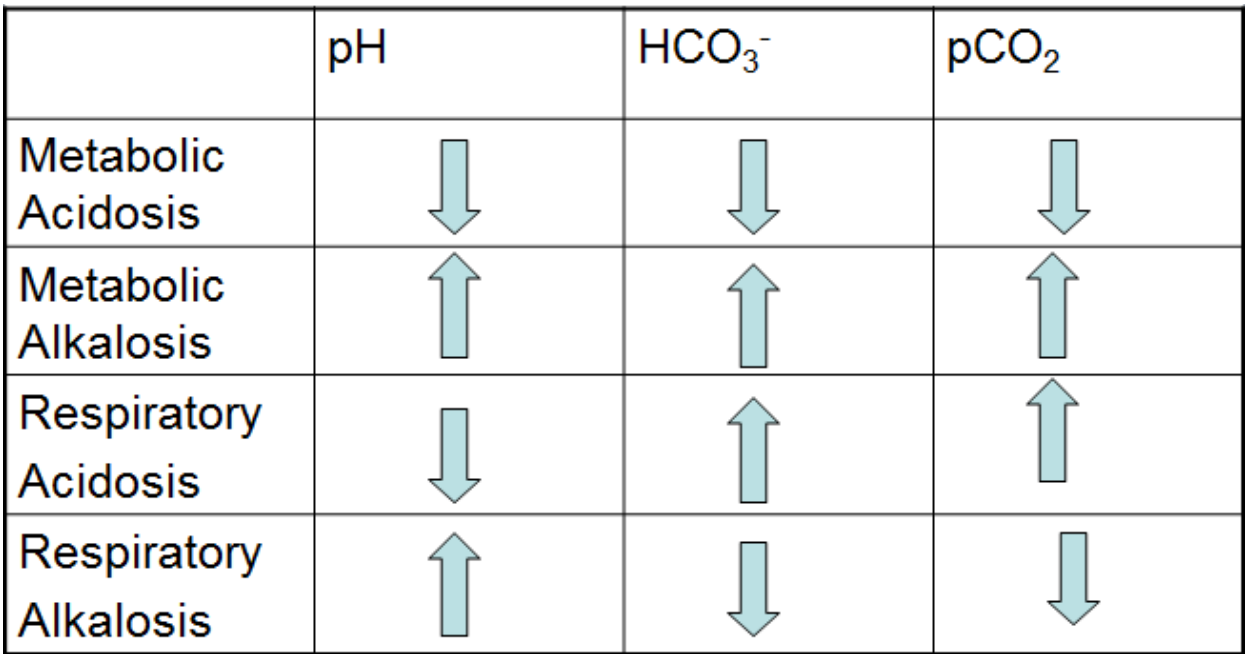
Medicalc 2

Sunday, May 20, 2012
10:42 PM

- **Acid Base Compensation**
  - Explanation
    - Acid base disturbances must be tackled on two levels. First it must be decided which is the primary disturbance, second you check the compensation of that disturbance which may then reveal a secondary acid/base disturbance. To find the primary acid bace imbalance use the table below.
    - 

    - **Acute Respiratory Acidosis (Chronic Respiratory Acidosis = COPD/restrictive lung dz): any hypoventilation state**
      - CNS Depression (drugs/CVA)
      - Airway Obstruction
      - Pneumonia
      - Pulmonary Edema
      - Hemo/Pneumothorax
      - Myopathy
    - **Metabolic Alkalosis: CLEVER PD**
      - Contraction
      - Licorice
      - Endo: (Conn's, Cushings, Bartter's)
      - Vomiting
      - Excess Alkali
      - Refeeding Alkalosis
    - **Respiratory Alkalosis: CHAMPS (think speed up breathing)**
      - CNS disease
      - Hypoxia
      - Anxiety
      - Mech Ventilators
      - Progesterone
      - Salicylates/Sepsis
  - Calculations
    - Respiratory Acidosis

