Pediatric Hypovolemic Shock and Maintenance Fluids

HYPOVOLEMIC SHOCK

I. Recognition:

	Infant	Child	Signs and Symptoms
Mild	**5%**	**3%**	Decreased urinary output, mild tachycardia, dry mucous membranes, decreased tearing.
Moderate	**10%**	**6%**	Oliguria, tachycardia, dry membranes and tongue, sunken eyes and fontanel, poor skin turgor, borderline to poor perfusion, mild to moderate tachypnea
Severe	**15%**	**9%**	Oliguria or anuria, possible shock, poor perfusion, decreased LOC, tachypnea, marked metabolic acidosis.

II. Associated Conditions:

Gastroenteritis, Burns, Trauma, Hemorrhage, prolonged illness associated with poor oral intake. Bowel Obstruction, Pneumonia, DKA, DI, Neglect, Cystic Fibrosis, Inborn Errors of Metabolism

III. Action:

1. Establish ABC's (intubation and ventilation may be necessary with profound shock.
2. Establish IV access.
3. Fluid Therapy

A. Poor perfusion (aka Shock) requires rapid administration of volume. Give NS 20cc/kg IV (in less than 5-10 minutes) then reassess, repeat as necessary.

B. Calculate replacement fluids based on estimated deficit (% dehydration), ongoing losses, maintenance needs, and special situations (hyper or hyponatremia)

Ex. Deficit replacement

Ex. 10% dehydration of a 7 kg infant

% deficit x weight (grams) = fluid deficit in cc

10% X 7000 grams = 700g or 700cc

Add deficit to maintenance fluids of 700cc to give 1400cc for the day

Hyponatremic dehydration can be corrected over 24 hours with half the deficit replaced in the first 8 hours, but sodium should only rise 0.5 meq/L/hr. KCL 20 mEq/liter may be added when patient voids

Hypernatremic/ hypertonic dehydration frequently requires a slower correction over 48 hours (ex 10 day old breast fed infant with Na^+ of 165 or DKA) Don't use anything less tonic than Normal Saline for patients with Severe Hypernatremia (Na^+ >165).

Pediatric Fluid and Electrolyte Requirements				
Requirements	**Infants (> 1 month old)**	**< 10 kg**	**10-20 kg**	**>20 kg**
Fluid	100-120 mL/kg	100 mL/kg	1000 mL + 50 mL/kg > 10 kg	1500 mL + 20 mL/kg > 20 kg
Goal Calories kcal/kg	~120	~110	~80	$\geq$ 45
Dextrose g%	5-10%	5%	5%	5%
Electrolytes	**Infants/Children**		**Adolescents**	
Sodium	3 mEq/kg		2 mEq/kg	
Potassium	2 mEq/kg		1 mEq/kg	
Consider adding the electrolytes below if using IVF's > 3-5 days				
Magnesium	0.25 mEq/kg		0.25 mEq/kg	
Calcium	1 mEq/kg		0.25 mEq/kg	
Phosphorus	0.5 mMol/kg		0.25 mMol/kg	
1mEq KPhos = 0.68 mMol P (1 mEq NaPhos = 0.75 mMol P)				

All **infusions** should be connected to a constant infusion pump

Generally use D10 1/4NS for neonates and D5 1/2NS for other infants and children. (Specific electrolyte needs and therapies will require different concentrations).

Add K+ (20 meq/liter) if urine output is documented and/or after evaluation of serum electrolytes.