Useful formulas in fluid therapy

Fluid volumes:

<table>
<thead>
<tr>
<th>Total body water: 60% body weight</th>
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<tbody>
<tr>
<td>ECF fluid: 30% BW</td>
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<tr>
<td>Blood volume: 8% BW</td>
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<tr>
<td>Interstitium: 22% BW</td>
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<tr>
<td>Intracellular fluid: 30% BW</td>
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Correction of dehydration

% dehydration (estimate) x Body weight (kg)

Maintenance

Adults: 60 ml/kg/day
Neonates: 70 ml/kg/day

Total amount of fluid to give:

maintenance + replacement (% dehydration) + ongoing losses

Total bicarbonate deficit:

Base deficit x 0.3 x bodyweight (kg) = deficit in meq. To obtain deficit in grams, divide meq/12.

Commercial solutions are hypertonic: 5% and 8.4% NaHCO₃. Isotonic bicarbonate is 1.3%.

To make isotonic bicarbonate:

Add 13 g NaHCO₃, 260 ml of 5% or 154 ml of 8.4% to each liter of sterile water.

Correction of metabolic acidosis

If blood pH < 7.2
Give _ of calculated deficit in 30 minutes, then rest over 12 hours

Correction of potassium deficit

Body weight (kg) x 0.4 x deficit

Potassium is an intracellular ion. Calculation of deficit based on serum concentration provides only an estimate for fluid supplementation.

Maximum rate of administration: ≤0.5 meq/L

Hypertonic saline: 4 ml/kg given during 5-10 minute period.

Calculation of osmotic pressure:

2[Na] (meq/L) + glucose/18 (mg/dl) + BUN/2.8 (mg/dl) = plasma osmotic pressure.

Anion gap

(Na⁺+K⁺) – (Cl⁻+HCO₃⁻) = anion gap.

Calculating infusion rate

Drops per minute = total infusion volume (ml) x drops/ml
infusion time (min)
Equivalent values of some salts used in fluid therapy

1 g NaCl = 17 meq Na, Cl
1 g NaHCO$_3$ = 12 meq Na, HCO$_3$
1 g KCl = 14 meq K, Cl
1 g CaCl$_2$ = 20 meq Ca
1 g Ca gluconate = 4.5 meq Ca
1 g Ca borogluconate = 4.1 meq Ca
1 g MgSO$_4$ = 8.3 meq Mg

1 meq Na = 59 mg NaCl
1 meq Na = 84 mg NaHCO$_3$
1 meq Na = 112 Na Lactate
1 meq K = 74.5 mg KCl
1 meq Ca = 55 mg CaCl$_2$
1 meq Ca = 224 mg Ca gluconate
1 meq Mg = 120 mg MgSO$_4$

Sodium: 23
Potassium: 39
Chloride: 35.5
Calcium: 40
Bicarbonate (HCO$_3$): 61
Sodium bicarbonate: 84