ER/Clinic [*When The Poop Hits The Fan*] Cheat Sheet

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DRUG ASSISTED INTUBATION

1. ***PREOXYGENATE*** X **3 minutes** with **100% Oxygenated** Non-Rebreather
2. **All drugs** are **IV Push** except **Fentanyl**
3. **Elderly, decreased cardiac output** or **hypotensive/hypovolemic -** use **lower** range of **drug dosage**

INDICATIONS FOR PRETREATMENT MEDS = "**ABC**": **Asthma** (RAD), **Brain** (Head Trauma) & **Cardiovascular**

- **Fentanyl** [For **Elevated ICP**, **AAA**, **Aortic Dissection** & **CAD**] 3 m**c**g/kg IV push over 1 minute (O 3 min/D 30-60m) Give **3 minutes** before sedative; helps reduce **adverse catecholamine** response. Give **over 30-60** seconds to **minimize** respiratory depression [**Avoid** in **PEDS**, **Shock**, Hyp**OT**ensive or Hyp**OV**olemic]
- **Albuterol** Nebulizer – Give **10** minutes **before** intubation to help **prevent** acute **bronchospasm**
- **Lidocaine** 1.5mg/kg **–** Give **3** minutes **before** intubation; For **patients** with **asthma/COPD** to **decrease hypertensive** response and **bronchospasm** (**No need** to give if **Albuterol** was given)
- **Infants < 1 year** or **kids 5** or **under** using **Sux** or **> 5** using **2nd dose** of **Sux: Atropine 0.03 mg/kg;** Max **0.5 mg/kg** IV **2 minutes** before intubation **(May** help **prevent bradycardia)**

THEN SEDATION [**Onset** -" O"/**Duration** -" D"]

Etomidate 0.3 mg/kg (O 15-45s/D 3-12m)

- [**Use** in Hyp**OT**ensive pts] [May cause **Seizures;** Avoid in **Sepsis**]

Propofol 2-3 mg/kg (O 15-45s/D 5-10m)

- [**Good** for **RAD**] [**Avoid** in TBI & Hy**PO**tension]

Midazolam 0.3 mg/kg (O 30-90s/D 15-30m)

- [Good to use for **Seizures**] [**Avoid** in TBI; **Decreases** BP]

Ketamine 2-4 mg/kg (O 45-60s/D 10-20m)

- [Good for **Asthma** Patients/**Sepsis**/Bronchodilator/Maintains RR/**Increases** BP]
- [**Avoid** in **Hypertensive** Patients w **Ischemic Cardiac Disease**]

CHOICE OF INDUCTION AGENT

TBI or **CVA**

- **Etomidate** (**Best** for Hyp**ER**tensive pt) or **Ketamine** (**Best** for Hyp**OT**ensive pt) **AVOID Ketamine** in **Cerebral Herniation [**Dilated pupils/**HA**/AMS/**SZ**/Decreased Reflexes**]**

Status epilepticus

- **Propofol** (**Best**) or **Etomidate (2nd choice)** or **Midazolam (3rd);** AVOID **Ketamine**

Reactive airway disease

- **1st line: Ketamine** & **Propofol**
- **2nd line: Etomidate** & **Midazolam**

Cardiovascular disease

- **Etomidate**

Shock & Sepsis

- **Ketamine 1 mg/kg** or **Etomidate 0.15 mg/kg (Lowest dose** to help **prevent hypotension)**

THEN PARALYTIC

Succinylcholine 0.6-2 mg/kg (O 30-60s/D 5-10 min)
[**CONTRA** – K >5.5; **Burns** >24H; **Crush Injury** >3 days; **CVA** >72H; (**MS/ALS**)/**Spinal Cord Injury**; H/O **MH**]
Rocuronium 0.6-1.2 mg/kg (O 45-60s/D 30-60 min)

- [**Use** for **Burns/Dialysis/Crush Injury**]

Vecuronium 0.1 mg/kg (O 1.5-3 min/D 30-60 min)

Post-Intubation Maintenance Meds

(Sedation) **Midazolam** 0.1-0.4 mg/kg/HR; **Ketamine** 0.5 mg/kg/min; **Propofol** 0.6 mg/kg/HR

*** Etomidate** should **NOT** be used as an **infusion** or in **repeated bolus doses** for maintenance of sedation after intubation*****

(Paralysis) **Vecuronium** 10-15 m**c**g/kg IV q12-15min prn or 1 m**c**g/kg/min
Rocuronium 0.1-0.2 mg/kg IV prn or 4-16 m**c**g/kg/min

(Analgesia) **Fentanyl** 0.3 to 1.5 m**c**g/kg/HR; **Morphine** 0.01 to 0.15 mg/kg/HR

DAI Peds

PREOXYGENATE X 3 minutes with **100% Oxygenated** Non-Rebreather

THEN SEDATION

Hypovolemic – **Etomidate** 0.1mg/kg or **Midazolam (Best for Peds)** 0.1mg/kg **3 minutes** before procedure
Normovolemic – **Etomidate** 0.3mg/kg or **Midazolam** 0.05-0.3mg/kg
Fentanyl 1m**c**g/kg per dose, max 4m**c**g/kg
Propofol 0.5mg/kg Q 3-5 min, max 1.5mg/kg
Ketamine 1-2 mg/kg loading dose IV; 1 mg/kg IV Q 10-15min; **give slowly** (not to exceed 0.5 mg/kg/min)

THEN PARALYTIC

Succinylcholine <10 kg: 2mg/kg; >10kg: 1mg/kg [O 30-60s/D 5-10 min]
Rocuronium 0.6 – 1.2mg/kg [O 60s/D 30 min]
Vecuronium 0.1mg/kg [O 2.5-3 min/D 30-60 min]

DAI CHECKLIST

1. **Oral Pharyngeal Airway**
2. **Laryngoscope** with **Macintosh** Blade, **Miller** Blade or **GlideScope**
3. **Endotracheal tube** w **Stylet**
4. **Gel**, **syringe** and **bougie**
5. **IV** both arms with **NS** 1,000/HR
6. **Non-rebreather mask** with **100% Oxygen**
7. **Towel roll** under patient's shoulders– **RAMP** Position (Tragus of ear to sternal notch level)
8. **Inspect** patient's oral airway and **Suction**
9. **Ventilator** and **CO2** detector
10. **Assistant** for **C-Spine** stabilization and **Cricoid** pressure if needed
11. **Pre-oxygenate** patient for **3 minutes 100% O2** before procedure
12. Estimate **patient** weight
13. **LMA Laryngeal Tube**, **King Tube** or **Combitube** available
14. **Pretreatment medications** if indicated**,** e.g. **Lidocaine, Atropine, Albuterol, Fentanyl**
15. **SEDATION:**
    - **Etom** 0.3mg/kg; **Prop** 2mg/kg; **Vrsd** 0.2mg/kg; **Ket** 2mg/kg; **Fntyl** 2m**c**g/kg
16. **PARYLITIC:**
    - **Roc** 1mg/kg, **Sux** 0.6-2mg/kg, **Vec** 0.1mg/kg

CARDIOVERSION, DEFIBRILLATION & PACING

Cardioversion Sedation

Propofol (Diprivan) 1-2 mg/kg IV
Etomidate (Amidate) 0.2 mg/kg IV bolus x 1-3 doses
Midazolam (Versed) 5 mg IV; PEDS 0.1-0.6mg/kg
Diazepam (Valium) 2-10mg IM/IV
Midazolam and Diazepam have a significantly **longer** recovery time, and can produce confusion in the recovery period as well.

Cardioversion and Defibrillation Joules

BIPHASIC (use device-specific energies when known)
Defibrillation is **200 J**
Synchronized **Cardioversion** for atrial rhythms is 50-75-120 J; (**200 J** may be used for **obese** patients)
Synchronized **Cardioversion** for v-tach is 120-150-200 J

PEDIATRIC
First shock **defibrillation**, use **2** J/kg; Additional defibrillation attempts are at **4 J/kg**
Pediatric **cardioversion** gets **1** J/kg **first** shock
Additional cardioversion shocks are at **2 J/kg**

Cardioversion VTE Prophylaxis for A-Fib/A-Flutter/A-Tach/SVT

** Perform **Transesophageal Echocardiography** (TEE) before cardioversion, if possible, to lower risk of dislodging a **left atrial thrombus** **
Enoxaparin (Lovenox) 1 mg/kg SC **q 12 hours** (Onset of action **3-5 hours**)
OR
Apixaban (Eliquis) 5 mg PO **BID** (Onset of action **3-4 hours**)
OR
Rivaroxaban (Xarelto) 20 mg PO **daily** (Onset of action **3-4 hours**)

Transcutaneous Pacing

Pacer Rate – **70** BPM
Output – **Start** at **40** mA and increase until capture

CARDIAC ARRHYTHMIA PROTOCOL

Asystole/PEA

CPR per **ACLS Protocol**; **Advanced Airway**
Epinephrine 1 mg IV/IO Q 3-5 minutes

Atrial Fibrillation/Atrial Flutter [Unstable = CARDIOVERSION]

Diltiazem (**Rate** control **NOT** Rhythm control) [**CONTRA** – LVEF < 40%]

- 0.25 mg/kg (average adult dose - 20 **mg**) direct IV over 2 minutes; after 15 minutes, may give second dosage of 0.35 mg/kg over 2 min (average adult dose - 25 **mg**)
- Maintenance 5-15 mg/HR IV

Metoprolol (Mainly **Rate** control) [**CAUTION** – Asthma/COPD/Hypoxia]

- 5 mg IV every 5 minutes; MAX 6 doses
- Maintenance 25-100 mg po Q12HR

Digoxin (**Adjust** dose based on **Creatinine/GFR/Elderly**)

- Possible **synergistic effect** when used with **CCBs** and **B-blockers**
- 0.125-0.25 mg IV X 1 [2.4-3.6 m**c**g/kg IV]; May repeat in 6 hours X 1 dose
- Maintenance 0.125-0.25 mg IV QD
- Check Digoxin level 6-8 hours after last dose given; Target: < 1 ng per mL

AV Block Second Degree Type II (Symptomatic) & Third Degree

[ATROPINE - NOT effective for treatment **of second-degree type II** or **third-degree AV block]**
Transcutaneous Pacing Start **70 BPM** and **40 mA**
Epinephrine IV Drip 0.1-0.5 m**c**g/kg/min (70kg adult: 7-35 m**c**g/min)
Dopamine IV Drip 5-10m**c**g/kg/min

