

Med Exam – things to remember

- Read the question carefully. What is the question asking?
- Identify if the patient's weight is given in kilograms.
- Generally pediatric medications are based on kilograms. Convert pounds to kilograms if needed.
- PO, IV, etc. all have recommended dose ranges.
- Remember the drop (gtt) factor for electronic pumps is 60. You will always use 60 to determine your rate unless otherwise indicated in a question.
- Concentration = the amount of medication per milliliter of fluid administered IV. Usually this concentration is in milligrams per milliliter but may be in units, micrograms, etc. per milliliter.
- Exam questions may be fill in the blank as well as multiple choice.
- Conversions (Ex. mL-Tsp, Mg-mcg, etc) – HESI Dosage Calculation Module 2 Recommended

Dilution / Concentration

- The Concept
 - The Amount Of A Substance In A Mixture Or Solution
- Ultimately, We Need To Know How Much Medicine Is Mixed In One Milliliter Of Fluid
 - Milligrams
 - Units
 - Mg PE (Phenytoin Equivalents)



Summary: Calculating Dilution/Concentration

What You Need

- Medication Reference
- Prescribed Medication

Calculate the Concentration

- Divide The Medicine By The Fluid
- Compare With The Recommended Concentration

Analyze

- Is The Medication Diluted Appropriately?
- Administer If All Other Aspects Of The Medication Are Correct
- Is The Medication Too Strong? Too Many Milligrams Per Milliliter Of Fluid?
- Contact The Pharmacist

Must, May, & Concentration

- The Recommended Dilution / Concentration For A Medication Can Be Found In *Intravenous Medications* By Gahart & Nazareno - Under The Heading **DILUTION**
- Watch For Key Words
 - **May** Be Further Diluted
 - **Must** Be Further Diluted
 - **Concentration** Of
 - **Final Concentration** Of



Must Be

- “A Single Dose **Must** Be Further Diluted With 50 to 100 mL Of The Same Solution And Be Given As An Intermittent Infusion.”
 - Important Information For The Nurse Administering The Medication
 - Is The Patient’s IVPB Mixed In 50 to 100 mL?
 - If Yes, Great!
 - What If...The Patient’s Ceftriaxone Is Mixed In 10 mL?
 - What Does The Prudent Nurse Do At This Point?

Concentrations Of

- Look For The Words “Concentrations Of” Or “Final Concentration” In The Medication Reference
- “**Concentrations Of** 10 mg/mL To 40 mg/mL Are Recommended For Intermittent Infusion.”
 - Important Information For The Nurse Administering The Medication

The Next Step

- The Next Step Is To Calculate The Concentration Of The Medication Received From The Pharmacy
 - Divide The Medication By The Fluid
 - 100 mg of Ceftriaxone Is Mixed In 10 mL Of Normal Saline

$$\frac{100 \text{ mg}}{10 \text{ mL}} = 10 \text{ mg of ceftriaxone in each mL}$$

- Compare With The Recommended Concentration
- “Concentrations Of” Directions Take Precedence Over “Must” Directions



Practice Problem #1

The IVPB you are to administer contains 350 mg of ceftriaxone mixed in 25 mL of Normal Saline.

The recommended range is 10mg to 40 mg per mL.

Does the dilution fall in the recommended range?

$$\frac{350}{25} = 14 \text{ mg/mL}$$

yes!

Practice Problem #2

Medication: Ranitidine 18 mg

Mixed in: 10 mL normal saline

What is the concentration of this medication?

$$\frac{18 \text{ mg}}{10 \text{ mL}} = 1.8 \text{ mg/mL}$$

$$1.8 \text{ mg/mL}$$

Recommended Range

Recommended Dose Consists Of:

- Age Or Age Range Of Patient
- Dose
 - The Recommended Dose For Adults Is Usually Expressed In A Stated Dose
 - “1 to 2 Gm”
 - The Recommended Dose For Children Is Usually Based On The Child’s Weight
 - “50 to 75 mg/kg”
- Frequency of Dose
 - How Often The Dose Can Be Administered

Practice Problem #3

The pediatric dose for piperacillin sodium is 200 mg to 300 mg/kg/24 hours in equally divided doses every 4 to 6 hours. The patient weighs 30 kg. Which of the following is within the recommended range?

