



Toxidromes and Antidotes

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1. To discuss the identification and therapeutic approach to common toxidromes:

- Anticholinergic
- Sympathomimetic
- Opioids
- Sedative hypnotic
- Serotonin
- Neuroleptic malignant syndrome
- Cholinergic

2. To Discuss common Antidotes and their indications



The Dose Makes The Poison



Poison is in everything, and no thing is without poison. The dosage makes it either a poison or a remedy.

(Paracelsus)

The Dose Makes The Poison

WATER

very low toxicity



90,000 mg/kg

CAFFEINE

moderate toxicity



250 mg/kg

1080

high toxicity



2 mg/kg



TABLE 1.1.1 Risk assessment-based approach to poisoning

Resuscitation

Airway

Breathing

Circulation

Detect and correct

— hypoglycaemia

— seizures

— hyper-/hypothermia

Emergency antidote administration

Risk assessment

Agent

Dose

Time since ingestion

Clinical features and course

Patient factors

Supportive care and monitoring

Investigations

Screening—12-lead ECG, paracetamol

Specific

Decontamination

Enhanced elimination

Antidotes

Disposition

What is a Toxidrome

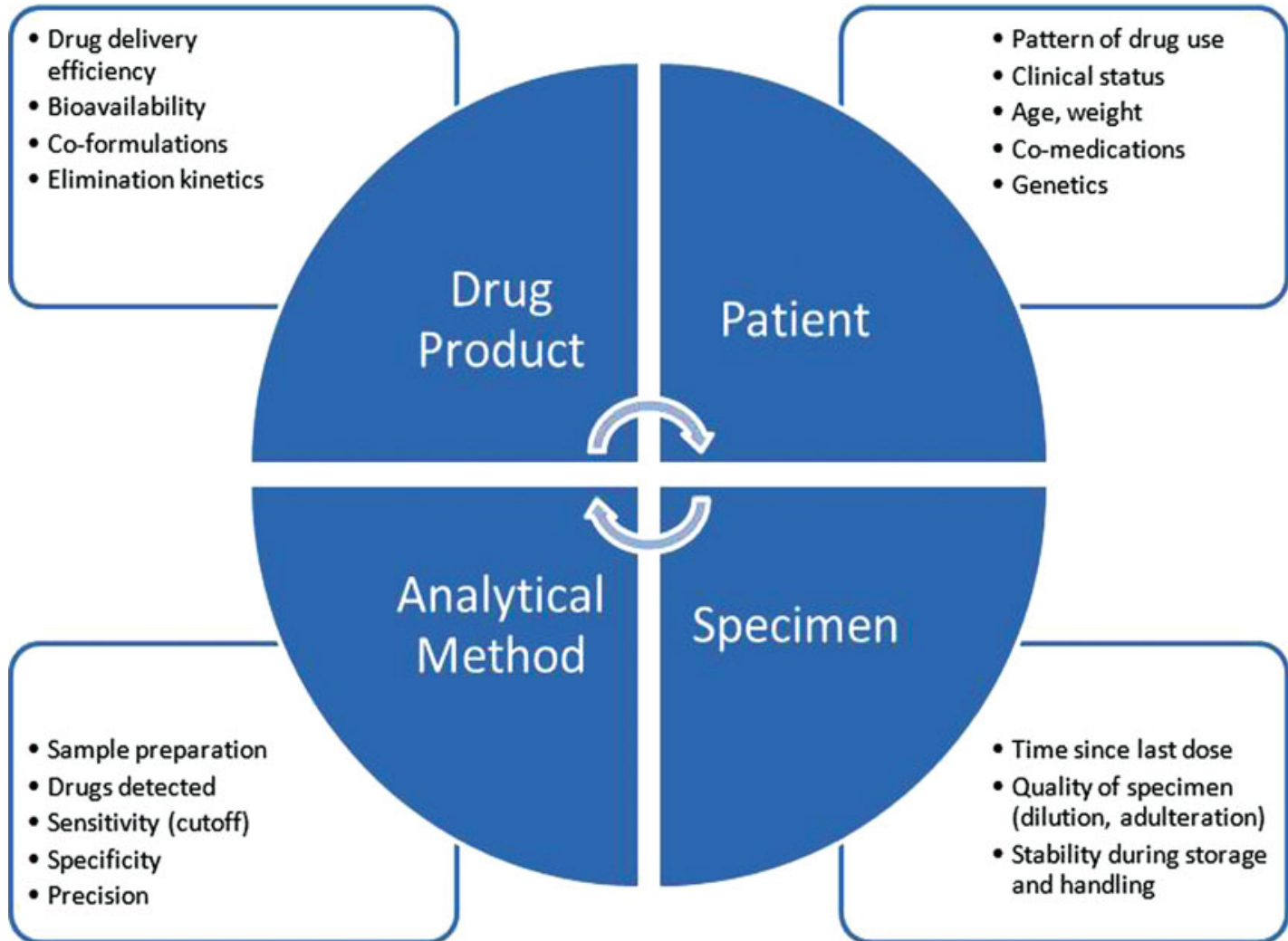


- **A toxidrome** is a constellation of **signs and symptoms** that help narrow the differential diagnosis to certain toxin and thus guides therapy
- i.e A clinical picture that suggests exposure to certain class of poisons

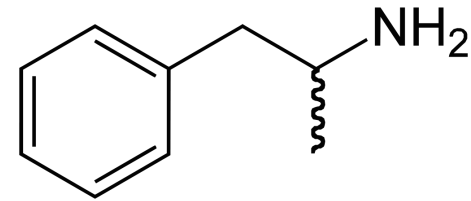
Toxidromes Vs urine drug screen (UDS)

- Urine drug testing: tests for specific class of xenobiotic, commonly (opioids, BDZ, amphetamines, cannabis, ...)
- Significant rates of false positive and false negative results
- If truly positive, it indicates exposure to the substance at some point in time and not necessary indicates toxicity