Bradycardia [Transcutaneous Pacing if drugs are ineffective]

Atropine 0.5 mg Q 3-5 minutes; Max 3 mg
Epinephrine IV Infusion 2-10 m**c**g/minute; titrate to patient response
Dopamine IV Infusion 5-10 m**c**g/kg/minute; titrate to patient response

SVT/PSVT Narrow Complex [Unstable = CARDIOVERSION]

Adenosine (1st line for **SVT; 2nd line** for **PSVT)** [**Contra** – Drug induced tachycardia]

- 6 mg rapid IV push; May repeat with 12 mg IV 1-2 minutes X 2

Diltiazem (1st line for **PSVT; 2nd line** for **SVT)** (Rate control **NOT** Rhythm control) [**CONTRA** – LVEF < 40%]

- 0.25 mg/kg (usual adult dose, 20 mg) direct IV over 2 minutes; after 15 minutes, May repeat dosage of 0.35 mg/kg actual body weight over 2 min (average adult dose - 25 mg)

Verapamil [**CONTRA** – LVEF < 40%]

- 5 mg IV over 2 minutes; may repeat 5-10 mg IV in 15-30 minutes PRN

Metoprolol (Mainly Rate control) [**CAUTION** – Asthma/COPD/Hypoxia]

- 5 mg IV over 5 minutes; MAX 6 doses
- Maintenance 25-100 mg po Q12HR

Torsades de Pointes [Unstable or Pulseless = DEFIBRILLATION]

*__TdP__ is a **COMBINATION** of **polymorphic** ventricular tachycardia **PLUS** prolonged QT-interval **> 475ms*** Labs **CMP** & **Magnesium** levels **- Low Potassium, Magnesium** & **(Calcium** - less common) can cause **TdP**

Offending Drugs:

Class 1a - Quinidine, Procainamide, **Disopyramide**
Class 1c – **Flecainide**, Propafenone
Class III – Amiodarone, **Sotalol** (Betapace), Bretylium, Ibutilide, Dofetilide, Dronedarone
Also - **Phenothiazines**, Tricyclic Antidepressants, **lithium**, Ziprasidone, **Haldol**, Antiretroviral drugs, **Methadone**, Anthracycline chemotherapeutic agents (Doxorubicin, Daunomycin), **Celexa** & **Lexapro**
Consider **Antifungals** & **Macrolides**, **large amount** of **Loperamide** (Imodium) or **Cocaine**
Fluoroquinolones (**In order** of **greatest risk**):
1-Moxifloxican (Avalox, Vigamox)
2-**Levaquin**, Gemifloxacin, Ofloxacin
3-Cipro (Lowest risk)

TREATMENT

***DO NOT** use **Amiodarone**, Procainamide, **Beta-blockers**, or most other Antiarrhythmics**

1) **Magnesium Sulfate**
   - **[w/ cardiac arrest]**
     Dose: 2-4 g IV over 1-2 min x 1; may follow w/ 3-20 mg/min IV
   - **[w/o cardiac arrest]**
     Dose: 2-4 g IV over 15 min x 1; may follow w/ 3-20 mg/min IV
2) **Remove offending drugs**
3) IV **Potassium** (Adjunct med) targeting a **high-normal** potassium level **(>4.5 mEq/L)**
4) **Sodium Bicarb** (For **Quinidine-induced** TdP) [**1-2 mEq/kg** IV x 1]; **may repeat dose** x 1 PRN
5) **Transcutaneous/Transvenous Pacing** at **90-140 bpm** (If bradycardic)
6) **Other medications** may be considered **(Isoproterenol (**For **acquired/drug-induced TdP), Esmolol, Mexiletine,** & **Dilantin)** but a **Cardiologist MUST** be consulted **FIRST.**

Lidocaine** is **no longer recommended** for **Torsades. Occasionally,** it can have an **initial beneficial** effect, but **Torsades recurs** in **all cases.

V-Fib or Pulseless V-Tach [ACLS Protocol including CPR and Defibrillation]

CPR and **Defibrillation** 200 Jules per **ACLS Protocol**

- **Epi** 1 mg Q 3-5 min
- **Amiodarone** 300 mg may repeat with **Amiodarone** 150 mg once
- **Lidocaine** (**2nd line** – Use if Amiodarone is unavailable) **1-1.5 mg/kg** slow IV bolus over 2-3 minutes; Max **3 mg/kg**

Chest compressions and **maintain airway**

ROSC - If **successful** then use **maintenance dose** of:

- **Epinephrine** 0.1- 0.5 m**c**g/kg/min
- **Amiodarone** of 1 mg/minute
- **Lidocaine** 1-4 mg/min

V-Tach with **Pulse**

Stable with pulse

- **Amiodarone** 150 mg over 10 minutes; then maintenance dose of 1 mg/minute

Unstable with Pulse

- **Synchronized Cardioversion** 100 Jules

Wide Complex *Stable* Tachycardia Infusion Meds [Unstable = CARDIOVERSION]

Procainamide IV

- 20-50 mg/min until arrhythmia suppressed; Max 17mg/kg; Maintenance 1-4 mg/min

Amiodarone IV

- 150 mg over 10 minutes; Repeat PRN; Maintenance 1mg/min X 6 hours

Sotalol IV (Betapace)

- 100 mg (or 1.5 mg/kg) over 5 minutes; **Avoid** if prolonged QT

WPW [Unstable = CARDIOVERSION]

AV node-specific antiarrhythmic drugs *that are normally used to control the ventricular rate during* ***atrial fibrillation,*** *e.g.* ***Beta-blockers, CCBs (Verapamil - MOST DANGEROUS), Adenosine, Amiodarone, & Digoxin,*** *are* ***CONTRAINDICATED for WPW patients with preexcited A-Fib*** *or for any rate* ***>200 bpm.***

Administering these drugs *for* ***WPW*** *under the* ***WRONG circumstance*** *can lead to* ***V-FIB!***

ALWAYS *consult a* ***CARDIOLOGIST*** ***before*** *administering* ***pharmacological treatment*** *for* ***WPW***

VAGAL MANEUVERS is **FIRST** option **then** use **pharmacological treatment** if **urgent** treatment is required

WPW MEDICATIONS

Ibutilide IV (Class III antiarrhythmic drug): 1 mg over 10 minutes
Procainamide IV - Loading dose: Infuse 20 to 50 mg/minute until arrhythmia is controlled, hypotension occurs, QRS complex widens by 50% of its original width, or total of 17 mg/kg is given. **1st Choice** for WPW preexcited AF or atrial flutter
Verapamil IV: 5 mg Q2-3 minutes; max 15 mg; **2nd Choice** for WPW preexcited AF or atrial flutter
Adenosine IV: 6 mg rapid IV push; May repeat with 12 mg IV 1-2 minutes X 2
Amiodarone IV: 150 mg over 10 minutes then 1 mg/min
Digoxin IV: 500 mcg over 20 minutes
Magnesium IV: 2-4 grams over 15 minutes

TOXINS

Drug Overdose Protocol – POISON CONTROL (800) 222-1222

ABCDs, Early Airway Protection, GCS, O2, IV, Labs, EKG, **CXR, Telemetry, Suicide Precautions**
Consider gastric lavage if appropriate

LABS - CBC, CMP, UA, UDS, Urine HCG, Lipase, ABG, Acetaminophen, Salicylate, ETOH, PT/INR, PTT,
Drug levels of **offending drug** if available

HISTORY:

- **S.A.M.P.L.E.**
- **Agents** ingested; **Amount** of ingestion; **Time** of ingestion
- Cause and/or **reason for ingestion** (e.g., accidental, intentional, suicide attempt, recreational)

HIGHLY DANGEROUS DRUGS – **Propranolol**, **Verapamil**, **TCA** (Elavil, Pamelor, Doxepin, Tofranil), **Colchicine**

GASRIC LAVAGE (w/wo **Sorbitol)** may be performed if the patient presents **obtunded** within **1-2 hours of ingestion** when there is **no good antidote** of therapy or if the patient **rapidly deteriorates** while in the emergency department.

Activated Charcoal: (**Adults**) 1-2g/kg X 1, Max 100g, Minimum 30g

- Considerable **morbidity** is associated with **charcoal aspiration**. Its use **should be limited** to substances that would be well absorbed and have a high likelihood of toxic dose ingestion. It is **not recommended** in instances in which **GHB or GBL** are known to be the only intoxicants.
- **Multi-dose** activated charcoal (30-50 g q4h) is recommended for overdoses with **barbiturates** (Phenobarbital), the hypnotic sedative **Glutethimide** (Doriden, Elrodorm, Noxyron) and the tranquilizer **Meprobamate** (Miltown or Equanil)

Bilateral *Pinpoint* Pupils Under 2mm (Miosis) Causes

1. **Opioid Overdose [Fentanyl,** Heroin**, Codeine,** Hydrocodone**, Oxycodone,** Morphine**, Hydromorphone]**
2. **Organophosphate** (Insecticide) & Acetylcholinesterase Inhibitors (**SLUDGE**)
   - Increased saliva and tear production, diarrhea, vomiting, small pupils, sweating, muscle tremors, and confusion
   - **SLUDGE** (salivation, lacrimation, urination, diarrhea, GI upset, emesis)
   - **DUMBELS** (diaphoresis and diarrhea; urination; miosis; bradycardia, bronchospasm, bronchorrhea; emesis; excess lacrimation; and salivation)
3. **Pontine Hemorrhage**

1. Opioid Overdose

[Fentanyl, Heroin**, Codeine,** Hydrocodone**, Oxycodone,** Morphine**, Hydromorphone]**
Naloxone 0.4 - 2 mg in the adult **IV/IO/IM/SC**
Slowly administer 0.4 - 2 mg of IV every **1-2 minutes** for a more controlled reversal of opiate effect. Assisted **bag-valve-mask** breathing can be provided until the patient is ventilating adequately.

The onset of effect following IV Naloxone administration is typically **1-2 minutes**; maximal effect is observed within **5-10 minutes**. For partial response Narcan can be repeated **as often as needed**.