$$200 \text{ mg} \times 30 \text{ kg} = 6,000 \text{ mg}$$
$$300 \text{ mg} \times 30 \text{ kg} = 9,000 \text{ mg}$$

$$\begin{array}{l} 200 \text{ mg} - \text{Every } 6 \text{ hrs} \\ 1 - 1,500 \text{ mg} \\ 2 - 1,500 \text{ mg} \\ 3 - 1,500 \text{ mg} \\ \hline 4 - 1,500 \text{ mg} \\ \hline 6,000 \text{ mg} \end{array}$$

$$\begin{array}{l} \text{Every } 4 \text{ hrs} \\ 1 - 1,000 \text{ mg} \quad 4 - 1,000 \text{ mg} \\ 2 - 1,000 \text{ mg} \quad 5 - 1,000 \text{ mg} \\ 3 - 1,000 \text{ mg} \quad 6 - 1,000 \text{ mg} \\ \hline 6,000 \text{ mg} \end{array}$$

$$\begin{array}{l} 300 \text{ mg} \\ 1 - 2,250 \text{ mg} \\ 2 - 2,250 \text{ mg} \\ 3 - 2,250 \text{ mg} \\ \hline 4 - 2,250 \text{ mg} \\ \hline 9,000 \text{ mg} \end{array}$$

$$\begin{array}{l} 1 - 1,500 \text{ mg} \quad 4 - 1,500 \text{ mg} \\ 2 - 1,500 \text{ mg} \quad 5 - 1,500 \text{ mg} \\ 3 - 1,500 \text{ mg} \quad 6 - 1,500 \text{ mg} \\ \hline 9,000 \text{ mg} \end{array}$$

- A. 2,000 mg every 4 hours
- B. 1,200 mg every 4 hours**
- C. 1,450 mg every 6 hours
- D. 6,000 mg every 6 hours

B. 1,200 mg every 4 hours

Practice Problem #4

Calculation based on once a day dose.

Patient:

20 kg, 5-year-old

Prescribed Medication: 1,000 mg of ceftriaxone daily

Medication Reference

Recommended Dose: 50 to 75 mg/kg of body weight in 24 hours as a single dose or in equally divided doses every 12 hours. Do not exceed a total dose of 2 gm in 24 hours.

$$\begin{aligned} 20\text{kg} \times 50\text{mg} &= 1,000\text{mg}/\text{kg} \\ 20\text{kg} \times 75\text{mg} &= 1,500\text{mg}/\text{kg} \end{aligned}$$

Is the prescribed medication in the recommended range?

yes!

Practice Problem #5

Calculation based on BID dose.

Patient: 20 kg, 5-year-old

Prescribed Medication: 700 mg of ceftriaxone, **BID.**

$$700 \text{ mg} \times 2 = 1,400 \text{ mg}$$

Medication Reference

Recommended Dose: 50 to 75 mg/kg of body weight in 24 hours as a single dose or in equally divided doses every 12 hours. Do not exceed a total dose of 2 gm in 24 hours.

$$\begin{aligned} 20 \text{ kg} \times 50 \text{ mg} &= 1,000 \text{ mg/kg} \\ 20 \text{ kg} \times 75 \text{ mg} &= 1,500 \text{ mg/kg} \end{aligned}$$

Is the prescribed medication in the recommended range?

yes!

Practice Problem #6

Which of the following is a recommended dose for a 30 kg child? The medication is vancomycin (Vancocin).

Medication Reference

Recommended Dose for Pediatric Patient: 40
mg/kg/24 hours equally divided and given every 6, 8, or 12 hours. Do not exceed 2 gm in 24 hours.

$$30\text{kg} \times 40\text{mg} = 1,200\text{mg/kg per 24 hours}$$

Every 6 hours

$$\begin{array}{r} 1 - 300\text{ mg} \\ 2 - 300\text{ mg} \\ 3 - 300\text{ mg} \\ 4 - 300\text{ mg} \\ \hline 1,200\text{ mg} \end{array}$$

Every 8 hours

$$\begin{array}{r} 1 - 400\text{ mg} \\ 2 - 400\text{ mg} \\ 3 - 400\text{ mg} \\ \hline 1,200\text{ mg} \end{array}$$

- A. 200 mg every 6 hours
- B. 400 mg every 8 hours**
- C. 100 mg every 12 hours
- D. 1,200 mg every 24 hours