        - Acute
            - $expected\ [HCO_3] = 24 + \left(\frac{(actual\ pCO_2\ - 40)}{10}\right)$
        - Chronic
            - $expected\ [HCO_3] = 24 + 4\left(\frac{(actual\ pCO_2\ - 40)}{10}\right)$
        - Explanation
            - If the actual [HCO_3] is higher or lower than the expected value, there may be an underlying metabolic alkalosis or acidosis respectively
    - Respiratory Alkalosis
        - Acute
            - $expected\ [HCO_3] = 24\ - 2\left(\frac{(40\ - actual\ pCO_2)}{10}\right)$
            - Explanation
                - The acute physiological change rarely results in [HCO_3] of less than about 18. An [HCO_3] of <18 indicates a coexisting metabolic acidosis.
        - Chronic
            - $expected\ [HCO_3] = 24\ - 5\left(\frac{(40\ - actual\ pCO_2)}{10}\right)$
            - Range is +/- 2
            - Explanation
                - Maximal renal compensation takes 2-3 days.
                - The Limit of compensation is a [HCO_3] of about 12-15.
    - Metabolic Acidosis
        - $expected\ pCO_2 = 1.5([HCO_3]) + 8$
        - Range +/- 2
        - Explanation
            - Maximal compensation may take 12-24 hrs to reach
            - Limit of compensation is a pCO_2 of about 10 mmHg
            - If the actual pCO_2 is higher or lower than the expected pCO_2 there may be a respiratory acidosis or alkalosis (respectively) as well
    - Metabolic Alkalosis
        - $expected\ pCO_2 = 0.7([HCO_3]) + 20$
        - Range +/- 5
- Notes
    - There will be 4 segments
        - Respiratory acidosis
        - Respiratory alkalosis
        - Metabolic acidosis
        - Metabolic alkalosis
    - The two respiratory segments will have one entry for the pCO_2 and will need to spit out both calculations
    - The metabolic segments will only need one entry for the HCO_3 and will just use the one calculation
    - Once the calculations are done it needs to flash up the range (if one is associated) and explanation along with the answer

- **Anion Gap**
    - Explanation
        - The calculated estimated difference between the measured anions and cations in serum. Common cations include Na, K, Ca and Mg.

Common anions are Cl, Bicarb, and phosphate. Anion gap is used to help identify cause of metabolic acidosis. Increased anion gap acidosis indicates MUDPILERS etiology, while non-anion gap acidosis indicates HARDUPS etiology. Normal anion gap is generally regarded as <11 mEq/L. A low anion gap is commonly brought about by hypoalbuminemia.

- **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
  - Renal Tubular Acidosis
  - Diarrhea
  - Uretero-Pelvic Shunt
  - Post-Hypocapnia
  - Spironolactone

- Calculation
  - $([Na^+] + [K^+]) - ([Cl^-] + [HCO_3{}^-]) =$
  - Answer is in (mEq/L)
- Notes
  - Usually the K is left out of the calculation so if we could do your add as you go feature that would be great.
  - I was thinking maybe just a box for input for each electrolyte value

- **Calcium/albumin correction**
  - Explanation
    - Calculation is used when the patient albumin levels are abnormal. Used to make up for the change in total calcium due to altered albumin binding. The calculation gives an estimate of what the calcium level would be if the albumin levels were normal. When the patient has decreased albumin, the corrected calcium level will be higher than the total calcium.
    - Normal Ca levels = 8.5 - 10.5 mg/dL
  - Calculation
    - $[0.8 + (4 - [albumin])] + [Ca^{2+}]$
    - Ca in mg/dL
    - Albumin in g/dL
    - Normal albumin is set at 4 g/dL
  - Notes
    - Maybe display the calculation and have a rolling number wheel for the albumin value that starts at 4 and one for Ca that starts at 9.5
      - The wheel would need to be calibrated for tenths of a number….
        - 1.1, 1.2, 1.3, 1.4, 1.5, etc.
    - Again, your rolling calculations are cool
- **Cockcroft-Gault Eqn**
  - Explanation
    - Used to estimate creatinine clearance which is used to estimate GFR

in ml/min. Glomerular filtration rate (GFR) is the volume of fluid filtered from the glomerular capillaries into the bowman's capsule typically given at a per minute rate.

- Calculation
  - $$\frac{(140 - age) * (mass\ in\ kg) * (0.85\ if\ female)}{72\ * [creat\left(\frac{mg}{dL}\right)]}$$
- Notes
  - Might be easiest as just data entry boxes and maybe a check-box for if female

- **Corticosteroid converter**
  - Explanation
    - Used to correlate changing from one corticosteroid to another based on anti-inflammatory potencies. The table below shows the values used to calculate doses. Biological half life is used to more accurately reflect the duration of action in vivo of the corticosteroid. Fludrocortisone is typically used for it's mineralcorticoid action and has negligible anti-inflammatory effects at therapeutic doses.
      - Short bio-half life = 8-12 hours
      - Intermediate bio-half life = 12-36 hours
      - Long bio-half life = 36-72 hours
  - Calculation
    - For Cortisone
      -
      -

Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	1 mg	0.8	0.8	Short
Hydrocortisone	0.8 mg	1	1	Short
Prednisone	0.2 mg	4	0.6	Intermediate
Prednisolone	0.2 mg	4	0.6	Intermediate
Triamcinolone	0.16 mg	5	0	Intermediate
Methylprednisolone	0.16 mg	5	0.25	Intermediate
Betamethasone	0.03 mg	25	0	Long
Dexamethasone	0.03 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