** If **NO IMPROVEMENT** after giving **10mg of Narcan**, then **Opioid overdose** is an **UNLIKELY CAUSE.****

- **Naloxone - PEDIATRIC [IV/IO/IM/SC/ETT]**

[<1 mo]
0.1 mg/kg IV q2-3min prn; Alt: 0.1 mg/kg IM q3-8min prn; Info: may repeat q1-2h if sx recur
[1 mo-5 yo and <20 kg]
0.1 mg/kg IV q2-3min prn; Alt: 0.1 mg/kg ETT/SC/IM/IO q3-8min prn; Info: SC/IM/IV administration preferred; may repeat q1-2h if sx recur
[>5 yo or >20 kg]
1-2 mg IV q2-3min prn; Alt: 2 mg ETT/SC/IM/IO q3-8min prn; 0.005 mg/kg IV x1, then 0.0025-0.16 mg/kg/h IV; Info: SC/IM/IV admin. preferred; may repeat q1-2h if sx recur; reassess tx if no response after 10 mg

2. Organophosphate or Carbamate Insecticide Poisoning - ADULT

Decontamination; **AVOID Succinylcholine**
Atropine- doubling approach with escalation of doses from 1 mg to 2 mg, 4 mg, 8 mg, 16 mg, etc.
OR
Give weight-based **Atropine** dosage:
[>41 kg] Atropine
2 mg IM x1 for mild SX; may repeat q10min x2 if SX progress; give 2 mg IM x3 for severe SX
[18-41 kg] Atropine
1 mg IM x1 for mild SX, may repeat q10min x2 if SX progress; give 1 mg IM x3 for severe SX
[7-18 kg] Atropine
0.5 mg IM x1 for mild SX; may repeat q10min x2 if SX progress; give 0.5 mg IM x3 for severe SX

2. Organophosphate or Carbamate Insecticide Poisoning - PEDS

[<2 yo] Atropine: Continue atropinization until muscarinic SX gone
0.05 mg/kg IM or 0.02 mg/kg IV q10-30min prn; Info: doses <0.1 mg assoc. w/ paradoxical bradycardia
[2-10 yo] Atropine: Continue atropinization until muscarinic SX gone
1-2 mg IM/IV q10-30min prn; Start: 1 mg IM/IV x1
[>10 yo] Atropine: Continue atropinization until muscarinic SX gone
1-2 mg IM/IV q10-30min prn; Start: 2 mg IM/IV x1

Bilateral DILATED Pupils

1. **Cocaine**, Atropine, **Meth**, Wellbutrin, **Benadryl**, Vistaril, **Atrovent**, Detrol, **DM**
2. **Anticholinergics: ANTI**histamine**s, ANTI**depressants**, ANTI**psychotics**, ANTI**spasmodics, **ANTI**parkinsons
3. Head injury, **Stroke**, Seizures

1. Cocaine or Meth Overdose

Give **Benzodiazepines:**

- **Ativan** 4 mg/dose slow IV at 2 mg/min or 0.1 mg/kg (May give IM if no IV access)
- **Diazepam** 5-10 mg IV/IM q5-10min; not to exceed 30 mg
- **Midazolam (Versed)** 0.5-1 mg given over 2 minutes (not to exceed 2.5 mg/dose); wait 2-3 minutes to evaluate sedative effect after each dose (Can give IM if no IV access)

2. Anticholinergic Overdose

1) Hot as Hades, **2) Blind** as a Bat, **3) Dry** as a Bone, **4) Red** as a Beet, **5) Mad** as a Hatter
Dilated non-reactive pupils, hypertension, **tachycardia**, flushed dry skin, **fevers**, seizures, **hallucinations**

Give **Benzodiazepines:**

- **Ativan** 4 mg/dose slow IV at 2 mg/min or 0.1 mg/kg (May give IM if no IV access)
- **Diazepam** 5-10 mg IV/IM q5-10min; not to exceed 30 mg
- **Midazolam (Versed)** 0.5-1 mg given over 2 minutes (not to exceed 2.5 mg/dose); wait 2-3 minutes to evaluate sedative effect after each dose (Can give IM if no IV access)

Give **Physostigmine** 0.5-2 mg slow IVP (not to exceed 1 mg/min); keep **Atropine** nearby for immediate use
If no response, repeat **q20min** PRN
If initial dose effective, may give additional **1-4 mg q30-60min** PRN
RARELY USED; indicated **ONLY** when life-threatening symptoms related to anticholinergic toxicity

Benzodiazepine Overdose (Valium/Xanax/Versed/Ativan/Tranxene/Klonopin)

[Dizzy, Confusion, Drowsiness, Blurred vision, Anxiety, Agitation, Nystagmus, Hypotension]

Determine if **use** of this **medication** is the **first time** or if patient is a **chronic user**? (**Very** important)

The **cornerstone** of treatment in benzodiazepine (BZD) overdoses is **good supportive care, airway protection** and **monitoring**.

Single-dose activated charcoal is **not routinely recommended**, as the risks far outweigh the benefit. BZD are **very rarely fatal** in overdoses, and the altered mental status from **BZD overdose** greatly **increases** the **risk** of **aspiration** following oral charcoal dosing.

USE OF FLUMAZENIL IN THE ROLE OF BZD TOXICITY

Flumazenil **RISKS USUALLY OUTWEIGH BENEFITS**
Adults - 0.2-0.5 mg IV q minute (**Short duration** of **0.7** to **1.3 hours**); Up to **3mg/hour** or **5 mg total**
Children - 0.01 mg/kg given IV over 30 seconds (maximum dose 0.2 mg). Initial dose may be followed at **one minute intervals** with up to **four repeat doses** of 0.01 mg/kg (**maximum 0.2 mg**) per dose. The maximum dose should **NOT exceed 1 mg total** or **0.05 mg/kg**; the lower dose is preferable.

Flumazenil:

- Flumazenil competitively and reversibly **binds benzodiazepine receptors** (i.e., GABA).
- The use of Flumazenil for suspected benzodiazepine overdoses is **CONTROVERSIAL**. Some sources would go so far as to suggest that **Flumazenil** has **no role** in the routine treatment of a coma unless the patient is known **NOT** to be **benzodiazepine dependent** and the **overdose** is known to result **ONLY** from **benzodiazepines**. One study found that **only 10%** of the patient population presenting with a benzodiazepine overdose were suitable candidates for Flumazenil. **Only** in patients who **are naive to** and **overdose solely** on a **benzodiazepine** can it be considered.
- Flumazenil is **very effective** at **reversing** the **CNS depression** associated with benzodiazepines but is **less effective** at **reversing respiratory depression.**
- If used, Flumazenil should be administered **slowly (0.2 mg/min** up to **3-5 mg)** because large doses cause **agitation**, **withdrawal** and **death**. **Serious risk** of inducing **seizures** and **cardiac arrhythmias**, particularly **PSVT**, can occur after Flumazenil administration, and many fatalities have been reported, particularly in patients with **co-ingestions** or **long-term** use of **benzodiazepines**.
- If **full airway protection** has been achieved, a good outcome is expected, and therefore Flumazenil administration is **unlikely** to be **required**.
- Flumazenil is **contraindicated** in patients with increased intracranial pressure (**ICP**) or closed head injury (**CHI**), those with a history of **epilepsy**, or those known to have ingested a tricyclic antidepressant (**TCA**) agent.

Beta-Blocker Overdose

Bradycardia, **hypotension**, depressed level of consciousness, **seizures** (Propranolol), bronchospasm (rare)
Treatment:

- **Glucagon 50-150 mcg/kg** IVP over 1 minute, **THEN 3-5 mg/hr** or **50-100 mcg/kg/hr** IV; titrate infusion to achieve adequate clinical response. **Glucagon** enhances **myocardial contractility**, **heart rate**, and **AV conduction**; **Drug of choice** for beta-blocker toxicity. Because a **glucagon bolus** can be **diagnostic** and **therapeutic**, Empirically administer glucagon and check for a response
- **Atropine (**for **severe bradycardia) 0.5 mg Q5 minutes; Max 3 mg**
- **IV Fluids**
- **Gastric lavage** if within **2 hours** of ingestion
- Multi-dose **activated charcoal** (MDAC) may reduce bioavailability of **Nadolo**l and **Sotalol**
- **Levophed** or **Dopamine** if severely **hypotensive refractory** to **IV fluids**
- **Epinephrine** for **severe bradycardia - Unresponsive** to **atropine: 2-10 mcg/min** by **IV infusion** or **0.1-0.5 mcg/kg/min (7-35 mcg/min** in **70 kg patient); titrate** to **patient response**
- **Cardiac pacing**
- **Benzodiazepines** (in patients with **seizures**)
- **High dose Insulin**: **1 U/kg** bolus followed by continuous infusion of **1-10 U/kg/h**; considered for **overdoses** that are **refractory** to **crystalloids, glucagon,** and **vasopressor** infusions

- **Hemodialysis** in **severe cases** of **Atenolol**, **Nadolol** and **Sotalol** overdose. **Propranolol**, **Metoprolol**, and **Timolol cannot** be removed by hemodialysis
- Consider **Extracorporeal membrane oxygenation (ECMO)**

Salicylate Overdose

Treatment includes **ABCs**, **limiting absorption**, enhancing **elimination**, correcting **metabolic abnormalities**, and providing **supportive care**. **No** specific **antidote** is available for **salicylates**.

Consider **EARLY** ventilatory support (**Intubation**) if needed

Gastric lavage & **Activated Charcoal** with **Sorbitol** may be beneficial up to 60 minutes after salicylate ingestion. **Warmed** (38°C) isotonic **LR** or **NaCL solution** may be used. Protect the airway **before** gastric lavage.

Concomitant **alkalization of blood** and **urine** keeps **salicylates** away from **brain tissue** and **in the blood**, in addition to **enhancing urinary excretion**. When the **urine pH** increases from 6.1 to 8.1, **renal clearance** of **salicylate** increases **18-fold**.

Initial IV bolus of **1 mEq/kg** of **sodium bicarbonate** then start **sodium bicarbonate IV infusion** by adding 3 ampules of sodium bicarbonate (each ampule containing **44 mEq** of sodium bicarbonate) to a liter of **D5W**. **Urine output goal** is **1-1.5ml/kg/hr** & titrated to keep the **urinary pH greater** than **7.5**.