Factors That Influence The Results Of UDS



Amphetamines



| Drug Class | Cross-reactant |
|-----------------------|---------------------|
| Amphetamines | benzphetamine |
| | chlorpromazine |
| | clobenzorex |
| | isometheptene |
| | isoxsuprine |
| | phentermine |
| | phenylpropanolamine |
| | promethazine |
| | ritodrine |
| | thioridazine |
| | trazodone |
| | trimethobenzamide |
| | trimipramine |
| | ephedrine |
| | methylphenidate |
| | pseudoephedrine |
| | desipramine |
| | bupropion |
| | fenfluramine |
| | propranolol |
| labetalol | |
| mexiletine | |
| selegiline | |
| tyramine | |
| amantadine | |
| ranitidine | |
| phenylephrine | |
| vapor sprays (Vick's) | |

Toxidrome # 1



- 25 year-old male, Ingested 25 tablets (50 mg each) of diphenhydramine, 2 H ago
- He is drowsy and his skin is dry
- BP= 135/85, HR= 130, RR=18
- He is trying to catch something in the air

Anticholinergic Toxidrome



Mad as a hatter
Altered mental status



Blind as a bat
Mydriasis



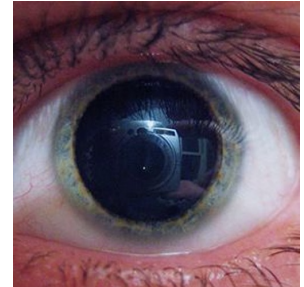
Red as a beet
Flushed skin



Hot as a hare
Dry skin (anhydrosis)



Dry as a bone
Dry mucous membranes



Anticholinergic Toxidrome



Anticholinergic Toxidrome

- Blind as a bat
- Dry as a bone
- Red as a beet
- Hot as a hare
- Mad as a hatter

Exam: mydriasis, dry flushed skin, hyperthermia, altered mental status, seizure, tachycardia, hypotension, urinary retention



Antidote: Physostigmine
Other Treatment: fluids

Anticholinergic Toxidrome



Management:

1) ABCDE

2) Supportive care: fluid, cooling if needed,....

3) Physostigmine: in moderate to severe toxicity, if No TCA overdose, no wide QRS, no seizure, no bradycardia

4) If physostigmine is contraindicated, then just use supportive care and benzodiazepines for agitation or seizure

Toxidrome Case #2

- 32-year-old woman found delirious and very agitated; extremely paranoid; appears to be hallucinating
- Vital signs: HR 130 bpm; BP 170/100 mm Hg; R 16/min; T 100.4°F
- Pupils 7mm (mydriasis)
- Skin: **moist**, diaphoretic



Sympathomimetic Toxidrome

Mnemonic: "MATHS"

- M** : Mydriasis
- A** : Agitation, arrhythmia, angina
- T** : Tachycardia
- H** : Hypertension, hyperthermia
- S** : Seizure, sweating



Management:

1. Treat agitation, HTN, and seizures with benzodiazepines
2. Avoid pure β -blockers due to unopposed alpha agonism

Sympathomimetic toxidrome

Excessive Sympathetic nervous system stimulation

- Tachycardia
- Hypertension
- Mydriasis
- Tachypnea
- Sweating (as opposed to dry skin in anticholinergic syndrome!)
- Hyperthermia
- Seizures
- Stroke
- MI

- Meds:
 - Decongestants (Pseudoephedrine)
 - Ritalin, Adderall
 - Cocaine, amphetamines
- Treatment:
 - Benzodiazepines
 - Supportive care (cooling, IVF...)

Toxidrome Case #3

- A 15-year-old boy found unresponsive, snoring in bed.
- Vital signs: HR 50 bpm, BP 90/60 mm Hg, RR 5/min, Temp 97°F
- Pupils 1-2 mm (miosis)
- Neurologic: unresponsive to painful stimuli
- Physical exam: decreased bowel sounds



Opioid toxidrome

- Excessive stimulation of mu receptors in the CNS from opioid agonists.
- Meds:
 - Morphine
 - Fentanyl
 - Hydromorphone
 - Codeine
 - Oxycodone
- Recreational drugs:
 - Heroin

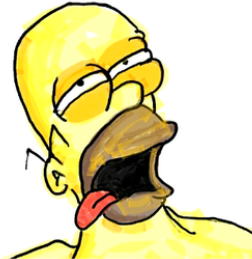
Opioid Toxidrome

EMNote.org

Narcotic (Opioid) Toxidrome

Mnemonic: "CPR-3H"

- C** : Coma
- P** : Pinpoint pupils
- R** : Respiratory depression
- H** : Hypotension
- H** : Hypothermia
- H** : Hyporeflexia



NOTE: Meperidine (*Demerol*) will not cause miosis

Antidote: Naloxone

Start with **0.04 mg** and titrate up q 2-3 min as need for ventilation to 0.5 mg, 2 mg, 5 mg, up to max 10-15 mg

@jackfchong

Toxidrome Case #4

- A 45-year-old female found unresponsive at home. She was last seen approximately 20 hours prior. She does not respond to painful stimuli.
- Vital signs: HR 60 bpm, BP 100/50 mm Hg, T 96°F, RR 10/min
- HEENT: 4 mm bilaterally, reactive to light
- Skin: pressure sores
- Physical exam: poor gag reflex, decreased muscle tone and depressed reflexes



