NURS 428

Math Competency Review
Common Errors

- LEAVING BLANKS!!
- Rounding errors
- Incorrect conversions:
  - lb $\rightarrow$ kg
  - g $\rightarrow$ mg $\rightarrow$ mcg
- Omitted:
  - Unit of measure
  - Dose range
- Incorrect unit of measure
- IV components/percentage strength
- Misread labels
- IV rate miscalculations
- Safe dose range
Directions state:
- Round doses to the nearest tenth unless otherwise noted.
- Round flow rates (mL/hr) to the nearest whole number.
- Pounds to kilograms.
  - The answer is rounded to the nearest tenth (*Calc. With Confidence* pg. 99).
  - *This occurs on the conversion*, not at the end of the entire equation.
Conversions

- $1 \text{ kg} = 2.2 \text{ lb}$
- $1000 \text{ mcg} = 1 \text{ mg}$
- $1000 \text{ mg} = 1 \text{ g}$
**Omissions**

- **Unit of measure**
  - Directions state: Make sure the unit of measure accompanies each answer

- **Dose range**
  - Weight based dosing question(s) may ask for a dose range
  - Answers including only one dose are incorrect
Incorrect unit of measure

- Incorrect unit of measure given in the answer:
  - mcg instead of mg
  - mg instead of mL
- Unit of measure that is cancelled out left in answer
  - When determining mg/kg/day, mcg/kg/day, etc the kg cancels when you multiply to determine dose
    - e.g.: $9 \text{ mg/kg/day} \times 55 \text{ kg} = 495 \text{ mg/day}$
IV components/strength

- Question may ask define the components and strength of an IV solution
  - D\textsubscript{51}/\textsubscript{4}NS: 5% dextrose and 0.225% normal saline
  - D\textsubscript{51}/\textsubscript{2}NS 10 mEq KCL: 5% dextrose, 0.45% normal saline and 10 mEq potassium chloride
  - D\textsubscript{10}W: 10% dextrose in water
- See pages 433-435 in *Calculate with Confidence*
Concentration may be given:

- Prior to reconstitution and/or after reconstitution
  - If given only prior to reconstitution – use this number
  - If given both prior to and after reconstitution – use the after reconstitution number
CEFAZOLIN
for Injection, USP
Equivalent to 500 mg of cefazolin activity
For IM or IV Use

Sterile, Nonpyrogenic, Preservative-free
PREPARATION OF SOLUTION:
For IM Use - Add 2 mL Sterile Water for Injection, SHAKE WELL. Resulting solution provides an approximate volume of 2.2 mL (225 mg per mL). For IV Use - See insert. Discard unused solution 24 hours after reconstitution if stored at room temperature or within 10 days if stored under refrigeration, 5°C (41°F). Each vial contains cefazolin sodium equivalent to 500 mg cefazolin. The total sodium content is approximately 24 mg (1.05 mEq sodium ion) per 500 mg of cefazolin.

USUAL DOSAGE: 250 mg to 1 g every six to eight hours. See insert. See package insert for detailed indications, IM or IV dosage and precautions.

Prior to reconstitution: Store at 20° to 25°C (68° to 77°F). [See USP Controlled Room Temperature.]

PROTECT FROM LIGHT.

Mfd. for SAGENT Pharmaceuticals
Schaumburg, IL 60195
Made in USA
IV rate

- Total infusion time should be given in hours/minutes
  - 300 mL at 50 mL/hr = 6 hours
  - 2,000 mL at 60 mL/hr = 33.3 hours or 33 hours 20 minutes
- Flow rate should be given in mL/hr
  - mL ÷ time in hours
    - 375 mL in 3 hours = $375 ÷ 3 = 125$ mL/hr
    - 50 mL in 15 minutes = $50 ÷ 0.25 = 200$ mL/hr
    - Alternatively: \[ \frac{50 \text{ mL}}{15 \text{ min}} = \frac{x}{60 \text{ min}} \]
Safe dose range