Consider **Hemodialysis** if:

- Serum salicylate level greater than **120 mg/dL** acutely **or** greater than **100 mg/dL** 6 h post-ingestion
- Refractory acidosis
- Coma or seizures
- Pulmonary edema
- Volume overload
- Renal failure

When **enteric-coated aspirin** has been ingested or when **salicylate levels do not decrease** despite treatment with charcoal, **Whole Bowel Irrigation** (WBI) with the laxative **polyethylene glycol** (**Miralax**) should be used in addition to charcoal therapy.

Tricyclic Antidepressant (TCA) Overdose

Includes - Amitriptyline, Amoxapine, Doxepin, Imipramine (Tofranil), Nortriptyline (Pamelor)
S/S - Confusion, delirium**, hallucinations,** arrhythmias**, hypOTension,** sinus tach**, seizures,** and signs of **Anticholinergic toxicity (e.g. - hyperthermia, flushing, dilated pupils)**

ECG, Labs**, POC Blood Glucose; IV Fluids** if **hypotensive**

Treatment includes **ABCs**, **limiting absorption**, enhancing **elimination**, correcting **metabolic abnormalities**, and providing **supportive care**.

Consider **EARLY** ventilatory support (**Intubation**) if needed

- **Gastric lavage** & **Activated Charcoal** may be beneficial up to 60 minutes after ingestion. **Warmed** (38°C) isotonic **LR** or **NaCL solution** may be used. Protect the airway **before** gastric lavage.
- **Sodium Bicarbonate** [**1-2 mEq/kg** Rapid IV Push x 1] for pts w/ **QRS >100ms** or serum **pH <7.45**; subsequent doses based on response and serum pH
- **Diazepam** 5 mg IV or **Lorazepam** 2 mg IV for TCA-induced **seizures**

SECONDARY THERAPIES FOR TCA OD IF S/S ARE REFRACTORY TO SODIUM BICARBONATE TREATMENT

Gastric lavage & **Activated Charcoal**

Consider vasopressors **Norepinephrine, Dopamine** or **Phenylephrine** for **hypotension refractory** to **Sodium Bicarbonate** and **aggressive IV fluid** resuscitation therapy

- **Norepinephrine 0.1-1** mcg/kg/min IV**; Start: 0.1-0.5** mcg/kg/min IV**,** then **titrate** to effect
- **Dopamine 10-15** mcg/kg/min IV
- **Phenylephrine [0.1-0.5 mg IV** q10-15min prn**] Max: 0.5 mg/dose** IV

Consider **3% Hypertonic Saline** - used only when **hypotension** is **refractory** to **all other first line treatments**, including **Sodium Bicarbonate**, aggressive **fluid resuscitation** and **vasopressors**

For **Arrhythmias refractory** to **Sodium Bicarbonate:**

- **Magnesium 1-2 g IV** over **15 min x 1;** may follow w/ **3-20 mg/min IV**
- **Lidocaine** bolus dose **(1 to 1.5 mg/kg IV),** followed by an **infusion (1 to 4 mg/minute)**

Intravenous Lipid Emulsion Therapy (ILE)

Intralipid - 1 to 1.5 mL/kg given **over one minute** of a **20 percent lipid emulsion solution. Same dose** may be **repeated** in cases of **cardiac arrest** every **three to five minutes,** for a total of **three bolus doses.**

Following the **initial bolus,** an **infusion** is started at a rate of **0.25 to 0.5 mL/kg per minute** until **hemodynamic** recovery occurs**; Maximum 8 mL/kg**

Drugs to Avoid

1. Despite prominent **anticholinergic toxicity** in some patients with **TCA poisoning**, **Physostigmine** is **CONTRAINDICATED** as it is associated with **cardiac arrest** in the setting of **TCA toxicity**
2. **Flumazenil** is **CONTRAINDICATED** in patients with known or suspected **TCA use**

Tylenol Overdose

Most patients who **overdose** on **acetaminophen** will **initially be asymptomatic**, as clinical symptoms of end-organ toxicity do not manifest until **24-48 hours** after an acute ingestion.

Minimum toxic doses of **acetaminophen** for a single ingestion, posing significant **risk of severe hepatotoxicity**, are as follows:

Adults: **7.5-10 g**

Children: **150-200 mg/kg**

Use the **Rumack-Matthew Nomogram** (acetaminophen toxicity nomogram) to interpret serum acetaminophen concentrations in relation to time since ingestion, in order to **assess potential hepatotoxicity**. Can only be used **4 hours** or more **after** ingestion.

Treatment includes **ABCs**, **limiting absorption**, enhancing **elimination**, correcting **metabolic abnormalities**, and providing **supportive care**.
Consider **EARLY** ventilatory support (**Intubation**) if needed

Gastric lavage & **Activated Charcoal** may be beneficial up to 60 minutes after ingestion. **Warmed** (38°C) isotonic **LR** or **NaCL solution** may be used. Protect the airway **before** gastric lavage.

Patients with **acetaminophen** concentrations **below** the **"possible" line** for **hepatotoxicity** on the **Rumack-Matthew** nomogram may be **discharged home** after they are **medically cleared**.

Admit patients with **acetaminophen** concentration **above** the **"possible" line** on the **Rumack-Matthew** nomogram for treatment with **N-acetylcysteine (NAC**). NAC is nearly **100% hepatoprotective** when it is given **within 8 hours after an acute acetaminophen ingestion**, but **can be beneficial** in patients who present more than **24 hours after ingestion**. **NAC** is approved for both **oral and IV** administration.

NAC's treatment **effectiveness** did **not depend** on whether it was started **0-4** or **4-8** hours after ingestion.

NAC [PO/NG route] (IV Reglan or **Zofran as needed)**
140 mg/kg PO/NG x1; then 4h later, **70 mg/kg** PO/NG q4h x 17 doses; Start: w/in 24h of ingestion. Repeat dose if vomited w/in 1h

NAC [IV route] (IV Reglan or **Zofran as needed)**
150 mg/kg IV x1 over 60min; then **50 mg/kg** IV x 1 over 4h; then 100 mg/kg IV x1 over 16h; Start: w/in 24h of ingestion, w/in 8h for max benefit; Pts >100 kg, **cap weight at 100 kg** for dose calculations.

Because **NAC** can be beneficial for acetaminophen-induced hepatic failure when **patients present more than 24 hours after a single ingestion**, medical toxicologists recommend initiating treatment with NAC in patients who present **after 24 hours** if an **acetaminophen concentration is detected** and **if hepatic injury is evident from liver function studies**.

ANTICOAGULANT REVERSAL TREATMENT

Anticoagulant	Treatment
Antiplatelets (Aspirin, Plavix, Brilinta, Ticlid)	Platelets (Mixed study results)
Coumadin	FFP, Vitamin K, Kcentra, Factor VIIa
Lovenox & Heparin	Protamine Sulfate
Dabigatran Etexilate (Pradaxa)	Idarucizumab (Praxbind)
Rivaroxaban (Xarelto, Janssen) & Apixaban (Eliquis)	Andexanet alfa (Andexxa, Portola)

MEDICAL EMERGENCIES & CONDITIONS

ACE-Inhibitor Induced Angioedema (ACEI-AAG)

****Antihistamines**, **steroids** & **epinephrine DO NOT WORK** for **ACEI-AAG****

- Although ACEI-AAG **usually occurs soon after starting ACEi**, it may occur years later. Higher incidence among **women** and a **five-fold** higher incidence among **African Americans**
- ACEI-AAG is due to **excessive** accumulation of **bradykinin**
- **Lack** of **allergic trigger** (in contrast, ACEI-AAG may occur after minor trauma)
- Starts with **focal swelling** (e.g. isolated swelling of **tongue** or **lips**, often asymmetric)
- Evolves over **hours** (**slower progression** than **histamine-mediated angioedema**)
- **Absence** of urticaria or itching
- **Failure** to **respond** to **antihistamines**, **steroid**, **epinephrine**

Treatment: **FFP** 2-4 units (FFP contains enzymes which metabolize bradykinin)
__Ecallantide__ and __Icatibant__ are potential __alternative treatments__ but are __rarely used__ meds due to their __high cost__– __Ecallantide__ ($15,000 per treatment) and __Icatibant__ ($4,000-$11,000 per treatment)

Agitation

Ativan [2-6 mg/day PO/IM/IV divided bid-tid]
Haldol lactate [0.5-10 mg PO/IM q1-4h] Max: 20 mg/day; Info: switch to PO ASAP; Monitor WBC and ANC
Benadryl [25-50 mg PO/IM/IV q4-6h prn**]** Max: 300 mg/day
Geodon [10 mg IM q2h prn] Max: 40 mg/day x 3 days; Monitor WBC and ANC

Allergic Reaction & Anaphylaxis Adult [Remove source of offending antigen if possible]

Decadron (Dexamethasone) 8mg or **Solu-Medrol** (Methyl Prednisolone) 250mg IV Q4H; **IV Fluids**;
Pepcid 20mg po/IV or **Zantac** 50mg IV or 150mg po; **Benadryl** 25-50mg IV; **Duoneb** Nebulizers;
Epinephrine SC/IM: 0.3 mg – may repeat dose X 1 after 5-15 min PRN

SEVERE [Profoundly Hypotensive and/or **Cardiopulmonary Arrest]**

- **Epinephrine** IV **1-4** m**c**g/min (**1-4 mg** Epi in a **1,000 mg bag** of NS at **1 cc/min**) increase 1 m**c**g/min PRN; Infuse **continuously** connected with a second bag of **high flowing** NS/LR
- **Racemic Epi** 2.25%/0.5ml **Nebulizer** Q 3 hours to **reduce laryngeal swelling** (**Adjunct** to IV/IM Epi)
- **Glucagon** 3-5mg/HR IV (Beneficial only for **beta-blocker/CCB overdose.** Should be used **in addition to** epinephrine, **NOT** as a substitute)
- **Glucagon** 2 mg **Nebulizer** to **reverse** severe **bronchospasm (Adjunct** to **Duoneb)**
- **Dopamine** 20-50 m**c**g/kg/min IV (high dose): **WILL** increase BP and stimulate vasoconstriction; May increase infusion by 1-4 m**c**g/kg/min at 10-30 min intervals until optimum response obtained

Anaphylaxis Peds [**Remove source** of offending **antigen** if possible**]**

Epinephrine 1:1000 Solution

- <30 kg: 0.01 mg/kg (0.01 mL/kg) SC/IM, not to exceed 0.3 mg (0.3 mL) per injection, repeated q5-10 min as necessary
- ≥30 kg: 0.3-0.5 mg (0.3-0.5 mL) SC/IM, not to exceed 0.5 mg (0.5 mL) per injection, repeated q5-10 min as necessary