Sedative-hypnotic Toxicidrome



Apnoea
GCS reduced
Ataxia
Slurred speech

Hypnotic
toxicidrome



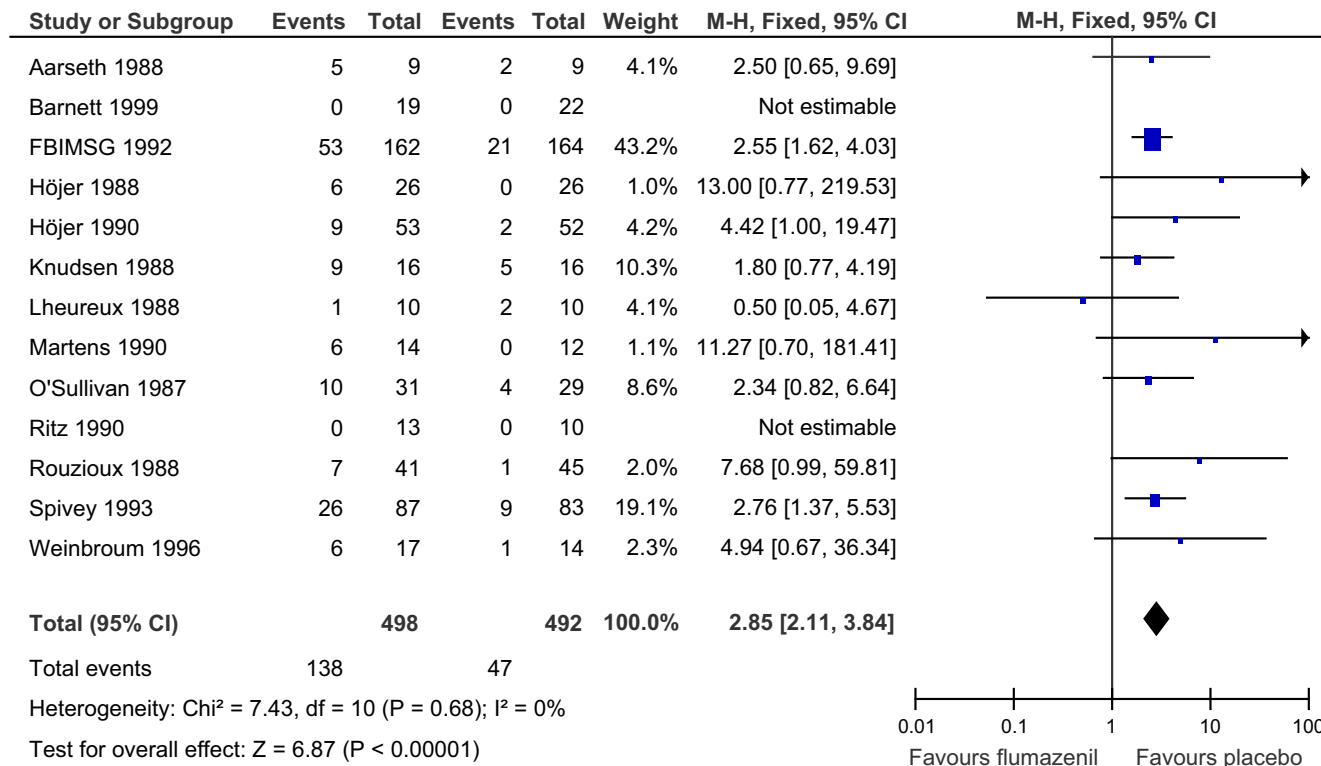
Sedative-hypnotic Toxidrome

- Usually from excessive stimulation/potentiation of GABA receptors in the CNS.
- Can happen with H1 blockade in the CNS
- Meds:
 - Benzodiazepines (GABA agonism)
 - Antipsychotics (H1 blockade)
 - ETOH (GABA agonism)
- Treatment:
 - Supportive
 - Flumazenil??



MiniReview

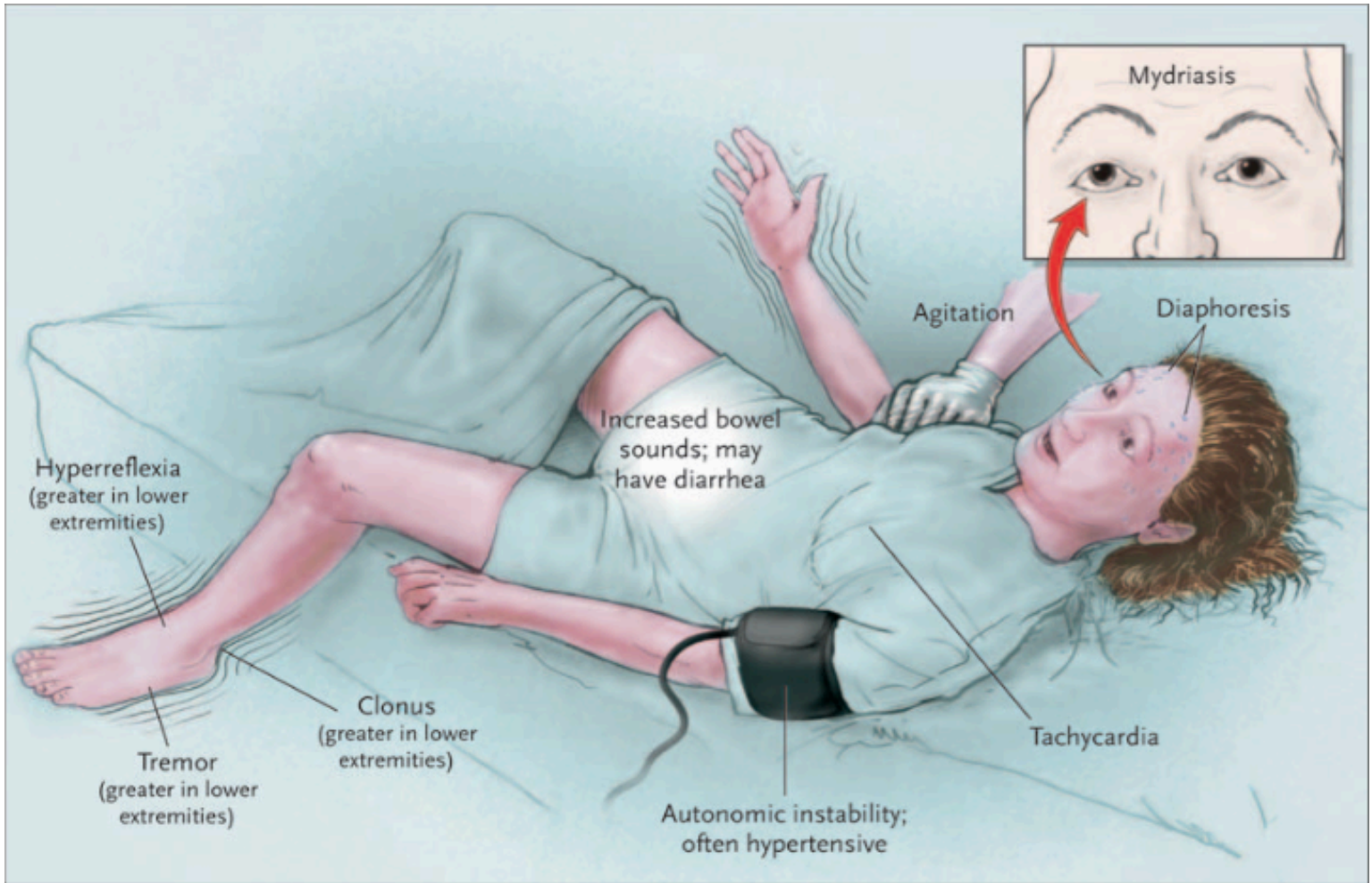
Adverse Events Associated with Flumazenil Treatment for the Management of Suspected Benzodiazepine Intoxication – A Systematic Review with Meta-Analyses of Randomised Trials



