**TOXICOLOGY STUDY SHEET**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **BP** | **HR** | **R** | **T** | **Pupils** | **Diaphoresis** | **Mental Status** | **Other** |
| **Anticholinergic** | −/↑ | ↑ | ± | ↑ | ↑ | ↓ | Delirium | Dry mucous membranes, flush, urinary retention |
| **Cholinergic** | ± | ± | ± | − | ± | ↑ | Normal to depressed | Salivation, lacrimation, urination, diarrhea, bronchorrhea, fasciculations, paralysis |
| **Etoh or Sedative Hypnotic** | ↓ | ↓ | ↓ | −/↓ | ± | − | Depressed, agitated | Hyporeflexia, ataxia |
| **Opioids** | ↓ | ↓ | **↓** | ↓ | ↓ | − | Depressed | Hyporeflexia |
| **Serotonin toxicity** | ↑ | ↑ | −/↑ | −/↑ | −/↑ | ↑ | Normal to agitated delirium | Clonus, tremor, seizures |
| **Sympathomimetics** | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | Agitated | Tremor, seizures diaphoresis |
| **Withdrawal from etoh or bdzs**  | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | Agitated, disoriented hallucinations | Tremor, seizures diaphoresis |
| **Withdrawal from opiates** | ↑ | ↑ | − | − | ↑ | ↑ | Normal, anxious | Vomiting, rhinorrhea, piloerection, diarrhea, yawning |

↑ = increases; ↓ = decreases; ± = variable; − = change unlikely;= **↑** =change more likely

Note that the above table is a spectrum. Depending on the severity toxicity not all vital signs may be indicated as above.

**TOXIDROMES CONTINUED:**

**Anticholinergic:** “happy pickers” think diphenhydramine, jimson weed

Antidote: physostigmine (contraindicated if seizure risk or wide QRS)

**Cholinergic:** Killer B’s bronchorrhea, bronchospasm, bradycardia

Antidote: Atropine, pralidoxime (2-PAM)

**DUMBBELS: D**iarrhea **U**rination **M**iosis/muscle weakness **B**ronchorrhea **B**radycardia **E**mesis **L**acrimation **S**alivation/sweating

**DRUGS OF ABUSE:**

**Sedative hypnotics:** Antidote is flumazenil, not often used for supposed seizure risk in chronic users (can be considered to prevent intubation or invasive workup such as LP).

**Opioids:** antidote Narcan .04mg

**Opioid mimic:** clonidine, causes pinpoint pupils, bradycardia, sedation, respiratory depression. Treatment is still the same: naloxone

**GHB:** Pt. comes in comatose with normal vitals, suddenly wakes up and self extubates

**PCP:** mydriasis, rage, delusions, amnesia, vertical and rotary nystagmus. Rx with benzos

**TOXIC ALCOHOLS:**

**Methanol:** metabolized to Formic Acid (ocular toxicity)

Treat with Fomepizole (ADH blocker) and dialysis

**Ethylene Glycol:** metabolized to Glycolic and Oxalic Acid (renal toxicity)

Treat with Fomepizole (ADH blocker) and dialysis

**Isopropanol:** metabolized to Acetone \*Ketosis without acidosis\*

**OVER THE COUNTER MEDICATIONS:**

**APAP:** 4 hour level >150 treat with NAC.

Toxic range: >150mg/kg (kids) or 7.5g (adults)

Rumack-Mathew nomogram can be applied to ACUTE ingestions only

**Aspirin:** Toxic range: >150mg/kg. Tinnitus, Tachypnea, Hyperthermia, mixed resp alkalosis/metabolic acidosis

Treatment: Bicarb 1-2mEq/bolus followed by drip.