Epinephrine Prefilled Autoinjector [0.1mg/0.1mL; 0.15mg/0.15mL; 0.3mg/0.3mL]

- 7.5-15 kg: 0.1 mg SC/IM once
- 15 to <30 kg: 0.15 mg SC/IM once; may repeat dose q5-15min if symptoms persist
- ≥30 kg: 0.3 mg SC/IM once; may repeat dose q5-15min if symptoms persist

Anxiety

Ativan 1-2mg po/IM/IV
Vistaril 25-100mg po or IM
Midazolam 2.5- 5mg IM or 1-2.5mg IV

Asthma

DuoNeb Nebulizer, **Decadron** (Dexamethasone) 10mg, **MgSO4** 2g/50ml IV (**Adjunct med**)
Racepinephrine INH 2.25% 0.05ml/kg; **MAX** 0.5ml (**For Croup**) Q 3-4 hours
Prednisolone 40-80 mg/day PO divided qd-bid (PEDS 1-2 mg/kg/day PO)
Solu-Medrol (Methylprednisolone) 1-2 mg/kg IM/IV x 1 (Adult and Peds)
Terbutaline 0.25mg SC; Repeat in 15-30 minutes PRN
Epinephrine 0.3- 0.5 mg SC/IM

Bell's Palsy (***CANNOT*** **move forehead**)

Labs - BMP, ESR, TSH, CBC, A1C, Borrelia burgdorferi IgM & IgG (only in **endemic** areas), RPR, HIV
Prednisone 60mg QD X 6 days then **Medrol Dosepack**
Valtrex 500mg BID X 10 days or **Zovirax** 400mg 5/Day X 10 days
Eye patch and **Refresh Tears** if needed

Dysphagia or Food Stuck in Throat

Glucagon 2mg IV and **Valium** 5mg IV

Headache

Reglan 10mg, **Decadron** 10mg, **Benadryl** 25mg, **Toradol** 30mg, **Compazine** 10mg,
Thorazine 10-50 mg IM/IV, **DHE-45** 0.5mg, **Magnesium** 2 grams IV

Headache in **Pregnancy**

IV NS 1 Liter Bolus, **Compazine** 10mg IV, **Benadryl** 50mg IV, **Tylenol** PO or IV

Hiccups

Thorazine 25-50 mg IV or IM are effective in 80% of cases. To prevent or minimize **hypotension** caused by this agent, **preloading** the patient with 500-1000 mL of **IV fluid** is advised.

Also

Haldol 2-5 mg, **Reglan** 10 mg Q8 hours, or **Baclofen** 10mg po Q6hours

HypER**glycemia (DKA** Only – ***Not* HHS)**

Thirst, labored **(Kussmaul)** breathing**, AP,** N/V**, AMS,** tachycardia**, hypotension,**
Signs of dehydration **(dry oral mucosa & abnormal skin turgor), polyuria** & **polydipsia,** Acetone breath

1) Blood glucose >250 mg/dL
2) Bicarb < 18 mEq/L
3) pH < 7.3 (Metabolic acidosis)
4) Ketonemia & **Ketonuria**

Exams: CBC**, CMP,** UA & Urine Culture**, ABGs,** Blood Cultures**, beta-hydroxybutyrate,** Nitroprusside Ketone Reaction Test, **Lactic acid**, CRP, **EKG**, CXR, **Cardiac Telemetry**

Treatment Goals

1) **Correction** of **fluid loss (DO NOT** use **Normal Saline** as it can **WORSEN metabolic acidosis)**
2) **Correction** of **hyperglycemia** with **insulin**
3) **Correction** of **electrolyte disturbance ESPECIALLY Potassium loss**
   NEVER** administer **insulin BEFORE** checking **Potassium levels FIRST
4) **Treatment** of **concurrent infection**
5) **Address complications** if **warranted (Cerebral edema)**

1) **Fluid Correction** with **LR (Amount depends** on **degree of dehydration):**
   - **1-3 L during first hour**
   - **1 L during second hour**
   - **1 L during following 2 hours**
   - **1 L Q4H afterwards as needed**

2) **Insulin Therapy:**
   (Subcutaneous absorption of **insulin** is **reduced** in **dehydration; therefore, IV insulin** is **preferred)**
   - **Optimal rate** of **glucose decline** is **100 mg/dl/hr**
   - **Insulin bolus** of **0.15 U/kg before starting infusion (Necessity of bolus is debatable)**
   - **IV Insulin infusion** with **infusion pump** at **rate of 0.1 U/kg/hr**
   - **Mix 24 units of regular insulin** in **60 ml of NS** at **rate of 15 ml/hr (6 U/hr)** until **blood glucose drops below 180 mg/dl**
   - **Then decrease** to **5 ml/hr (2 U/hr)** until **ketoacidotic state resolves**

3) **Electrolyte Correction:**
   - **Potassium level > 6 mEq/L: DO NOT administer Potassium supplement**
   - **Potassium level 4.5 - 6 mEq/L: Administer 10 mEq/hr** of **Potassium Chloride**
   - **Potassium level 3-4.5 mEq/L: Administer 20 mEq/hr** of **Potassium Chloride**

4) **Treatment of concurrent infection**
   - **Start empiric antibiotics** if **warranted (vital signs, CXR, CBC, CRP, Lactic Acid)** and **continue until Blood & Urine Culture results are back; then switch** to **antigen-specific therapy**

5) **Cerebral edema (Occurs in 1% of children with a 21% mortality rate)**

Cerebral edema is a **serious** complication that can occur **during treatment** of **DKA**. Deterioration of **mental status** despite **improved metabolic state** usually indicates **cerebral edema**.

- **Mannitol** 0.5-1 g/kg IV over 20 minutes; may repeat in 30-120 minutes if needed
- **3% Hypertonic Saline** 5-10 mg/kg over 30 minutes if no response to Mannitol
- **Dexamethasone** IV 2-4 mg q6-12hr if no response to Mannitol

Hy**PO**glycemia

D50 Dextrose – 50% hypertonic glucose solution in 50 ml vial (500 mg/ml), for slow IV injection.
NEVER BY IM OR SC INJECTION

- Adult: **1 ml/kg by slow IV injection** (3 to 5 minutes) - **followed by at least LR 20 cc**
  Check blood glucose level 15 minutes after injection. If blood glucose level is still < 60 mg/dl, administer a second dose or give oral glucose, according to the patient clinical condition.

Adverse effects & precautions

- **May cause:** Vein irritation; severe tissue damage (necrosis) in the event of extravasation. The solution is viscous: **use a large vein and a large caliber needle**.

Hy**PO**glycemia - PEDS

PEDS Dextrose Administration: Age <1 use D10%; Age 1-7 use D25%; Age 8 and above use D50%
– 50% glucose solution is **too viscous, concentrated and irritant to be used in children**.
– In children **use 10% glucose solution**. If ready-made 10% glucose solution is not available**: add 10 ml of 50% glucose per 100 ml of 5% glucose** to obtain a 10% glucose solution. The dose of 10% glucose to be administered is **5 ml/kg by IV injection** (over 2 to 3 minutes) or infusion.

Hyp**ERK**alemia [**ALWAYS** check **Ca** and **Mg** levels]

1. **Dextrose** 50g in water and **Regular Insulin** 10 units [Use **5:1 ratio** Glucose to Insulin]
2. **Albuterol 15 mg** nebulizer (3 mg ampules X 5)
3. **Normal Saline** 1 liter **plus** IV **Lasix** 20 mg [**LIMIT** NS to **100 ml** if pt has **renal failure**]
4. **Kayexalate 15g po Q6H (AVOID** in patients with **GI motility** problems**)**
5. **Metabolic Acidosis** – **Sodium Bicarb** 100 mEq IV over 5 min **or** 2-5 mEq/kg IV x 1
6. I**V Calcium Gluconate** 1g (10 mL of a 10 percent solution) over 3 minutes **or** IV **Calcium Chloride** 500 to 1000 mg (5 to 10 mL of a 10 percent solution) over 3 minutes [**BOTH** are **Adjunct** treatments] Effects only lasts **30 to 60 minutes** and require **constant cardiac monitoring**
7. **Digoxin toxicity** - **AVOID Calcium**; instead, give **Magnesium Sulfate** (2 g over 5 minutes) for patients with cardiac arrhythmias from digitalis toxicity [**MUST** check **Mg** level **FIRST before** giving **MgSO4**]
8. **Discontinue** K-sparing diuretics, **ACE inhibitors** & ARBs, **NSAIDs** and other drugs that inhibit renal potassium excretion

Hyp**OK**alemia – K < 3.5 mEq/L; Moderate 2.5-3.0 mEq/L; Severe < 2.5 mEq/L

- Low **Magnesium** can cause low **Potassium**; Correct **Magnesium** level **before** administering KCL
- K **increase** of **0.25 mEq/L** for each **20 mEq IV KCl** on average; **IV** K **only** if **K is < 2.5mEq/L**
- Give no more than **10 - 20 mEq/h IV** at a time to avoid potential effects on cardiac conduction
- **Severe hypokalemia**, administer up to **40 mEq/h** IV through **Central Line**. Maintain close follow-up care, provide continuous **ECG monitoring**, and check serial potassium levels.
- **Remove** offending **meds – Beta2 agonists,** Digoxin**, Lasix,** Insulin**, Thiazides (HCTZ),** Amphotericin B

Hyp**ER**tensive Emergency/Pre-Eclampsia/Eclampsia

Labetalol 10-20 mg IV over 2 min; Max effect in 5 min; Repeat Q 10 minutes PRN for total of 300 mg
Hydralazine 20-40 mg IV/IM; repeat PRN [**Contra** – CAD]
Pregnancy associated **[Pre-eclampsia]** 5-10 mg IV/IM initially, **THEN** 5-10 mg q20 min PRN; **max** 30 mg
ALSO
Clonidine 0.1mg po; **Metoprolol** 5mg IV; **Enalapril** 1.25mg IV; **Nitropaste** 1-2" on front and back
Nitroprusside or **NTG** may be needed to treat **severe hypertension**