Toxidrome # 5

- 20 year old female presented with confusion, diarrhea and agitation
- Vital signs: HR 130, BP: 150/90, T: 37.9, RR: 18
- Hx: Patient on Fluoxetine (SSRI) for depression. Lately was prescribed tramadol for pain following a dental procedure
- Physical exam: Agitated, exaggerated bowel sounds, has tremor, hyperreflexia with clonus

Serotonin Toxicity



Serotonin toxidrome

- Excessive activity at the serotonin receptor (5HT) in the CNS and peripherally
- Usually results from a drug-drug interaction of two serotonergic agents.
- In this case the two serotonergic agents were:
 - Fluoxetine (SSRI)
 - Tramadol
- Treatment:
 - Benzodiazepines
 - Supportive care (cooling, IVF...)
 - Cyproheptadine

Medications that can cause serotonin syndrome

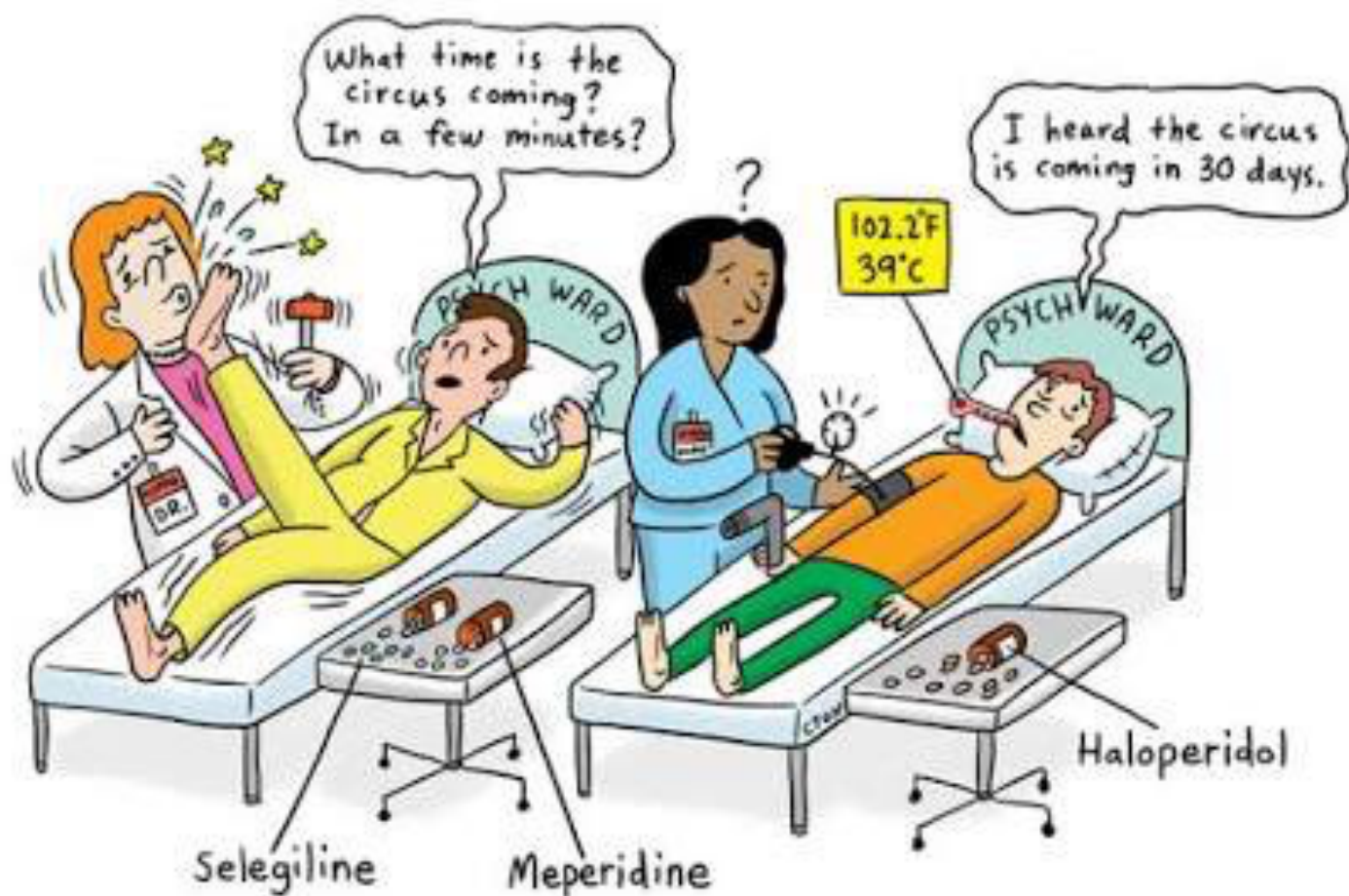
| Action | Medications |
|--|---|
| Increases serotonin formation | Tryptophan |
| Increases release of serotonin | Amphetamines and amphetamine derivatives Cocaine MDMA |
| Impairs serotonin reuptake | Cocaine, MDMA, meperidine, tramadol, pentazocine SSRIs (citalopram, escitalopram, fluoxetine, fluvoxamine, paroxetine, sertraline) SNRIs (desvenlafaxine, duloxetine, milnacipran, venlafaxine, levomilnacipran) Dopamine-norepinephrine reuptake inhibitors (bupropion) Serotonin modulators (nefazodone, trazodone, vilazodone, vortioxetine) TCAs (amitriptyline, amoxapine, clomipramine, desipramine, doxepin) St. John's wort 5-HT3 antagonists (dolasetron, granisetron, ondansetron, palonosetron) Metoclopramide, valproate, carbamazepine, sibutramine, dextromethorphan, cyclobenzaprine |
| Inhibits serotonin metabolism | MAOIs (phenelzine, tranylcypromine, isocarboxazid, moclobemide, safinamide, selegiline, rasagiline, linezolid, tedizolid, methylene blue, procarbazine) |
| Direct serotonin agonist | Buspirone, triptans, ergot derivatives, fentanyl, LSD |
| Increases sensitivity of postsynaptic receptor | Lithium |

