions first

Medication	Initial dose ^a	Onset of action (min)	Half-life, t _{1/2} (h)	Comments/adverse effect
Diphenhydramine	1.25 mg/kg ^b Teen: 50 mg	5–15 (IM/IV) 20–30 (PO)	2–8 2–8	Paradoxical reaction ^a
Hydroxyzine	1.25 mg/kg ^b Teen: 50 mg	5–15 (IM/IV) 20–30 (PO)	7–10 7–10	Paradoxical reaction ^a Paradoxical reaction ^a
Lorazepam	0.05–0.1 mg/kg ^b Teen: 2–4 mg	5–15 (IM/IV) 20–30 (PO)	12 12	Paradoxical reaction ^a ; respiratory depression
Midazolam	0.05–0.15 mg/kg ^b Teen: 2–4 mg	5–15 (IM/IV) 20–30 (PO)	3–4 3–6	Paradoxical reaction ^a ; respiratory depression
Haloperidol ^f	0.1 mg/kg ^b Teen: 2–5 mg	15–30 (IM) 30–60 (PO)	21 21	EPS/NMS Transient hypotension, may prolong QTc ^d
Risperidone ^{e,f}	<12 yr: 0.5mg Teen: 1mg	45–60 (PO) 45–60 (PO)	20 20	EPS/NMS may prolong QTc ^d
Olanzapine ^e	<12 yr: 2.5 mg Teen: 5–10 mg	30–60 (IM) 45–60 (PO)	30 30	EPS/NMS may prolong QTc ^d
Quetiapine	25 mg	45–60 (PO)	6	EPS/NMS may prolong QTc ^d
Ziprasidone	<12 yr: 5 mg Teen: 10–20 mg	30–60 (IM) 60 (PO)	2–5 7	EPS/NMS may prolong QTc ^d

IM, intramuscular; IV, intravenous; PO, oral; EPS, extrapyramidal symptoms; NMS, neuroleptic malignant syndrome.
^aA paradoxical reaction, such as behavioral disinhibition, agitation, hyperexcitability, and insomnia may occur.
^bRound dose to nearest milligram or half milligram.
^cAlthough not U.S. Food and Drug Administration approved, haloperidol lactate has been used IV (with dosage usually approximated at PO dose × 0.625).
^dRelative risk for QTc prolongation: ziprasidone > quetiapine > risperidone, olanzapine, haloperidol.
^eRapidly disintegrating oral tablet available.
^fLiquid formulation available.

**Take Home
Points**

Altered mental status is
usually caused by an
underlying disease process

ABC > IV > glucose + labs > CT > LP

Even with a past history of mental health illness acute onset psychosis is more commonly associated with an underlying medical cause

Altered Mental Status