B. 400mg every 8 hours

A Review - Tubing Drop Factor

- Microdrip Infusion Set
 - 60 Drops (gtts) = 1 mL
 - 60 Minutes = 1 Hour, Therefore
 - $\text{gtts/minute} = \text{mL/hr}$
- IV Pumps Are Microdrip
- Macro drip Infusion Set Drop Factor Will Vary.
Check The Package!

$$\frac{\text{VOLUME TO BE INFUSED X TUBING DROP FACTOR}}{\text{INFUSION TIME IN MINUTES}} = \text{DROPS/MINUTE}$$

For A Microdrip System: Drops/Minute = mL/Hour

Memorize

Practice Problem #7

- What Is The Recommended Rate Of Administration For A 25 mL IVPB To Be Given Over 30 Minutes?
- The IVPB Will Be Administered By IV Pump

$$\frac{25 \text{ mL}}{30 \text{ min}} \times 60 \text{ gtt} = 50 \text{ gtt/min}$$

50 gtt/min
50 mL/hr

Practice Problem #8

1. **Patient:** A 6.5 kg, toddler, with the diagnosis of acute otitis media.

Prescribed Medication: Administer 275 mg amoxicillin (Amoxil) every 12 hours

Medication Reference

Recommended Dose: Acute otitis media: 80 to 90 mg/kg/day divided every 12 hours

$$6.5 \text{ kg} \times 80 = 520 \div 2 = 260$$
$$6.5 \text{ kg} \times 90 = 585 \div 2 = 292.5$$

Concentration of Suspension: Amoxicillin suspension 250mg / 5 ml

The recommended range is 260 mg to 292.5 mg every 12 hours.

The nurse will administer 5.5 ml of amoxicillin every 12 hours

$$\frac{250}{5} = 50 \rightarrow \frac{275}{50} = 5.5$$

Practice Problem #9

2. Patient:

15 kg, 3-year-old

Prescribed Medication: Administer 1.1 grams of ceftriaxone (Rocephin), IV every 12 hours

$$1,100 \text{ mg} \times 2 = 2,200 \text{ mg every 24 hours}$$

Medication Reference
Recommended Dose:

50 to 75 mg/kg of body weight/24 hr as a single dose or in equally divided doses every 12 hours (25 to 27.5 mg/kg every 12 hours). Do not exceed a total dose of 2 gm/24 hours

$$\begin{aligned} 50 \text{ mg} \times 15 \text{ Kg} &= 750 \text{ mg/Kg} \\ 75 \text{ mg} \times 15 \text{ Kg} &= 1,150 \text{ mg/Kg} \end{aligned} \quad \left. \vphantom{\begin{aligned} 50 \text{ mg} \times 15 \text{ Kg} \\ 75 \text{ mg} \times 15 \text{ Kg} \end{aligned}} \right\} 24 \text{ hours}$$

The nurse would

- A. administer the medication.
- B. contact the primary care provider regarding a dose below the recommended range.
- C. contact the primary care provider regarding a dose exceeding the recommended range.

Practice Problem #10

3. Patient: 16 kg child

Prescribed Medication: 640 mg meropenem (Merrem), IVPB every 8 hours

Label on IVPB: Meropenem 640 mg in 25 ml normal saline.

Medication Reference

Recommended Dose: 40 mg/kg every 8 hours

Dilution/Concentration: 2.5 to 50 mg/ml

Rate of Administration: Intermittent infusion may be given over 15 to 30 minutes by IV pump

$$\frac{25}{50} \times 60 = 50 \text{ mL/hr}$$

The prudent nurse will

- A. administer the medication at 50 ml/hr.
- B. administer the medication at 125 ml/hr.
- C. contact the pharmacist regarding the concentration.
- D. contact the primary care provider regarding the ordered dose.

Practice Problem #11

Prescribed medication: Gentamycin sulfate 10 mg mixed in 50 mL normal saline every 8 hours.

Rate of Administration: Administer each dose over a minimum of 20 minutes or a maximum of 30 minutes.

The most appropriate rate for the nurse to set the IV pump is how many milliliters per hour?

$$\frac{50 \text{ mL}}{30 \text{ min}} \times 60 \text{ min} = \boxed{100 \text{ mL/hr}}$$

A. 50

B. 75

C. 100

D. 160