Avoid intubation whenever possible

HD for: 1) Altered mental status or pulmonary edema

 2) An acute level of > 100

 3) An acute level of >90 with

 3) Failure to respond to supportive care (bicarb, fluids)

**NSAIDS:** metabolic acidosis in massive overdose, can cause renal failure chronically.

**SYNDROMES OF HYPERTHERMIA:**

**Malignant hyperthermia:** first sign is rise in end tidal CO2, hyperthermia, rigidity, tachycardia, hypertension. Antidote: Dantrolene

Classic case is after OR case from inhaled anesthetics, can also be caused by succinylcholine

**Serotonin Syndrome:** Tachycardia, HTN, hyperthermia, hyperreflexia, myoclonus, lower extremity rigidity, rhabdomyolysis, tremor

Antidote: cyproheptadine

**NMS:** Diffuse rigidity, including upper extremities, rhabdomyolysis, tachycardia, HTN, hyperthermia

Antidote: bromocriptine, benzos

**PSYCHIATRIC MEDICATIONS:**

**TCAs:** “seizures, coma, death” sodium channel blockade, ekg may show terminal R in aVR, QRS >100 predictive of seizures >160 predictive of dysrhythmias

Treat with sodium bicarb

**Lithium:** Acute (GI distress) vs. Chronic (Neuro); can be acute on chronic.

Usually occurs with renal impairment, lithium is radiopaque get abd XR

Treatment: Hydrating the patient

HD if evidence AMS, renal failure or level 4.0 in acute or 2.5 chronic

**METALS:**

**Iron:** GI distress (vomiting); may be accompanied by hyperglycemia, leukocytosis

Radiopaque, get abdominal x-ray

**5 Stages:**

**1.** GI irritation (30min – 6hrs)

**2.** Recovery from GI symptoms (6-24hrs)

**3.** Shock and metabolic acidosis (6-72hrs)

**4.** Fulminant Hepatic Failure (12-96hrs)

**5.** GI mucosa healing leads to scarring and bowl obstruction (2-6weeks)

Antidote: Deferoxamine for level >500

**Lead:** WBI especially if lead visible on x-ray

Treatment: if symptomatic with encephalopathy or level >100 Rx BAL (British anti-lewisite) first then EDTA;

If asymptomatic child >45 or adult >89 Rx with DMSA (succimer)

**Arsenic:** Garlic breath; Rx with BAL (British anti-Lewisite) or DMSA if can tolerate PO

**Mercury:** Rx with BAL (British anti-Lewisite) or DMSA if can tolerate PO

**CELLULAR ASYPHYXIANTS**

**Cyanide:** Hemodynamic instability, setting of house fire, very high lactate

Antidote: Hydroxycobalamin

Old kit: sodium nitrate, amyl nitrate, sodium thiosulfate

**Carbon Monoxide:** Headache, produced by anything causing combustion (ie engines, bbq’s) can also be in setting of a house fire

Treat with HBO if Level >25%, >15% in pregnant women, or any level with signs of end organ damage (syncope, STEMI, AMS, seizures)

**Methemoglobinemia:** cyanosis, O2 sat 85% not correcting with oxygen. May see chocolate colored blood. Common offending agents benzocaine, dapsone

Antidote: Methylene blue

**CARDIAC MEDS AND HYPOGLYCEMICS:**

**Digoxin Toxicity:** Bradaycardia, AV blocks, bidirectional VTACH, slow afib

Usually occurs with renal impairment

Must check a level 6 hours after last dose patient has taken or the level will be falsely elevated

Give Digifab if ectopy on ekg, hyperK >5, or renal failure, significantly elevated dig level

Digifab dosing = [weight (kg) x concentration level (ng/mL)/100] \*round up to nearest number of vials

**Beta Blocker:** Bradycardia hypotension. Rx with glucagon, high dose insulin

**Calcium Channel Blocker:** Bradycardia hypotension. Rx with calcium, high dose insulin

**Sulfonylurea:** Hypoglycemia. Rx with Octreotide

**MALA** (Metformin Associated Lactic Acidosis): Usually in setting of renal failure causing decreased excretion of metformin. Leads to usually a severe lactic acidosis in the setting or relatively preserved mental status. Treatment is HD. Can use bicarb to temporize