    - For hydrocortisone

Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	1.25 mg	0.8	0.8	Short
Hydrocortisone	1 mg	1	1	Short
Prednisone	0.25 mg	4	0.6	Intermediate
Prednisolone	0.25 mg	4	0.6	Intermediate
Triamcinolone	0.2 mg	5	0	Intermediate
Methylprednisolone	0.2 mg	5	0.25	Intermediate
Betamethasone	0.04 mg	25	0	Long
Dexamethasone	0.04 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

- For Prednisone

Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	5 mg	0.8	0.8	Short
Hydrocortisone	4 mg	1	1	Short
Prednisone	1 mg	4	0.6	Intermediate
Prednisolone	1 mg	4	0.6	Intermediate
Triamcinolone	0.8 mg	5	0	Intermediate
Methylprednisolone	0.8 mg	5	0.25	Intermediate
Betamethasone	0.16 mg	25	0	Long
Dexamethasone	0.16 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

- For Prednisolone

Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	5 mg	0.8	0.8	Short
Hydrocortisone	4 mg	1	1	Short
Prednisone	1 mg	4	0.6	Intermediate
Prednisolone	1 mg	4	0.6	Intermediate
Triamcinolone	0.8 mg	5	0	Intermediate
Methylprednisolone	0.8 mg	5	0.25	Intermediate
Betamethasone	0.16 mg	25	0	Long
Dexamethasone	0.16 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

- For Triamcinolone

Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	6 mg	0.8	0.8	Short
Hydrocortisone	5 mg	1	1	Short
Prednisone	1.25 mg	4	0.6	Intermediate
Prednisolone	1.25 mg	4	0.6	Intermediate
Triamcinolone	1 mg	5	0	Intermediate
Methylprednisolone	1 mg	5	0.25	Intermediate
Betamethasone	0.2 mg	25	0	Long
Dexamethasone	0.2 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

- For Methylprednisolone

Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	6 mg	0.8	0.8	Short
Hydrocortisone	5 mg	1	1	Short
Prednisone	1.25 mg	4	0.6	Intermediate
Prednisolone	1.25 mg	4	0.6	Intermediate
Triamcinolone	1 mg	5	0	Intermediate
Methylprednisolone	1 mg	5	0.25	Intermediate
Betamethasone	0.2 mg	25	0	Long
Dexamethasone	0.2 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

- For Betamethasone

Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	31 mg	0.8	0.8	Short
Hydrocortisone	25 mg	1	1	Short
Prednisone	6 mg	4	0.6	Intermediate
Prednisolone	6 mg	4	0.6	Intermediate
Triamcinolone	5 mg	5	0	Intermediate
Methylprednisolone	5 mg	5	0.25	Intermediate
Betamethasone	1 mg	25	0	Long
Dexamethasone	1 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

- For Dexamethasone

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Compound	Equivalent Dose	Anti-inflammatory Potency	Mineralocorticoid Potency	Biological Half-life
Cortisone	31 mg	0.8	0.8	Short
Hydrocortisone	25 mg	1	1	Short
Prednisone	6 mg	4	0.6	Intermediate
Prednisolone	6 mg	4	0.6	Intermediate
Triamcinolone	5 mg	5	0	Intermediate
Methylprednisolone	5 mg	5	0.25	Intermediate
Betamethasone	1 mg	25	0	Long
Dexamethasone	1 mg	25	0	Long
Fludrocortisone	-	0	125	Intermediate

- Notes
  - First off, the calculation is The current dose times whatever value is in the equivalent dose column for the drug…
    - SO , if the patient is currently on dexamethasone and wants to switch to Cortisone then we would take the current dose of dexamethasone (from a data entry box) and multiply it times the cortisone value from the dexamethasone table equivalent dose column…. Get it?
  - I'll also need you to photoshop out those question marks from each table
  - Visually, I was thinking about having a data entry box in-between two pop-down lists of drugs….
    - The top pop-down list is the drug that the patient is currently on and thus the data entry box will be associated with that top drug. This top pop-down list will also dictate which table we will be making our calculations from.
    - The bottom pop-down list is the desired new drug, and will dictate which value from the upper drug's equivalent dose column we will multiply the current dose by.
  - If we could have a list of links to jpegs (or something) of the tables listed on the explanation page that would be great… so that when you click on "conversion chart for cortisone" it will take you to a big picture of the table I listed above as "For cortisone".
  - This one is kind of confusing so call me for clarification