LSD: lysergic acid diethylamide; MAOIs: monoamine oxidase inhibitors; MDMA: 3,4-methylenedioxyamphetamine; SNRIs: serotonin-norepinephrine reuptake inhibitors; SSRIs: selective serotonin reuptake inhibitors; TCAs: tricyclic antidepressants

SEROTONIN SYNDROME

VS

NEUROLEPTIC MALIGNANT SYNDROME



Treatment for neuroleptic malignant syndrome vs serotonin syndrome

Serotonin syndrome

Neuroleptic malignant syndrome

| | |
|---|---|
| Stop serotonergic agent | Stop causative agents |
| Supportive care (aim to normalize vital signs) | Supportive care (possible ICU admission) |
| Sedation with benzodiazepines | Medical therapy (dantrolene, bromocriptine, amantadine) |
| Medical therapy (cyproheptadine) | Consider ECT (unclear efficacy) |
| ECT: electroconvulsive therapy | |

Neuroleptic Vs Serotonin

Differentiating neuroleptic malignant syndrome and serotonin syndrome

| Factor | Serotonin syndrome | Neuroleptic malignant syndrome |
|------------------------|--|--|
| Causative medications | Serotonergic agents | Dopamine antagonists |
| Physical exam findings | Hyperreflexia, myoclonus, ocular clonus | Severe rigidity (lead pipe), hyporeflexia |
| Laboratory findings | More commonly no lab findings | More commonly increased creatine kinase, leukocytosis, low serum iron |
| Course of illness | Symptoms seen within 24 hours of starting/changing therapy and resolves within a few days of treatment | Slower in onset (1 to 2 weeks after starting/changing therapy) and resolves within 9 to 14 days of treatment |

Toxidrome #6

- A 56-year-old woman with confusion, shortness of breath, vomiting and diarrhea
- Vital signs: HR 50 bpm; BP 90/palp mm Hg; R 32/min; T 98.6°F
- Pupils 2 mm
- Skin: profuse sweating, tearing and rhinorrhea
- Physical exam: hyperactive bowel sounds, muscle fasciculations

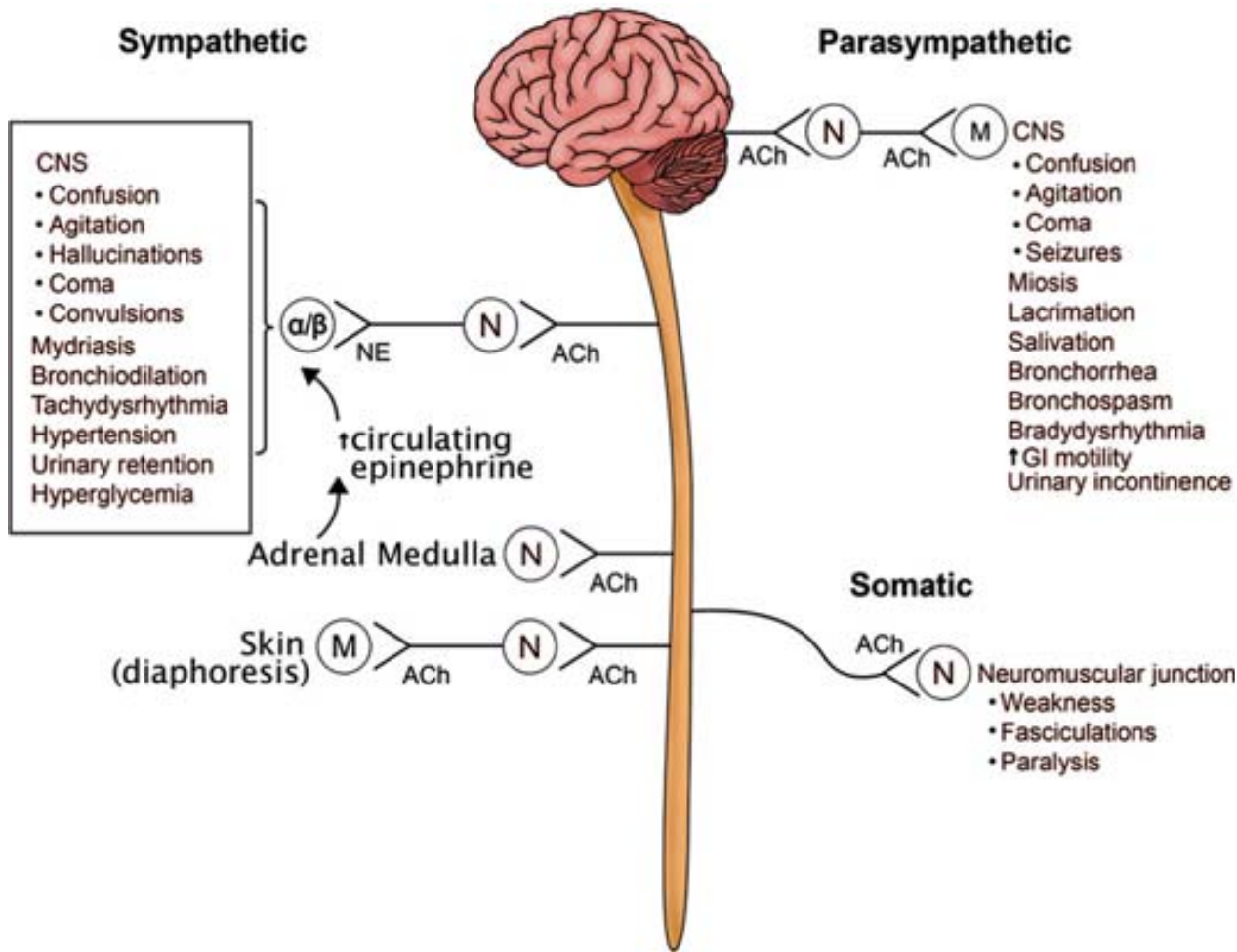


FIGURE 113-5. Pathophysiology of cholinergic syndrome as it affects the autonomic and somatic nervous systems.