- If the questions states: 7-9 mcg/kg/day in 3 divided doses (or q 8 hours) and you are asked to provide the safe 24-hr dose range, the “3 divided doses” piece **does not matter**
  - Ex: 32 kg pt:
    Dose range = 224 to 288 mcg/day *not* 74.7 to 96 mcg/day

- Safe means within range!
  - Exceeds range = too high/toxic
  - Lower than range = not high enough for therapeutic effects/subtherapeutic
Examples

750 mL LR at 80 mL/hr

- Determine infusion time
  \[ 750 \text{ mL} \div 80 \text{ mL/hr} = 9.38 \text{ hr} \]
  \[ 60 \text{ min} \times 0.38 \text{ hr} = 22.8 = 23 \text{ min} \]
  Infusion time: 9 hr 23 min

- IV was started at 0700, when will it be complete?
  4:23 PM; 1623
Examples

Clindamycin 600 mg in 100 mL D5W over 1 ½ hours

\[
100\text{mL} \div 1.5\text{ hours} = 66.666666 = 67\text{ mL/hr}
\]

OR

\[
\frac{100\text{ mL}}{90\text{ min}} = \frac{x}{60\text{ min}} = 66.666666 = 67\text{ mL/hr}
\]
Examples

Order: 2,000 units/hr IV heparin
Available: 20,000 units in 500 mL D5W
How many milliliters will infuse per hour?

\[
\frac{20,000 \text{ units}}{500 \text{ mL}} = 40 \text{ units/mL}
\]

\[
\frac{2,000 \text{ units/hr}}{40 \text{ units/mL}} = 50 \text{ mL/hr}
\]
A client weighs 162 lb. Heparin infusion 25,000 units in 1,000 mL.

- **Bolus with 90 units/kg**
  
  \[
  162 \text{ lb} \div 2.2 = 73.636363 = 73.6 \text{ kg}
  \]

  \[
  90 \text{ units/kg} \times 73.6 \text{ kg} = 6,624 \text{ units}
  \]

- **Initiate gtt at 20 units/kg/hr**
  
  \[
  20 \text{ units/kg/hr} \times 73.6 \text{ kg} = 1,472 \text{ units/hr}
  \]

  \[
  \frac{1,000 \text{ mL}}{25,000 \text{ units}} \times \frac{1,472 \text{ units/hr}}{1,472 \text{ units/hr}} = 58.88 \text{ mL/hr} = 59 \text{ mL/hr}
  \]
Examples

Dobutamine 2 mcg/kg/min for a pt who weighs 193 lb. Available: dobutamine 250 mg in 250 mL.
Calculate the rate in mL required to infuse 2 mcg/kg/min

\[
193 \text{ lb} \div 2.2 = 87.727272 \text{ kg} = 87.7 \text{ kg}
\]

\[
2 \text{ mcg/kg/min} \times 87.7 \text{ kg} = 175.4 \text{ mcg/min}
\]

\[
175.4 \text{ mcg/min} \times 60 = 10,524 \text{ mcg/hr}
\]

\[
10,524 \text{ mcg/hr} \div 1,000 = 10.524 \text{ mg/hr}
\]

\[
\frac{250 \text{ mg}}{10.524 \text{ mg/hr}} = 10.524 \text{ mL/hr} = 11 \text{ mL/hr}
\]

\[
250 \text{ mL} \times \]
The recommended dosage of Mezlin for an adult with serious infection is 0.2 to 0.3 g/kg/day given in 4 to 6 divided doses. The patient weighs 175 lbs. The provider orders 3.5 g q 6 hours.

- What is the 24-hour safe dosage range for this patient?

\[
\text{Safe range} = 0.2 \text{ g/kg/d} \times 79.5 \text{ kg} = 15.9 \text{ g/day} \\
0.3 \text{ g/kg/d} \times 79.5 \text{ kg} = 23.85 = 23.9 \text{ g/day}
\]

- Is this patient’s dose safe? Why?

\[
3.5 \text{ g} \times 4 \text{ doses} = 14 \text{ g/day}
\]

No – this dose is below therapeutic level and therefore is not safe.