- **Nitroprusside** 0.5 - 10 m**c**g/kg/min IV infusion; do not exceed 10 m**c**g/kg/min
- **NTG** 5 m**c**g/min; Increase by 5 m**c**g/min q3-5min up to 20 m**c**g/min

Hyp**OT**ension Adult

Norepinephrine (Levophed)

- **[Weight-based dosing]**

  Dose: 0.02-1 m**c**g/kg/min IV; Start: 0.1-0.5 m**c**g/kg/min IV, then titrate to effect; Info: pts w/ septic shock may require higher doses
- **[Non weight-based dosing]**

  Dose: 2-4 m**c**g/min IV; **Start**: 8-12 m**c**g/min IV, then titrate to effect; **Info**: pts w/ **refractory septic shock** may require **higher dosages** of **8** to **30 mcg/minute**

Dopamine 10-20 m**c**g/kg/min IV, Max: 50 m**c**g/kg/min; May increase 1-4 m**c**g/kg/min q10-30min
[100kg Patient = 2-5mg/kg/min] ****Inotrope of Choice for MI** **

- ***Lower dose*** (**2-5** m**c**g) stimulates dopamine receptors producing renal and mesenteric vasodilation
- ***Higher dose*** produces cardiac stimulation (**5-10** m**c**g) and vasoconstriction (**10-20** m**c**g)

Epinephrine 0.05-0.2 m**c**g/kg/min q10-15min to target; taper dose gradually to D/C
Phenylephrine 40-100 m**c**g q1-2 min PRN, not to exceed total dose of 200 m**c**g, then 40-60 m**c**g/min continuous IV infusion
Ephedrine [anesthesia-related**]** 5-10 mg IV prn; Max: 50 mg/total dose

Hyp**OT**ension Peds

Dopamine 5-20 m**c**g/kg/min; not to exceed 50 m**c**g/kg/min
Lower doses primarily stimulate dopaminergic receptors that produce **renal and mesenteric vasodilation**. Higher doses produce **cardiac stimulation and vasoconstriction** – **better** than Norepinephrine
Norepinephrine [2-12 yo] 0.1-2 m**c**g/kg/min IV; then titrate to effect; Max: 2 m**c**g/kg/min
Epinephrine 0.1 to 1 m**c**g/kg/minute continuous IV infusion; doses up to 5 m**c**g/kg/minute may be necessary in shock
Phenylephrine 5-20 m**c**g/kg IV bolus q10-15min
Ephedrine [anesthesia-related] 0.5 mg/kg **SC/IM** q4-6h prn

Malignant Hyperthermia

Occurs to particular medications used during general anesthesia (**Succinylcholine**)
Symptoms: **muscle rigidity, high fever, tachycardia**.
Complications: rhabdomyolysis and hyperkalemia.
Treatment: **Dantrolene** 2.5 mg/kg IV; repeated as necessary

Nausea/Vomiting

Zofran 4mg; **Reglan** 10mg; **Protonix** 40mg; **Compazine** 10mg; **Phenergan** 12.5-25mg;
Thorazine 12.5mg IM Q 30min; **Haldol** 1mg-5mg po or IM

Pre-Eclampsia

Fluids NS or **LR** - Total fluids should generally be limited to **80 mL/hr** or **1 mL/**kg**/hr**
Hypertension

- **Labetalol [Max** effect **5 min]** 20 mg IV with repeat doses every 10 minutes; **max** 300 mg
- **Hydralazine [20** min **onset]** 5-10 mg IV/IM initially, **THEN** 5-10 mg q20 min PRN; **max** 30 mg
- **Nifedipine** 10 mg PO every 15-30 minutes; **max** of 3 doses

Magnesium

- **Pre-Eclampsia** 1-2 g/h IV for at least 24h
- **Eclampsia** (**Seizures**) 4 g IV infusion pump over 5-10 minutes, followed by an infusion of 1 g/hr maintained for 24 hours after the last seizure. **Recurrent seizures** with an additional bolus of **2 g** and increase in the infusion rate to **1.5 - 2 g per hour**

Pre-Term Labor [**Is** there a ***REASON*** for **PTL?]**

Tocolytics NOT indicated **> 34 Weeks** and **Contraindicated:**
Symptomatic IAI includes a temperature greater than 38.0°C (100.0°F) and 2 of the 5 following signs:

- WBC count greater than 15,000 cells/mm
- Maternal tachycardia greater than 100 bpm
- Fetal tachycardia greater than 160 bpm
- Tender uterus
- Foul-smelling discharge

Magnesium 4-6 g IV over 20 minutes, followed by a maintenance dose of 1-4 g/h depending on urine output and persistence of uterine contractions
Indomethacin 100 mg PR followed by 50 mg PO every 6 hours for 8 doses
Nifedipine 20 mg orally, followed by 20 mg orally after 30 minutes. If contractions persist, continue with 20 mg orally Q 3-8 hours for 72 hours max 160 mg/d; **DO NOT** use with Magnesium
Terbutaline 0.25mg SC Q6 hours

Steroids

- Glucocorticoids is recommended in the **absence of clinical infection** whenever the gestational age is between **24 and 34 weeks**. An attempt should be made to **delay delivery for a minimum of 12 hours** to obtain clinical benefits of antenatal steroids. Late preterm glucocorticoids is **not indicated** in women with **clinical chorioamnionitis, multiple gestations, or pregestational diabetes**
- **Betamethasone may** be considered in women with a **singleton pregnancy** between 34 0/7 and 36 6/7 weeks gestation at **imminent risk** of preterm birth **within 7 days**
- **Betamethasone** 12 mg doses Q12 H X 2 doses and **Dexamethasone** 6 mg Q6H X 4 doses

Tension Pneumothorax

Chest pain; Air hunger; Respiratory distress; Tachypnea; Hypotension; Tracheal deviation from side of injury; Unilateral absent breath sounds; Elevated hemithorax without respiratory movement; Neck vein distention; Hyperresonance of affected lung; Cyanosis (late finding)

Needle decompression [Needle length rule of thumb – "The longer the better"]

- **At least** 3.25-inch, **10-14 gauge** angiocath required to penetrate the chest wall and pleural cavity
- **4th** or **5th intercostal** space just **anterior** to **mid-axillary** line in **adults** (**ATLS 10th Edition**)

Thoracostomy

- **28-32 F** chest tube for pneumothorax/hemothorax **4th or 5th** intercostal space just **anterior** to **mid-axillary line** (New **ATLS 10th Edition**)
- **PEDS** - **2nd intercostal** space **mid-clavicular line**

Thyroid Storm [Fever; Profuse Sweating; Respiratory Distress; N/V; AP; AMS; SZ]

Propylthiouracil (PTU) 400mg IV/PO/PR
Propranolol 1-3 mg IV x 1 **OR** 10-30 mg PO
Dexamethasone 1-9mg PO /IM **OR** 1-6mg IV
Cholestyramine 4g Q6H via NG Tube
Cooling methods; IV **D5W**; Correct **electrolyte abnormalities**; **Tylenol** (15 mg/kg orally or rectally Q 4 hours); address **cardiac arrhythmias**, if necessary

Traumatic Brain Injury (TBI)

- Hyperventilation should be used **ONLY** for **short periods** when immediate control of ICP is necessary
- Raise head of patient **unless** the patient has hypovolemia

Mannitol 20% solution (20g Mannitol per 100ml of solution)
IV Fluid NS or Ringers initially. Hypertonic saline 3%-23% can be used to reduce ICP

DO NOT USE Mannitol or Hypertonic saline in **hypotensive** or **hypovolemic** patients

TBI and Seizure Treatment - Peds

Phenobarbital 10-20 mg/kg/dose
Diazepam 0.1-0.2 mg/kg/dose, slow IV bolus
Phenytoin 15-20 mg/kg at 0.5-1.5ml/kg/min then 4-7 ml/kg/day maintenance
Hypertonic saline 3% at 3-5 ml/kg
Mannitol 0.5-1.0g/kg (Rarely requires, may **worsen** hypovolemia)

OTHER MEDICAL SITUATIONS

GC/Chlamydia

Rocephin 250mg IM X 1 ***OR*** **Cefixime** 400mg X 1
PLUS
Azithro 1g **or Doxy** 100mg BID X 10 days

IV Antibiotics

Rocephin 1-2g Q24H, **Vanco** 1g Q8H; **Cleocin** 600-1200 mg/day divided Q6-12h;
Azithromycin 500mg Q24H; **Zosyn** 3.75g or 4.5g Q6H; **Fortaz** 1g Q8H, **Unasyn** 3g Q6H;
Ancef 1g Q6H; **Meropenem** 1g Q8H; **Primaxin** 1g Q8H

Insulin Calculator

0.1units/KG/HR
OR

$$\frac{\text{Current Blood Sugar} - 100}{\mathbf{40}} = \text{Units of Insulin}$$

Lidocaine (Local Anesthesia Injections)

Lidocaine Safety and Toxic doses

- Peak blood levels of lidocaine usually occur **10-25 minutes after injection** – the point at which toxic effects are likely to be seen
- Maximum safe dose of lidocaine **without** vasoconstrictor (epinephrine) is **3 mg/kg** (duration of action 1 hour). No more than 300 mg (30 ml of 1% Lidocaine) at once
- Maximum safe dose of lidocaine **with** vasoconstrictor is **5 mg/kg** (duration of action 2-6 hours)

How to calculate Maximum safe dosage of Lidocaine

- 1% Lidocaine solution is **10 mg/mL**
- Example Calculation for a **70 Kg** man: Lido 1% with Epi: keep under 7 mg/Kg. 7×70 = 490 mg for 70 kg man. Divide 490 mg by 10 mg/ML = **49 ml**

Magnesium Sulfate

2 grams of IV **Magnesium Sulfate** = **0.2** mg/dL **increase** in Serum Magnesium

Potassium Chloride

20Meq IV or PO = **0.25 increase** in Serum K

PRBC

1 Unit PRBC = Increases **hemoglobin** by **1 gm/dl** and **hematocrit** by **3%**

Platelets

1 Unit Platelets = Increases **platelet count** in an adult by **5,000–8,000**/mm

BANANA BAG

Folic acid 1 mg
Thiamine (VITAMIN B-1) 100 mg
Pyridoxine (VITAMIN B-6) 100 mg in sodium chloride 0.9% 100 mL IVPB; Administer over 60 Minutes
Give **DAILY** X 3 days; give 1st dose prior to any food or dextrose containing IV