Organophosphate Poisoning

Muscarinic Overstimulation

Musc leaks from Everywhere

I am Overstimulated
Now you all work
Your Ass off &%@#...



Nicotinic Overstimulation

Nics give Tension, weakness and Paralysis

HyperTension and Muscle weakness

I'm Covered in SLUDGE

- Salivation
- Lacrimation
- Urination
- Defecation
- GI cramps
- Emesis



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Mydriasis Tachycardia (MT)

Muscle Weakness, Twitching, Fasciculation
High BP, Paralysis

MT... my BP is high and paralysis is happening



Creative-Med-Doses

Cholinergic Toxidrome



sweating
(diaphoresis)

crying
(lacrimation)

pin point pupils
(miosis)

running nose
(rhinorrhea)

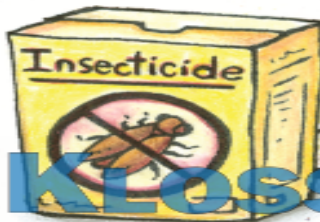
frothing at
the mouth
(salivation & bronchorrhea)

vomiting
(emesis)

bradycardia

urination

diarrhea



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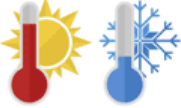




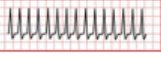








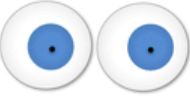



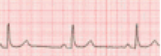


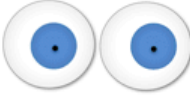



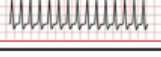






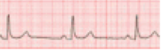





Cholinergic toxidrome

- Excessive stimulation of nicotinic and muscarinic acetylcholine receptors
- Usually from blockade of acetylcholinesterase leading to excessive free acetylcholine molecules acting on the receptors



Cholinergic toxidrome

- Medication:
 - Alzheimer's meds (donepezil)
 - Myasthenia gravis meds (pyridostigmine)
- Chemicals:
 - Organophosphates
 - Carbamates
- Treatment:
 - Antidote: Atropine, 2PAM
 - Supportive care

| | HR & BP | Resp. | Temperature | Pupils | Bowel Sounds | Diaphoresis |
|--|--|--|--|---|---|---|
| <p>Anticholinergic</p> <p>Anticholinergics – Atropine, scopolamine, glycopyrrolate, benztropine, trihexyphenidyl</p> <p>Antihistamines – Chlorpheniramine, Cyproheptadine, Doxylamine, Hydroxyzine, Dimenhydrinate, Diphenhydramine, Mefenazine, Promethazine</p> |  |  |  |  |  |  |
| |   | <p>No change</p>  |  | <p>Dilated</p>  |  |  |
| <p>Cholinergic</p> <p>Organic Phosphorous Compounds: Carbamates • Atracurium, Pilocarpine, Urecholine (Betanecol), Carbachol, Choline, Metacholine, Mushrooms</p> | <p>No change</p>  | <p>No change</p>  | <p>No change</p>  | <p>Pinpoint</p>  |  |  |
| <p>Opioid</p> <p>Morphine • Codeine • Tramadol • Heroin • Meperidine • Diphenoxylate • Hydromorphone • Fentanyl • Methadone • Propoxyphene • Pentazocine • DXM • Oxycodone • Hydrocodone</p> |   |  |  | <p>Pinpoint</p>  |  |  |
| <p>Sympathomimetic</p> <p>Caffeine, cocaine, amphetamines, methamphetamines, Ritalin, LSD, Theophylline, MDMA</p> |   |  |  | <p>Dilated</p>  |  |  |
| <p>Sedative-Hypnotic</p> <p>anti-anxiety agents, muscle relaxants, antiepileptics and preanesthetic medications – Barbiturates – Benzodiazepines</p> |   |  |  | <p>No change</p>  |  |  |

Antidote

TABLE 32.7

Antidotes

| Agent or Clinical Finding | Antidote |
|---------------------------|----------------------------------|
| Acetaminophen | N-acetylcysteine |
| Benzodiazepines | Flumazenil* |
| Beta-blockers | Glucagon* |
| Cardiac glycosides | Digoxin immune Fab |
| Crotalid envenomation | Crotalidae polyvalent immune Fab |
| Cyanide | Hydroxocobalamin* |
| Ethylene glycol | Fomepizole |
| Iron | Deferoxamine |
| Isoniazid | Pyridoxine |
| Methanol | Fomepizole |
| Methemoglobinemia | Methylene blue |
| Opioids | Naloxone* |
| Organophosphates | 1. Atropine* 2. Pralidoxime* |
| Sulfonylureas | 1. Glucose* 2. Octreotide |



ACMT

Antidote Card

*This antidote card is for information only and is not meant to substitute for medical judgment or toxicology consultation. For patient care issues please contact your local toxicologist or poison center at 1-800-222-1222.