**CAUSTICS:**

**Hydrofluoric Acid:** seen in window/glass etching. Pain out of proportion to skin findings, causes hypocalcemia, hypomagnesemia, QTc prolongation, cardiac arrythmia and death

Treatment: decontamination, calcium topically (if systemic illness give IV)

**Bleach**: Sodium Hypochlorite; Stridor, drooling, or vomiting needs endoscopy within 12hrs

**ANTICONVULSANTS**

**Na channel blockade:** phenytoin, carbamazepine, topiramate, VPA

**GABA antagonism:** phenobarbital

**Calcium channel blockade:** Gabapentin, pregabalin, VPA

Phenytoin: cerebellar symptoms, ataxia, slurred speech, nystagmus

Carbamazepine: Can present with anticholinergic toxidrome and qrs widening

VPA toxicity results in hyperammonemia rx with L-carnetine

Note: intractable seizures and “recently treated for TB” think isoniazid give B6/pyridoxine

**LOCAL ANESTHETICS:**

*“Neurotoxicity before cardiotoxicity”*

Treatment is intralipid

Lidocaine toxic dose without epi **4.5**mg/kg, with epi **7**mg/kg

1% solution means 1G / 100mL or 1000mg / 100mL = 10mg/mL

2% solution means 2G / 100mL or 2000mg / 100mL = 20mg/mL

Examples:

Would take approx. **~30cc (**4.5mg x 70kg = 315mg / 10mg = 31.5cc) of **1% lidocaine without epi** for toxicity in a 70kg adult.

Would take approx. **~15cc (**4.5mg x 70kg = 315mg / 20mg = 15.75cc) of **2% lidocaine** **without epi** for toxicity in a 70kg adult.

Would take approx. **~50cc (**7mg x 70kg = 490mg / 10mg = 49cc) of **1% lidocaine with epi** for toxicity in a 70kg adult.

Would take approx. **~25cc (**7mg x 70kg = 490mg / 20mg = 24.5cc) of **2% lidocaine** **with epi** for toxicity in a 70kg adult.



**ENVIRONMENTAL:**

**Radiation:** absolute lymphocyte count at 48 hrs <1200 predictor of bad outcome

**Spiders:**



Note: *black widow envenomation can cause severe muscle spasms (even of abdominal muscles) can be confused for acute abdomen, especially in pediatrics.*

**Snakes:**

**Crotalids (pit vipers):** *cottonmouths, water moccasins, and rattlesnakes*

Triangular head, elliptical pupils, and two curved fangs.

Causes coagulopathy, necrosis, swelling. Rx with Cro-Fab.

The treatment for compartment syndrome from crotalid envenomation is Cro-Fab, not fasciotomy



**Elapids:** Coral snake (above) Neurotoxicity leading to weakness, respiratory paralysis; *“Red on yellow, kill a fellow. Red on black, venom lack”*

**Scorpions:** Centuroides (bark scorpion)

Hyperthermia, hypertension, nystagmus, drooling, mydriasis, pancreatitis

Rx with benzos and antivenom (only if systemic illness or very old and very young)

**Plants containing cardiac glycosides (know what they look like; see plant ppt):**

Oleander

Yellow Oleander

Foxglove

Lily of the Valley

Red squill

**Mushrooms:** In general (there are always exceptions) If nausea and vomiting occurs < 6 hrs this is a good prognostic indicator

Amanita phalloides (Death Cap), hepatoxicity, GI manifestations delayed >6 hrs.

**Ciguatoxin:** large fish, barracuda, grouper, etc. heat stabile

Temperature reversal, sensation of loose teeth are classic symptoms, also GI upset

Supportive care

**Scombroid:** histamine release, flushing, GI upset, peppery taste. Rx with diphenhydramine.

\*\*\*This is meant to be a quick reference study guide. A lot of the toxicity and treatments mentioned in this paper are very nuanced and at times controversial. If there are ever any questions with the management of a poisoned patient please consult our medical toxicology service. \*\*\*\* 516-975-1300