IV Fluids

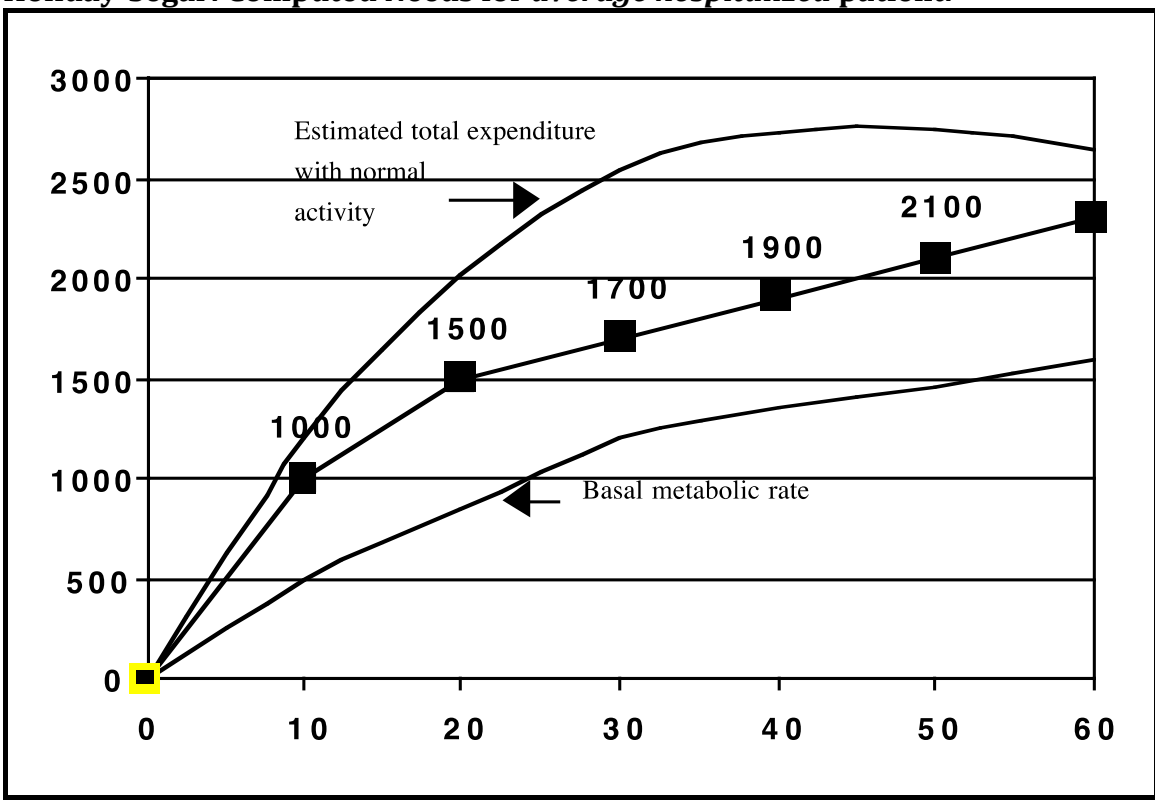
Weight
1 kg = 2.2 pound

IV Fluids
Normal saline = 154 meq/L of Na^+
½ Normal Saline = 77 meq/L of Na^+
¼ Normal saline = 38 meq/L of Na^+

Maintenance Fluids:
<u>4/2/1 = Maintenance IV rate cc's/hour</u>
4 cc/kg for each of the first 10 kg
2 cc/kg for each of the second 10 kg
1 cc/kg for each additional kg

<u>100/50/20 = Maintenance fluid requirement/day</u>
100 cc/kg for each of the first 10 kg
50 cc/kg for each of the second 10 kg
20 cc/kg for each additional kg

Holiday-Segar: Computed Needs for *average hospitalized* patient.



Degree of Dehydration:

Infant EWL* ml/kg	Adol EWL* ml/kg	Clinical Data
Mild 5% 50	**Mild** 3% 30	• **Dry mucous membranes** • **Oliguria**
Moderate 10% 100	**Moderate** 5% 50	• **Marked oliguria** • **Poor skin turgor** **Sunken fontanel** • **Tachycardia**
Severe 15% 150	**Severe** 7% 70	• **Hypotension** • **Poor Perfusion**

Oral Rehydration Solutions

Fluid	CHO g/dl	Na^+ meq/L	K^+ meq/L	HCO_3 Meq/L	mOSM per Kg
AJ	11.9	0.4	26	--	700
Gingerale	9	3.5	0.1	3.6	565
Milk	4.9	22	36	30	260
Gatorade	5.9	21	2.5	--	377
Pedialyte	2.5	45	20	30	250
WHO	2	90	20	30	310

Oral Rehydration in children

- Mild dehydration
  - 50 cc/kg over 4 hours
- Moderate dehydration
  - 100 cc/kg over 4 hours

Fluid Calculation for Dehydration

- Maintenance
- Deficit (minus bolus)
- Ongoing loss

Fluid Management Concepts

- Bolus fluids
  - Bolus with NS or LR. These are isotonic solutions. You never want to bolus with hypotonic solutions.
  - If patient is hypoglycemic AND needs bolus of fluids you may bolus with D5NS or D5LR. One bolus of glucose is enough in most situations.
  - Usual bolus is 20cc/kg for a child (one liter for an adult). If there is ANY reason to be concerned about whether the child can tolerate the fluids (heart or kidney issues) bolus with 10cc/kg. It is always easier to give another bolus than to remove fluid.
  - You bolus till stable. If you need 60cc/kg or more than you probably need to do some invasive monitoring to make sure that you are "filling up the tank" but not overfilling it. Thus pulmonary artery wedge pressure to monitor LA pressure (pre-load). If PCWP is < 6 think "low volume (pre-load)". If > 12 think fluid overload (pulmonary congestion). Remember, increasing volume (Starling curve) increases cardiac output (until you get too high). Thus if patient is stable with a PCPW of 8 that is fine, if not, you can give more fluids. This discussion is ONLY in the context of a normal heart. What to do if there is heart disease is beyond the scope of this discussion.
- Calculate
  - Maintenance
  - Deficit
  - Ongoing losses
- Potassium Pearls
  - Potassium concentration in the serum is about 4.0 meq/liter
  - Potassium concentration in the cell is about 154 meq/liter
  - Thus potassium is actively pumped into the cell using a lot of energy via the ATPase system
  - Thus if you "bolus" potassium you will overload the pump which will cause an acute and significant rise in the serum K^+ which distorts the gradient across the membrane and can induce a serious arrhythmia and death.
  - If you need to give K^+ quickly, you never give it faster than 1 meq/kg/hour to a maximum of 20 meq/hour and you should be monitoring the patient if you are blousing near this rate. This rate is only done if arrhythmia is present. If severe hypokalemia but no arrhythmia give 0.5 meq/kg/hour. Monitor closely.