Medicalc Calculations

Thursday, April 05, 2012
10:33 AM

- GFR
  - MDRD equation
    - MDRD equation explanation
      - From the Modification of Diet in Renal Disease study, is used to estimate glomerular filtration rate or the flow rate of filtered fluid through the kidney. Will underestimate GFR in patients with GFR >60 mL/min.
  - MDRD equation
    - $GFR\left(\frac{\frac{mL}{min}}{1.73m^2}\right) = 186(plasma\ creatinine)^{-1.154} \times (age)^{-0.203} \times (0.742\ if\ female) \times (1.210\ if\ African\ American)$
    - GFR is expressed in mL/min/1.73m^2
  - Notes
    - Need input for plasma creatinine, and age
    - Need check box for african american and female
- A-a gradient
  - Explanation
    - Predicts the degree of shunting in the lungs by comparing the partial pressure of O_2 in the alveoli to the partial pressure of O_2 in the arterial blood. The difference between the two partial pressures indicates how well the oxygen is moving form the alveoli into the blood.
  - Calculation
    - $((713)FiO_2 - \frac{PaCO_2}{0.8})) - PaO_2 = A - a\ gradient$
    - A-a gradient is expressed in mmHg
  - Notes
    - Need input for FiO_2, PaO_2, PCO_2
    - Display results in mmHg
- Reference ranges
  - Notes
    - This is just a list of normal value ranges to be used as a jumpable list
    - If we could make it searchable that would be even better
    - Call me when you're doing this one and I'll let you know which ones we need to put in
- BMI
  - criteria
  - Explanation
    - Used for adults over 20 years old, used to indicate weight status and correlates with body fat. May overestimate BMI in athletes and those with muscular build. May underestimate in the elderly and in those who have lost muscle mass.

BMI	Weight status
<18.5	Underweight
18.5-24.9	Normal
25.0-29.9	Overweight
≥30.0	Obese

  - Calculation
    - $BMI = \frac{(lbs)703}{(height\ in\ inches)^2}$
  - Notes
    - I put the BMI picture in the image resources folder
    - Lets have the calculator on the front page along with the above table
    - Put the BMI graph picture on the explanation page
- APGAR
  - Explanation
    - Used to grade newborn babies on 5 criteria on a scale of 0-2. Performed at one and five minutes after birth. If the score is low, it may be repeated at 10, 15 and 30 minutes as well. Scores are summed and the total score is evaluated. 3 and below is considered critically low, 4-6 is low, 7-10 is normal.

	Score of 0	Score of 1	Score of 2	Aspect evaluated
Appearance	Blue or pale all over	Blue at extremities, body pink	No cyanosis, body and extremities pink	Skin color/complexion
Pulse	Absent	<100	≥100	Pulse rate
Grimace	No response to stimulation	Grimace/feeble cry when stimulated	Cry or pull away when stimulated	Reflex irritability
Activity	None	Some flexion	Flexed arms and legs that resist extension	Muscle tone
Respiration	Absent	Weak, irregular, gasping	Strong, lusty cry	Breathing

- Notes
  - Lets set it up by pneumonic… APGAR… Under each heading lets have a check box next to the description and then assign the proper 0-1-2 score to that check box. Add it all up and give total at the end
  - If there is a way that we can make the boxes for each section mutually exclusive so that only one box per APGAR section can be selected that would be great.
  - Lets also include the above table on the explanation page.

- ABCD2 score
  - Explanation
    - When a patient experiences a Transient Ischemic Attack (TIA) the $ABCD^2$ score is used to determine the risk for stroke within the first two days post attack. The $ABCD^2$ score is graded on 5 criteria: clinical features, age, duration of TIA, blood pressure, and presence of diabetes. The evaluation is added up and the score ranges from 0-7: 0-3 is low (2 day risk = 1.0%, 7 day risk = 1.2), 4-5 is moderate (2 day risk = 4.1%, 7 day risk = 5.9%), 6-7 is high (2 day risk = 8.1%, 7 day risk = 11.7%).

	Age	Blood pressure	Clinical features	Duration	Diabetes
0 points	<60 years old	Normal	Other than those specified	Less than 10 minutes	No diabetes
1 point	≥60 years old	Elevated ≥140/90	Speech disturbance without weakness	10-59 minutes	Diabetes present
2 points			Unilateral (one sided) weakness	≥60 minutes	

  - Notes
    - A set-up similar to the APGAR check boxes and mutually exclusive selections within the same category and all...

- 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.

	pH	HCO_3^-	pCO_2
Metabolic Acidosis	↓	↓	↓
Metabolic Alkalosis	↑	↑	↑
Respiratory Acidosis	↓	↑	↑
Respiratory Alkalosis	↑	↓	↓

  - 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
                - □ $expected\ pCO_2 = 1.5(\lfloor HCO_3 \rfloor) + 8$
                - □ 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
                - □ $expected\ pCO_2 = 0.7(\lfloor HCO_3 \rfloor) + 20$
                - □ 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
- Calcium/albumin correction
- Cockcroft-Gault Eqn
- Corticosteroid converter
- Fraction excreted Na or Urea
- Free water deficit
- Glasgow coma scale
- Lights criteria
- Maddrey's discriminant fx
- Mean arterial pressure
- MELD score
- Opioid converter
- QT correction
- Ransons criteria
- Osmolality
- Na hyperglycemia correction
- Hyponatremia correction
- Body surface area
- Conversions
- Osmolarity