OR

Folic acid 1 mg, **Thiamine** (VITAMIN B-1) 100 mg, **Pyridoxine** (VITAMIN B-6) 100 mg in sodium chloride 0.9% 100 mL IVPB
Intravenous, Administer over 60 Minutes, ONCE, for 1 dose
And
Folic acid tablet 1 mg
1 mg, Oral, DAILY, First Dose Tomorrow at 0900, for 2 doses
And
Thiamine (VITAMIN B-1) tablet 100 mg
100 mg, Oral, DAILY, First Dose Tomorrow at 0900, for 2 doses
And
Pyridoxine (VITAMIN B-6) tablet 100 mg
100 mg, Oral, DAILY, First Dose Tomorrow at 0900, for 2 doses

PLUS

Multivitamin

ENDOTRACHEAL DRUG DELIVERY

Follow all drug deliveries with **1-5 ml** (Peds - depending on size) or **10 ml** (Adult) of **Normal Saline** flush

ADULTS ONLY - Give all ETT drugs at **2 to 2.5 times** the recommended IV dose
PEDS – Various dosages depending on medication

Lidocaine: ETT lidocaine of **2 to 4 mg/kg**. For this ETT dose to reach therapeutic levels takes 5 minutes and to reach peak levels takes 20 minutes. The level remains therapeutic for 30 to 60 minutes
PEDS: ETT dose is **1mg/kg not to exceed 100 mg**

Epinephrine: ETT epinephrine 2 to 2.5 times the standard IV dose of 1 mg (ETT dose = **2 to 2.5 mg**)
PEDS: ETT dose is 0.1 mg/kg (1:1000 solution) ETT q3-5min prn; Max: 1 mg/dose

Atropine: ETT atropine be 2 to 2.5 the standard IV dose of 1 mg (ETT dose= **2 to 2.5 mg**)
PEDS: ETT dose is **0.04-0.06 mg/kg**; may repeat dose x1; flush ETT dose w/ 5 mL NS and follow w/ 5 ventilations. Maximum single dose, 0.5 mg for child, 1.0 mg for adolescent. This dose may be repeated once

Naloxone: ETT Naloxone 2 to 2.5 times the standard IV/IO dose of 0.4 to 2 mg (ETT dose = **1 to 5 mg**)
PEDS:
[<20 kg or <5 yo]
0.1 mg/kg **ETT/SC/IM/IO** q3-8min prn; SC/IM/IV administration preferred;
May repeat q1-2h if sx recur
[>5 yo or >20 kg]
2 mg **ETT/SC/IM/IO** q3-8min prn; SC/IM/IV administration preferred;
May repeat q1-2h if sx recur; Reassess tx if no response after **10 mg**

ER SITUATIONAL PROTOCOL

ACUTE CORONARY SYNDROME

Procedure (Perform ABC's and **Vital Signs First)**
Cardiac Monitor and 12-Lead EKG (**Right-sided EKG** if initial EKG shows **Inferior-lead** ST changes)
IV (**Both arms** if **Posterior MI**)
NTG po/Spray/Paste (If **Posterior MI**, Insert second IV & **Bolus** with **2 liters** of NS **FIRST**)
Targeted H&P
Thrombolytic Checklist if **CP > 15 min** or **< 12 hours** (Address BP if Systolic >180 or Diastolic >100)

Labs
CBC, CMP, Troponin, CK Total and MB, PT/INR, PTT, D-Dimer, BNP

Radiology
Portable CXR

Meds
Aspirin 324 mg chew and swallow
Morphine 1-2 mg IV if needed for pain and air hunger
O2 Nasal Cannula w 100% supplemental oxygen **ONLY IF** room air O2 < 94%
Nitro 0.4 mg SL, Spray **or** Paste 1"
(**AVOID NITRO** if Pt has taken PDE5 Inhibitors: **Viagra** - 24 hours, **Levitra** & **Cialis** – 48 hours)

If **EKG** shows **STEMI** then **IMMEDIATELY** prepare for **PCI** (**1st line**) and/or **Thrombolytics** (**2nd line** if PCI cannot be performed within **120 minutes** or is not available)

Interventional Criteria
Patients with **chest pain** suggestive of acute myocardial ischemia who present **up to 12** (and **possibly up to 24**) hours after onset of symptoms are candidates for **reperfusion therapy** with either **fibrinolytics** or **primary percutaneous coronary intervention** (PCI) if the following **ECG evidence** is present:

New ST-elevation at the **J point** in **two anatomically contiguous leads** using the following diagnostic thresholds:

- Men ≥ 40 years: ≥ **2 mm** V2 - V3 & ≥ 1 mm in all other leads
- Men < 40 years: ≥ **2.5 mm** V2-V3 & ≥ 1 mm in all other leads
- Women any age: ≥ **1.5 mm** V2-V3 & ≥ 1 mm in all other leads
- Men & Women **V3R** & **V4R**: ≥ **0.5 mm** (Men < 30 years: ≥ **1 mm** in V3R & V4R)

Patients with **CP** in the presence of a new **left bundle branch block** or a true **posterior** myocardial infarction (**ST depression in V1-V4**) are also considered **eligible** for **reperfusion therapy**.

Tenecteplase (TNKase) for **STEMI**
[<60 kg] Dose: 30 mg IV x1
[60-69 kg] Dose: 35 mg IV x1
[70-79 kg] Dose: 40 mg IV x1
[80-89 kg] Dose: 45 mg IV x1
[>90 kg] Dose: 50 mg IV x1

Alteplase for **STEMI**

Accelerated infusion over 1 ½ hours

- ≤67 kg: 15 mg IVP bolus over 1-2 minutes, THEN 0.75 mg/kg IV infusion over 30 minutes (not to exceed 50 mg), and THEN 0.5 mg/kg IV over next 60 minutes (not to exceed 35 mg over 1 hr)
- >67 kg (100 mg total dose infused over 1.5 hr): 15 mg IVP bolus over 1-2 minutes, THEN 50 mg IV infusion over next 30 minutes, and THEN remaining 35 mg over next 60 minutes

3-hour infusion

- <65 kg: 0.075 mg/kg IVP bolus over 1-2 minutes, THEN 0.675 mg/kg infused over the rest of the first hr, THEN 0.25 mg/kg IV for the next 2 hr
- ≥65 kg: (100 mg total dose infused over 3 hr): 6-10 mg IVP bolus over 1-2 minutes, THEN 50-54 mg infused over the rest of the first hr (ie, 60 mg in 1st hr including 6-10 mg bolus), THEN 20 mg/hr for the next 2 hr

Heparin

Loading Dose: **60 units/kg** IV push up to **4000 units**

Infusion Dose: **12/units/kg/hr** in half NS; Draw PTT lab from IV site **other than** Heparin site; **PTT** goal **50-65**

- Check PTT STAT **then** at 3 hrs **then** Q6h afterwards
- When PTT is between **50-65** seconds **then** check PTT QD

Enoxaparin (Lovenox) w **ST elevation myocardial infarction (STEMI)**

[<75 yo]

Dose: **1 mg/kg** SC q12h; Start: **30 mg IV plus 1 mg/kg SC x 1**, between 15min before and 30min after starting thrombolytic tx; Max: 100 mg/dose for first 2 SC doses; Info: give w/ aspirin; cont. for 8 days or until hospital D/C; D/C if Plt <100,000

[75 yo and older]

Dose: **0.75 mg/kg** SC q12h; Start: between 15min before and 30min after starting thrombolytic tx; Max: 75 mg/dose for first 2 doses; Info: give w/ aspirin; cont. for 8 days or until hospital D/C; D/C if Plt <100,000

Enoxaparin (Lovenox) w **Non-ST elevation myocardial infarction (Non-STEMI)**

- 1 mg/kg SC q12hr; **co-administer** with **antiplatelet therapy**; continue for duration of hospitalization or until percutaneous coronary intervention (PCI) performed

Nitro Infusion (25mg/250ml D5W)

5 m**c**g/min and increase dose by 5 m**c**g/min Q 5 minutes until CP is controlled **as long as** systolic BP remains above 90 mmHG

Clopidogrel (Plavix)

Start: 300 mg PO x1; Info: start dose optional for pts w/ STEMI; give w/ aspirin 75-325 mg PO qd;
May use w/ heparin or Lovenox acutely

Beta-blocker **(Metoprolol)** and ACE Inhibitor **(Lisinopril)** as **early** as **possible**

Consider Targeted Temperature Management (TTP)/Therapeutic Hypothermia (TH)

Indications:

1. **Comatose** patients with ROSC after **OHCA** when the initial rhythm was **ventricular fibrillation** (VF) or **pulseless ventricular tachycardia** (pVT)
2. **May be beneficial** for patients with non-VF/non-pVT (nonshockable) **OHCA** or with in-hospital arrest

Guidelines:

1. The temperature should be maintained between **32ºC and 34ºC** (89.6 F and 93.2 F)
2. Maintain TTM for at least **24 hours**

Inclusion Criteria:

1. Intubated patients with treatment initiated **within 6 hours** after cardiac arrest
2. Patients able to **maintain a systolic BP >90 mm Hg**, with or without pressors, after CPR
3. Patients in a **coma** at the time of cooling

Exclusion Criteria:

1. **Recent major surgery** within 14 days (Possibly increases risk for infection and bleeding)
2. Systemic **infection/sepsis** (Slightly increases in risk of infection)
3. Coma from **other causes** (drug intoxication, preexisting coma prior to arrest)
4. Known **bleeding diathesis** or with active ongoing bleeding (Hypothermia may impair the clotting system)

CVA

Procedure (Perform ABC's and **Vital Signs First)**

ABCs, GCS, Vital Signs, POC Blood Glucose, Large Bore IV X 2, NS 1-liter 100ml/HR, EKG, Cardiac Telemetry, Supplemental O2, Foley Catheter with I&Os

__Notify Tele-Stroke Team__

Labs

POC Blood Glucose, CBC, CMP, Troponin, UA, UDS, Urine HCG, Ethanol, PT/PTT/INR

ABO Rh or Type & Screen/Cross (**Only** with Aneurysm), ABG

Radiology

CT Head (non-contrast); CXR; CTA Head and Neck

Meds (Maintain BP < 185/110)

Labetalol 10-20 mg IV over 2 min; Max effect in 5 min; Repeat Q 10 minutes PRN for total of 300 mg