GI DECONTAMINATION

LAVAGE (OROGASTRIC LAVAGE WITH LARGE BORE TUBE)

Adult: 36-40 Fr

Child: no less than 22 Fr

- Consider airway protection
- Rarely indicated

Contraindications: Caustics, large or sharp foreign body, can't protect airway, toxin not in stomach

Activated Charcoal

Dose: 1 g/kg PO, ideally 10:1 charcoal:drug

- Consider in recent (1-2 hr) ingestion of toxic substance that adsorbs to charcoal and lack of contraindications (caustics, AMS, vomiting, decreased GI motility)

Multidose Activated Charcoal (MDAC)

- Consider for ingestions with enterohepatic or enteroenteric circulation (phenytoin, phenobarbital, carbamazepine, dapsone, theophylline, caffeine)

Whole Bowel Irrigation

Mechanical bulk cleansing of GI tract with polyethylene glycol solution (i.e. GoLyteLy™)

- Consider for ingestions with delayed/prolonged absorption, or body packers

Adult: 2 liters/hr PO (+/- NGT, antiemetic)

Child: 25 mL/kg/hr PO

Continue until rectal effluent is clear

N-ACETYL-CYSTEINE (NAC, ACETADOTE™)

Indication: Acetaminophen Poisoning

Oral dosing:

140 mg/kg load then 70 mg/kg q 4 h x 17 doses

IV dosing:

Load: 150 mg/kg x 60 min

Then: 50 mg/kg x 4 h

Then: 100 mg/kg x 16 h

| (kg) | (lb) | Acetadote (mL) | 5% Dextrose (mL) | Acetadote (mL) | 5% Dextrose (mL) | Acetadote (mL) | 5% Dextrose (mL) |
|------|------|----------------|------------------|----------------|------------------|----------------|------------------|
| 30 | 66 | 22.5 | 100 | 7.5 | 250 | 15 | 500 |
| 25 | 55 | 18.75 | 100 | 6.25 | 250 | 12.5 | 500 |
| 20 | 44 | 15 | 60 | 5 | 140 | 10 | 280 |
| 15 | 33 | 11.25 | 45 | 3.75 | 105 | 7.5 | 210 |
| 10 | 22 | 7.5 | 30 | 2.5 | 70 | 5 | 140 |

CALCIUM

Indication: Calcium Channel Blocker or Beta Blocker Poisoning

Adult: CaCl 10% 10 mL IV (1 gm) over 10-15min

CaGluconate 10% 30 mL/dose IV (3 gms) over 5-10 min

Peds: CaCl 10% 0.1-0.2 mL/kg IV (20 mg/kg) over 10-15 min

CaGluconate 10% 0.2-0.5 mL/kg IV (20-50mg/kg) up to 10

mL/dose over 5-10 min, not to exceed adult dose

Infusion: 0.5 mEq/kg/hr IV = 0.2 - 0.4 mL/kg/hr of CaCl₂ (10%), or 0.6 - 1.2 mL/kg/hr of CaGluconate (10%)

Indication: Hydrofluoric Acid

Dermal: 3.5 grams CaGluconate plus 5 oz water-soluble lubricant (KY jelly)

- 1 g CaCl₂ = 13.4 mEq elemental Ca
- 1 g CaGluconate = 4.3 mEq elemental Ca

GLUCAGON

Indication: Calcium Channel Blocker or Beta Blocker

Poisoning

Adult: 50 µg/kg (max 10 mg) IV over 1-2 min, repeat q 10-15 min 1-2 times PRN

Then: 1-5 mg/h (max 10 mg/h) IV in D₅W Peds: 50 µg/kg IV load then 70 µg/kg/hr

HIGH DOSE INSULIN EUGLYCEMIA (HIE)

Indication: Calcium Channel Blocker or Beta Blocker

Poisoning

Dextrose: ± 25-50 g (0.5-1 g/kg) IV bolus

Then: 0.25-0.5 g/kg/hr IV drip

Insulin: 1 U/kg IV bolus

Then: 0.5-1.0 U/kg/hour IV drip [mix as 500 U insulin in 50 mL NS (10 U/mL)]

Increase if no effect in 15 minutes

Titrate to 10 U/kg/hr

- Check capillary glucose q 30 min initially

DIGOXIN-SPECIFIC FAB (DIGIBIND AND DIGIFAB)

Indication: Digoxin and Cardiotoxic Steroid

- Reconstitute with 4 mL sterile H₂O
- IV over 30 min (IVP if critical)

Amount ingested known:

vials = [amount (mg)] x 0.8 / 0.5 mg

Level known:

vials = [level (ng/mL)] x [weight (kg)] / 100

Unknown ingestion/level (empiric therapy):

Adult: 10 vials (acute); 3-6 vials (chronic)

Peds: 1-2 vials

CYANIDE ANTIDOTE KIT [HOPE NITHIODOTE KIT]

Indication: Cyanide Poisoning

- Consider in Smoke Inhalation with Hypotension and Lactic Acidosis

Sodium Nitrite (NaNO₂) 3% (30 mg/mL)

Adult: 10 mL (300 mg) IV over 2-4 min

Peds: ~0.2 mL/kg IV over 2-4 min

Sodium Thiosulfate 25% (250 mg/mL)

Adult: 50 mL (12.5 g) IV over 10-30 min

Peds: 0.5 g/kg (2 mL/kg) IV as adult

Warning: no nitrite if smoke/fire victim/CO exposure.

HYDROXOCOBALAMIN (CYANOKIT™)

Indication: Cyanide Poisoning

Dose: 70 mg/kg (max 5 g) IV over 30 min

Repeat prn (max total 15 g) IV over 6-8 h

METHYLENE BLUE

Indication: Methemoglobinemia

IV: 1-2 mg/kg (0.1-0.2 mL/kg) of 1% over 5 min with 30 mL

flush q 4 h (max 7 mg/kg)

Neonate: 0.3-1 mg/kg IV

DEXTROSE (GLUCOSE)

Indication: Hypoglycemic agents

Dose: 0.5 -1.0 gram/kg, adjust based on size

Adult: D₅₀ (0.5 grams/mL) IV

Peds: D₂₅ (0.25 grams/mL) IV

Neonates: D₁₀ (0.1 grams/mL) IV

Consider administering thiamine if deficient

OCTREOTIDE (SANDOSTATIN)

Indication: Sulfonyleurea Poisoning

Adult: 50 µg SQ every 6 h

Peds: 1.25 µg/kg (max adult) SQ every 6 h

Continue therapy x 24h, then FSBG x 24 hours

FOMEPIZOLE (ANTIZOL™)

