ED Calculations

A-a O_2 Gradient

A-a O_2 Gradient = [(FiO_2) * (Atmospheric Pressure - H_2O Pressure) - ($PaCO_2$/RQ)] - PaO_2

RQ=Respiratory quotient – 0.8 on room air, 1.0 on 100% O_2

Atmospheric Pressure=760mmHg & H_2O Pressure=47 at sea level.

Thus on air @ sea level the equation becomes: A-a Gradient=150-1.25*$PaCO_2$ - PaO_2

Normal Gradient Estimates = 5-20 OR (Age/4) + 4 OR (Age/3)-3 mmHg

The 5 Causes of Hypoxemia, #1-3 have an elevated A-a Gradient:

1. V/Q Mismatch (ex: PNA, CHF, PE ,ARDS, atelectasis, etc)
2. Shunt (ex: PFO, ASD, pulmonary AVMs)
3. Alveolar Hypoventilation (ex: interstitial lung dz, environmental lung dz, PCP PNA)
4. Hypoventilation (ex: COPD, CNS d/o, neuromuscular dz, etc)
5. Low FiO2 (ex: high altitude)

Absolute Neutrophil Count

Absolute Neutrophil Count = WBC * (% PMNs + % Bands) /100

Anion Gap

Anion Gap= Na + K - (Cl + HCO_3-)

Delta Gap = Anion Gap - 17 (Normal anion gap)

Anion Gap Metabolic Acidosis: MUDPILERS

- Methanol
- Uremia
- DKA/Alcoholic KA
- Paraldehyde
- Isoniazid
- Lactic Acidosis
- Etoh/Ethylene Glycol
- Rhabdo/Renal Failure
- Salicylates

Non-Anion Gap Acidosis: HARDUPS

- Hyperalimentation
- Acetazolamide
- RTA
- Diarrhea
- Uretero-Pelvic Shunt
- Post-Hypocapnia
- Spironolactone

Bicarbonate Deficit

Bicarb Deficit = 0.4 * Wt in kg * (24 - Pt's bicarb level)

Corrected Calcium

Corrected Calcium = (0.02 * (40 - Pt's Albumin)) + Serum Ca

Corrected QTc (Bazett's Formula)

QTc = QT Interval / √ (RR interval)

QT in seconds, RR interval in seconds (= 60/HR)

Normal QTc ≤ 0.44 sec. A longer QTc puts the patient at increased risk for torsade de pointes.

Some causes of prolonged QT:

- IHD
- Cardiomyopathy
- Severe Bradycardia, High-Grade AV Block
- Anti-Arrhythmics
- Psychotropic & other Drugs
- HypoCa, other lyte abnormalities
- Autonomic dysfunction
- Hypothyroid
- Hypothermia
- Congenital Long QT Syndrome

Corrected Sodium in Hyperglycaemia

Corrected Sodium = Measured sodium + (Serum glucose – 5.5)/3.5

Creatinine Clearance (estimation of GFR by Cockroft-Gault Formula)

Male CrCl (~GFR) ml/min = $\frac{(140 - age) \times ideal\ wt}{0.814 \times [serum\ Cr]}$ (For Female multiply this by 0.85)

Fractional Excretion of Sodium

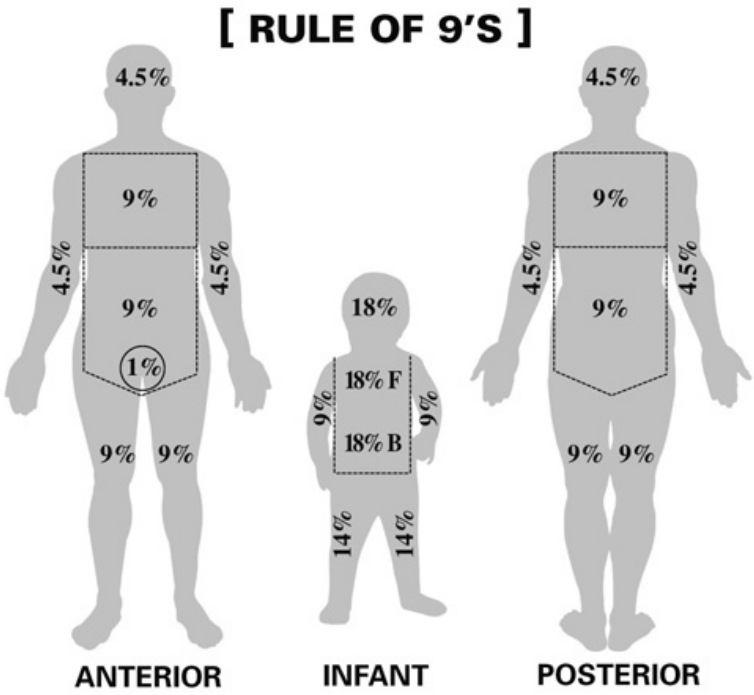
Fractional Excretion of Sodium (FENa) = $(P_{Cr} * U_{Na}) / (P_{Na} \times U_{Cr})$ %

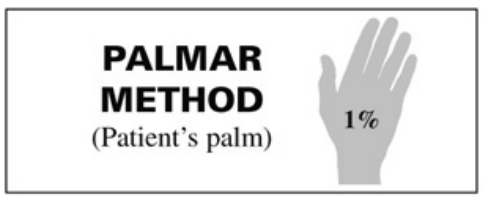
	Prerenal	Intrinsic Renal	Postrenal
U_{Na} (mmol/L)	<20	>40	>40
FENa	<1%	>1%	>4%

Prerenal: Anything that causes decreased effective renal perfusion: Hypovolemia, CHF, Renal Artery Stenosis, Sepsis, etc. NB: contrast-induced nephropathy will often look pre-renal.
Intrinsic Renal: ATN, AIN, Glomerulonephritides, etc
Postrenal: Obstruction (BPH, bladder stone, bilateral ureter obstruction)

Parkland Burns Formula

Fluid Requirements = Total Burn Surface Area (%) x Wt (kg) x 4mL
Give 1/2 of total requirements in 1st 8hrs, then give 2nd half over next 16hrs.





Serum Osmolarity

Serum Osmolarity = (2 * (Na + K)) + Urea + Glucose

Winter's Formula for Metabolic Acid Respiratory Compensation

Expected pCO_2 = 1.5 * HCO_3^- + 8 +/- 2

Respiratory changes in pH

Acute: For every ↑10mmHg of PCO2, pH ↓ by 0.08, HCO3 ↑ by 1mmol and vice versa.
Chronic: For every ↑10mmHg of PCO2, pH ↓ by 0.03, HCO3 ↑ by 3mmol, and vice versa.