If Labetalol is **contraindicated** due to **asthma** or **bradycardia**:

- **Hydralazine** 10-40 mg IV (5-10 mg IV for pregnant patients) & repeat PRN or **Nitropaste** 1-2"

Nicardipine 5 mg/HR IV; Titrate up by 2.5mg/HR every 5-15 minutes; Max 15mg/HR

Alteplase (tPA) *Within 4.5 hours of **onset** if pt is **<81 years old***

0.9 mg/kg IV; not to exceed 90 mg total dose; administer 10% of the total dose as an initial IV bolus over 1 minute and the remainder infused over 60 minutes

Give **ASAP** within 4.5 hours of SX onset; Max: **90 mg** total dose

D/C if **pre-treated** or **INR >1.7** or **PTT >80 seconds**

****Anticoagulants** are **NOT indicated** after **tPA** is given for **ischemic stroke** because the **risk** of **hemorrhagic conversion** is **too high****

MVA

Procedure (Perform ABC's and **Vital Signs First)**
ABCs, Vital Signs, C-Spine Collar & Spinal Precautions, GCS, Large Bore IV X 2,
NS or LR 1-liter bolus, Supplemental O2, TDap, Foley Catheter with I&Os, FAST Exam,
EKG, Cardiac Telemetry, Remove from backboard as soon as possible (**Max 2 hours**)

Labs
CBC, CMP, Amylase, Lipase, UA, UDS, Urine HCG, ABO Rh or Type & Screen/Cross,
Ethanol, PT/PTT/INR

Radiology
XR Chest, C-Spine and Pelvis in ER
CT Head, C-Spine, T-Spine, L-Spine **[ALL non-contrast]**
CT Chest & Abdomen/Pelvis **(w contrast)**

PULMONARY EMBOLISM

Procedure
ABCs, Vital Signs, POC Blood Glucose, Large Bore IV or IO, LR or NS 1-liter bolus, EKG,
Cardiac Telemetry, Supplemental O2

WELLS Score:

Clinical signs and symptoms of DVT; HR > 100; No alternative diagnosis better explains the illness; Immobilization at least 3 days OR surgery in the previous 4 weeks; Previous h/o DVT or PE; Hemoptysis; Cancer w/ treatment within 6 months

PERC Score:

Age >50; HR > 100; SaO2 < 95%; Unilateral leg swelling; Hemoptysis; Recent surgery or trauma < 4 weeks; Prior h/o DVT or PE; Hormone use

Labs
CBC, CMP, D-Dimer, CK, BNP, Troponin, ABG, UA, UDS, Urine HCG, PT/INR,
IMA (Ischemia Modified Albumen Levels) which is 93% sensitive and 75% specific for pulmonary embolism

D-Dimer:
A **Wells Score** of **4 or less** combined with a **negative D-dimer** test was shown to **safely exclude** PE.

D-dimer testing is **most reliable** for excluding pulmonary embolism in **younger patients** who have **no** associated comorbidity or history of venous thromboembolism and whose symptoms are of **short duration**.

Use an **age-adjusted D-dimer cutoff** (patient's age in years × 10 m**c**g/L) for patients **over age 50 years** when evaluating for venous thromboembolism (VTE); it reduces false positives without substantially increasing false negatives.

D-Dimer is of **questionable value** in patients who are **older than 80 years**, who are **hospitalized**, who have **cancer** or who are **pregnant**, because nonspecific **elevation of D-dimer concentrations** is **common** in such patients.

Radiology

CXR; CTA Chest

V/Q scanning may be used when CT scanning is not available or if the patient has a contraindication to CT

Meds

Alteplase (tPA) [Use **only** if pt is **unstable**]

100 mg IV infused over 2 hr; institute parenteral anticoagulation near the end of or immediately following Alteplase infusion when the PTT or thrombin time returns to <2x normal or less

Enoxaparin (Lovenox)

[1 mg/kg SC q12h]

Alt: 1.5 mg/kg SC qd; Continue for >5 days and overlap w/ **Warfarin** until INR 2-3; D/C if Plt <100,000

OR

Apixaban (Eliquis)

Start **10 mg** PO **bid** x **7 days** then **5 mg** PO **BID**

OR

Rivaroxaban (Xarelto)

Start **15 mg** PO **bid** x **21 days** then **20 mg** PO **daily**

SEIZURES

Procedure

ABCs, GCS, Vital Signs, POC Blood Glucose, Large Bore IV or IO, LR 1-liter bolus, EKG, Cardiac Telemetry, Supplemental O2, Foley Catheter with I&Os

Labs

POC Blood Glucose, CBC, CMP, CK, ABG, Troponin, UA, UDS, Urine HCG, Ethanol, PT/INR
Prolactin (Differentiates between **TRUE** epileptic seizure and **Pseudo-seizure**)
Salicylate, Acetaminophen
Drug Levels

- Gabapentin (Neurontin), Lamotrigine (Lamictal), Levetiracetam (Keppra), Oxcarbazepine (Trileptal), Phenobarbital (Luminal), Phenytoin (Dilantin), Primidone (Mysoline), Topiramate (Topamax)

Radiology

CT Head (non-contrast)

Meds

First Line

Ativan 4 mg or 0.1 mg/kg slow **IV** at 2 mg/min; May repeat in 10 min or 2 mg Q 30 min X 3

- Takes effect in 5-10 minutes; lasts 30-120 minutes

Diazepam 5-10 mg **IV/IM** q 5-10min; Max 30 mg **or** 0.5 mg/kg, THEN 0.25 mg/kg in 10 minutes PRN

- Takes effect in 1-2 minutes

Midazolam 10 mg **IM** or **intranasally** x1 [< 50 kg 5 mg]; divide dose and give 1 spray in each nostril

- Takes effect in 5 minutes

Second Line

(Use **Fosphenytoin** or **Phenytoin** for **seizures** secondary to **post-traumatic head trauma)**

Fosphenytoin 15-20 mg **PE/kg IV x1;** Max 150 mg **PE/min IV**

- **Quicker rate** of **administration** & **less S/E** than **Phenytoin** including **less venous irritation**

Phenytoin 1 gram **IV** or 15-20 mg/kg at **50 mg/min (25mg/min** in **elderly** and **patients** with **CAD)**
Never mix **Phenytoin** with 5% Dextrose solution. Use **Normal Saline** instead to minimize the risk of **crystal precipitation**.
Risk of **significant hypotension** and **cardiac arrhythmias** at rates faster than 50 mg/min, as well as potential **irritation at IV site** and **vascular compromise** of the **infused limb**.
Therefore, its use in SE should be **avoided if possible**

** For **TBI** – If needed, **Diazepam** or **Lorazepam** can be used in addition to **Phenytoin** until seizure stops**

Phenobarbital 15-20 mg/kg **IV** loading dose infused at 25-60 mg/min; prepare to **support ventilation**; may repeat in 20-minute intervals PRN; not to exceed 30 mg/kg; use only **after** **Phenytoin** or **Fosphenytoin** fails

Discharge on **Keppra** 500mg po QD or **Ativan** 1mg po QD

Seizures Secondary To Eclampsia

Magnesium 4 g **IV** infusion pump over 5-10 minutes, followed by an infusion of 1 g/hr maintained for 24 hours after the last seizure. **Recurrent seizures** with an additional bolus of **2 g** and increase in the infusion rate to **1.5 - 2 g per hour**

WARFARIN REVERSAL IN LIFE-THREATENING BLEEDING

Vitamin K: 10 mg IV over 30 minutes (starts to work in 2-3 hours, INR reversed within 24 hrs with adequate production of coagulation factors). Administer in 50 cc of Normal Saline over 30 min.

- **Anaphylaxis** with IV Vitamin K is **very rare** – do not withhold IV Vitamin K because of fear of anaphylaxis!

Plasma (FFP): 4-6 units typically required, large volume, need time for thawing, ABO compatibility, risks of transfusion – infection, TRALI (Transfusion-related acute lung injury), TACO (transfusion associated circulatory overload), etc.

Prothrombin Complex Concentrate (Kcentra, Octaplex, Beriplex – 4 factor PCC in Canada, with factors 2, 7, 9, 10)

- Works almost **immediately**
- Factor 7 has short half-life, so, PCC stops working effectively after 4-8hrs. Thus, **Vitamin K must be given with PCC.**
- Contraindicated in HIT, liver disease, recent thrombosis, MI, ischemic stroke, DIC
- Check INR immediately (within 15 min) and again in 6 hours

Dosing PCC

- Dosing may be INR or weight based. Check product monographs or institutional guidelines.
- Current Canadian recommendations:
    - **INR** 3-5: 2000 U PCC + Vit K
    - **INR** >5: 3000 U PCC + Vit K
- Dose may vary with extremes of weight
- Mix powder with provided solvent and administer as per manufacturer's monograph (slow push or mini-bag) or institutional guidelines.

TRAUMA - TREATMENT PRIOR TO TRANSFER

- **Airway**
    1) Insert airway or ET Tube in needed
    2) Provide suction
    3) Insert Gastric Tube to reduce risk of aspiration
- **Breathing**
    1) Administer supplemental oxygen
    2) Provide mechanical ventilation when needed
    3) Insert Chest Tube when needed
- **Circulation**
    1) Control external bleeding
    2) Establish two large-caliber IV lines each arm
    3) Restore blood volume with NS or blood products
    4) Insert Foley
    5) Cardiac monitor
- **Central Nervous System**
    1) Assist respiration in unconscious patient
    2) Administer Mannitol, if needed
    3) Immobilize head, neck, CTL spine injuries, extremity fractures
- **Diagnostic Studies**
    1) CBC, CMP, PT/INR, Blood type and cross, UA, HCG, ABG, ETOH, Urine Tox Screen
    2) XR C-Spine, CXR, Pelvis, extremities if needed
    3) EKG
- **Wounds**
    1) Clean and dress wounds after controlling external hemorrhage
    2) Administer Tdap
    3) Administer ABX when indicated
- **Fractures**
    1) Administer appropriate splinting and traction
    2) Pelvic binder if needed
    3) C-Collar and/or backboard if indicated
- **Other**
    1) Pain medications if needed
    2) Sedation and paralytic infusion when needed
    3) Keep WARM (Unless Therapeutic Hypothermia (TH) Protocol is initiated)