Indication: Methanol, Ethylene Glycol

Load: 15 mg/kg IV in 100 ml NS x 30 min

Maint: 10 mg/kg IV q12 hours until level <20 mg/dL

Hemodialysis: Give load if > 6 h since last dose

Maint: q 4 h during HD

At end, give scheduled dose if > 3 h

Or, ½ dose if 1-3 h since last dose

ETHANOL (ETOH)

Indication: Methanol, Ethylene Glycol

IV: 10% ETOH (100 mg/ml) (may use 5%)

Load: 0.8 g/kg (8 ml/kg) over 1 h

Maint: 80-130 mg/kg/h (0.8-1.3 ml/kg/h)

Chronic: 150 mg/kg/h (1.5 ml/kg/h)

HD: 250-350 mg/kg/h (2.5-3.5 ml/kg/h)

2-PAM (PRALDOXIME CHLORIDE)

Indication: Organophosphate poisoning

Adult: 1-2 g (20-40 mg/kg) in 100 ml NS IV over 15-30 min

Maint: 8 to 10 mg/kg/h or 500 mg/h IV

Peds: 20-40 mg/kg (max 2 gm) in 100 ml NS IV x 30-60min

Maint: 10-20 mg/kg/h IV

ATROPINE

Indication: Organophosphate/Carbamate Poisoning

Adult: 1-2 mg (mild) or 3-5 mg (severe) IV

Double q 3-5 min until dry

Maint: 10-20% of load IV qh, titrate prn

Peds: 20-50 µg/kg (min 0.1 mg/max 0.5 mg) IV

NALOXONE (NARCAN™)

Indication: Opioid Poisoning

Adult: Start at 0.04 -0.4 mg

IV/IM/SQ/Intranasally/Intratracheal. Repeat dose if initial response not adequate, up to 10 mg total. Titrate to RR ≥ 12 and sufficient tidal volume. If opioid naive, can start with 0.4 mg.

Peds: 0.01 mg/kg IV (IM, SQ, Intraosseous, Intratracheal can be used but not preferred) if opioid naive (0.001 mg/kg if opioid dependent)

Titrate to 0.1 mg/kg IV if no effect

Neonate: (asphyxia neonatorum) 0.01 mg/kg via umbilical vein (IM, SQ) q 2-3 min

For recurrent resp depression consider infusion: 2/3 of reversal dose infused hourly

FLUMAZENIL (ROMAZICON™)

Indication: Benzodiazepine Poisoning

Initial: 0.2 mg IV @ 0.1 mg/min

May repeat with 0.3 mg, then 0.5 mg

Infusion: 0.1-1.0 mg/h IV (in NS or D5W)

PHYSOSTIGMINE (ANTILIRIUM™)

Indication: Antimuscarinic Toxicity

• For reversal of neurobehavioral effects

• NO ECG evidence of TCA toxicity (+t40 aVR)

• Atropine at bedside, cardiac monitor, oximetry

Adult: 1-2 mg IV over > 5 min

May repeat in 5 – 10 minutes PRN

Peds: 20 µg/kg (max 0.5 mg) as above

FOLATE (FOLIC ACID)

Indication: Methanol Poisoning

1-2 mg/kg (50-75 mg) q 4 h x 24h

Extra dose at completion of hemodialysis

LEUCOVORIN (FOLINIC ACID)

Indication: Methotrexate Poisoning

Dose: MTX plasma level or 100 mg/m² IV over 15-30 min

(max 160 mg/min) q 3-6 h x several days or until serum MTX < 10 nmol/L or < 100 nmol (in cancer) and no bone marrow toxicity

SODIUM BICARBONATE (NAHCO₃)

8.4% (1 M) 50 ml ampule = 50 mEq

7.5% (0.892 M) 50 ml ampule = 44.6 mEq

Bolus: 1-2 mEq/kg IVP over 1-2 min

Infusion: 2-3 amps in 1 L D₅W @ 150-200 mL/h (2x maintenance in *peds*)

Indication: Tricyclic Antidepressant and other Sodium Channel Blocker Poisoning

• Goal is QRS narrowing

Indication: Salicylate Poisoning or to alkalinize urine in specific toxins

• Goal is urine pH 8.0 (alkalinization)

• Must make sure serum K ~ 4.0

Indication: Chlorine/Hcl Gas Inhalation

• Consider 4% nebulized solution

VITAMIN B6 (PYRIDOXINE)

Indication: Ethylene Glycol Poisoning

Adult: 50 mg IV q6h

Indication: Isoniazid Poisoning

Known amt: 1 g per g of INH (max 5 g)

Unknown: 70 mg/kg IV at 0.5 g/min

• Max 5 g, or until seizure stops

• Remainder IV over 4-6 h

VITAMIN K1 (PHYTONADIONE)

Indication: Brodifacoum Poisoning

Adult: 25-50 mg PO TID-QID x 1-2 d, then per INR

L-CARNITINE

Indication: Valproic Acid Poisoning

Note: Optimal dosing for VPA toxicity not well established.

Suggested dosing is below.

Loading Dose: 100 mg/kg IV (max 6 g) over 15-30 min

Then: 15 mg/kg (max 3g per dose) IV q 4 h over 10-30 min

Prophylaxis: 100 mg/kg/d PO ÷ q 6h (maximum 3g/day in adults and 2g/day in children)

PROTAMINE SULFATE

Indication: Heparin Poisoning

1 mg (max 50 mg) neutralizes 100 U heparin, or 100 anti-Xa

U of dalteparin/linzaparin, or 1 mg of enoxaparin

Load: 1% solution IV over > 10 min

Then: 0.5 mg/100 anti-Xa U if still bleeding

INTRAVENOUS LIPID EMULSION

Indication: Local Anesthetic Toxicity (LAST)

Loading Dose: 1.5 mL/kg of 20% solution over 1 minute.

Bolus may be repeated for persistent dysrhythmia

Infusion: 0.25 mL/kg/min over 30-60 minutes. Infusion rate can be increased if blood pressure declines.

Indication: Non-LAST with cardiovascular collapse

Poorly studied. Consider for poisoning by drugs expected to be lipid soluble based on Log D, or Log P. See

<http://lipidrescue.org> for further information.

Consider same dosing as above for LAST.

THANK YOU

