

# SHOCK MANAGEMENT/ FLUID RESUSCITATION

This TCCC pharmacology reference provides drug administration information based solely on TCCC Guidelines. This reference should not be used for the administration of these medications for any environment outside of tactical combat casualty care on the battlefield or in the combat/tactical setting.

## TRANEXAMIC ACID (TXA)

Used by Combat Medics (CM)

Antifibrinolytic agent

Casualties anticipated to need significant blood transfusion; hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding; casualties with signs or symptoms of significant traumatic brain injury or altered mental status associated with blast injury or blunt trauma.

**DOSAGE(S):** 2 gm slow IV/IO push

**ROUTE(S):** IV and IO

**CONTRA-INDICATIONS:** Hypersensitivity to TXA, subarachnoid hemorrhage, active intravascular clotting, considered relatively safe in pregnancy, if clinically indicated

**POTENTIAL SIDE EFFECTS:** Blurred vision or impaired color vision, nausea, vomiting, diarrhea (temporary)

**DRUG INTERACTIONS:** Factor IX complex concentrates or anti-inhibitor coagulant concentrates (risk of thrombosis may be increased)

**ONSET / PEAK / DURATION:** 30 sec-5 min/30 min-2 hr/24 hr

**TACTICAL CONSIDERATIONS:** Administer as soon as possible but not later than 3 hours after injury.



## CALCIUM

Used by Combat Medics (CM)

Calcium supplement

For use after blood product transfusions.

**DOSAGE(S):** 1 gm

**ROUTE(S):** IV or IO

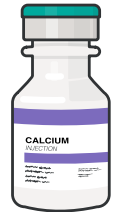
**CONTRA-INDICATIONS:** Contraindicated in patients with ventricular fibrillation, hypercalcemia, hypophosphatemia, or renal calculi, use cautiously in digitalized patients and patients with sarcoidosis, renal or cardiac disease, respiratory acidosis, or respiratory failure, potential benefits may warrant use in pregnant women despite potential risks if the alternative is worse

**POTENTIAL SIDE EFFECTS:** Tingling sensations, headache, irritability, weakness, syncope with rapid IV injection, mild decrease in blood pressure, vasodilation, bradycardia, arrhythmias, rebound hyperacidity, nausea polyuria, renal calculi, hypercalcemia, local reactions

**DRUG INTERACTIONS:** Decreased bioavailability with atenolol, fluoroquinolones and tetracyclines, calcium channel blockers decrease calcium effectiveness, cardiac glycosides increase digitalis toxicity, thiazide diuretics cause a risk of hypercalcemia

**ONSET / PEAK / DURATION:** Immediate/immediate/1-2 hr

**TACTICAL CONSIDERATIONS:** Administer one gram of calcium as either 30 ml of 10% calcium gluconate or 10 ml of 10% calcium chloride; immediately after the first transfused blood product. Monitor calcium chloride infusion closely as severe necrosis and skin sloughing can occur if peripheral IV extravasates.



## EPINEPHRINE

Used by Combat Medics (CM)

Sympathomimetic catecholamine (adrenaline analog)

For emergency treatment of **anaphylaxis** or allergic reactions.

**DOSAGE(S):** 0.3 mg (3 ml of 1:1000 solution), repeated every 5 to 10 minutes as necessary

**ROUTE(S):** IM or subcutaneous

**CONTRA-INDICATIONS:** None

**POTENTIAL SIDE EFFECTS:** Anxiety, restlessness, tremor, weakness, dizziness, sweating, palpitations, pallor, nausea and vomiting, headache, disorientation, tachycardia

**DRUG INTERACTIONS:** Antihypertensives reduce the pressor effects of epinephrine, thyroid hormones, antihistamines and some anti-arrhythmic medications increase its arrhythmogenic effects

**ONSET / PEAK / DURATION:** 15-30 sec (IM<subcutaneous)/20 sec to 4 min/5-10 min

**TACTICAL CONSIDERATIONS:** Standard EpiPens® deliver the recommended 0.3 mg IM dose. Casualties in hemorrhagic shock have poor tissue perfusion to their extremities reducing the delivery of epinephrine; use large muscle groups closest to the torso (in order of preference: thigh > deltoid > gluteal).



## DIPHENHYDRAMINE

Used by Combat Medics (CM)

First generation antihistamine (H1 blocker)

For emergent treatment of **anaphylaxis** or allergic reactions and non-emergent treatment of adverse drug reactions.

**DOSAGE(S):** 25 mg initial dose, may consider 50 mg based on clinical situation; repeat q 4-6 hr prn; max daily dose 300 mg

**ROUTE(S):** IM, IO & IV

**CONTRA-INDICATIONS:** Documented hypersensitivity to diphenhydramine, breastfeeding mothers, use in pregnancy if clearly needed

**POTENTIAL SIDE EFFECTS:** Sedation/somnolence/sleepiness, drowsiness, unsteadiness, dizziness, headache, rare extrapyramidal effects, tremor, or convulsions

**DRUG INTERACTIONS:** Accentuates effects of other medications that cause drowsiness or decreased level of consciousness (sedatives, hypnotics)

**ONSET / PEAK / DURATION:** 10 sec-20 min (IV<IO<IM)/15 min-2 hr/2-6 hr

**TACTICAL CONSIDERATIONS:** There is no evidence to support H1-antihistamines alone in emergency management of anaphylaxis – diphenhydramine should only be used as an adjunct to epinephrine during anaphylaxis management; the slower onset and longer duration may help sustain effects of successful treatment. Useful for minor reactions that are not life-threatening. Casualty weapons, communications and sensitive equipment should be secured.



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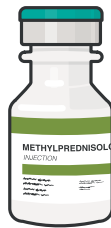
## METHYLPREDNISOLONE

Used by Combat Medics (CM)

Corticosteroid (anti-inflammatory)

For use after blood product transfusion anaphylactic reaction.

<b>DOSAGE(S):</b>	10-40 mg
<b>ROUTE(S):</b>	IV or IO
<b>CONTRA-INDICATIONS:</b>	Systemic fungal infections and known hypersensitivity (prior allergic reaction); potential benefits may warrant use in pregnant women despite potential risks if the alternative is worse
<b>POTENTIAL SIDE EFFECTS:</b>	Sodium retention, fluid retention, potassium depletion, hyperglycemia, increased liver function tests, muscle weakness, impaired sweating, pancreatitis, esophagitis, urticaria or allergic reactions
<b>DRUG INTERACTIONS:</b>	Potential seizures with cyclosporin; decreased efficacy with phenytoin or rifampin; variable effects on anticoagulants



**ONSET / PEAK / DURATION:** Immediate/1-2 min/1 hr

**TACTICAL CONSIDERATIONS:** Administer 10-40 mg IV or IO, after first administering epinephrine and diphenhydramine, when treating an anaphylactic reaction from a blood product transfusion.