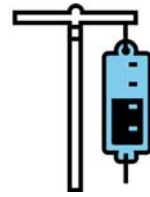


Critical Care Calculations Study Guide



Example #1

Your 65 kg patient has dopamine ordered at 6 mcg/kg/min. The IV has 400 mg of dopamine in 250 mL. What IV rate is correct?

1. Always determine the dose of medication per mL (Drug Concentration)

$$\frac{400 \text{ mg dopamine}}{250 \text{ mL fluid}} = 1.6 \text{ mg dopamine/mL fluid}$$

2. Do you need to convert your dose from mg to mcg? mcg to mg? grams to mcg?

$$1.6 \text{ mg} = 1600 \text{ mcg dopamine/mL fluid}$$

3. Use a streamlined equation where you only need 4 items:

- A. Ordered amount of drug
- B. Pt. weight (most of the time)
- C. Number of minutes in an hour (always the same!!)
- D. Dose/mL (calculated in #1)

$$\frac{\text{Ordered amount of drug} \times \text{pt's weight} \times 60 \text{ (minutes/hr)}}{\text{Drug concentration}}$$

$$\frac{6 \text{ (rate)} \times 65 \text{ (pt weight)} \times 60 \text{ (minutes/hr)}}{1600 \text{ (mcg dopamine/mL)}} = \frac{23400}{1600} = 14.6; \text{ round to 15; set rate at 15 mL/hour}$$

4. If the drug is not weight based, simply exclude the weight from the equation

Example #2

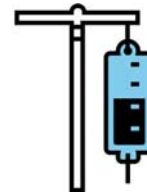
Your patient has a nitroprusside drip at 0.4 mcg/kg/min. The concentration is 50 mg nitroprusside in 250 mL fluid. The patient weighs 80 kg. What rate will you set the IV at?

Remember the equation

$$\frac{\text{Ordered amount of drug} \times \text{pt's weight} \times 60 \text{ (minutes/hr)}}{\text{Drug concentration}}$$

1. What is the dose/mL? (Drug Concentration) $50 \text{ mg}/250 \text{ mL} = 0.2 \text{ mg/mL}$
2. Do you need to convert from mg to mcg? YES! $0.2 \times 1000 = 200 \text{ mcg/mL}$
3. Input information into the equation:

$$\frac{0.4 \text{ (ordered amt of drug)} \times 80 \text{ (pt weight)} \times 60 \text{ (min/hr)}}{200 \text{ mcg/mL (dose)}} = 9.6 \text{ mL/hour; round to 10 mL/hour}$$



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$$\frac{\text{Ordered amount of drug} \times \text{pt's weight} \times 60 \text{ (minutes/hr)}}{\text{Drug concentration}}$$

Example #3

Lidocaine is ordered a 1 mg/min. Your IV has 2 grams of Lidocaine in 500 mL.
What rate will your IV run at?

1. Always begin by determining the amount of medication in each mL.

$$\frac{2 \text{ grams}}{500 \text{ mL}} = 0.004 \text{ gm/mL ;}$$

2. Do you need to convert your dose?

Multiply by 1000 to convert to mg = 4 mg/mL

3. Use your streamlined equation

$$\frac{\text{Ordered amount of drug} \times \text{pt's weight (NA in this example)} \times 60 \text{ (minutes/hr)}}{\text{Drug concentration}}$$

$$\frac{1 \text{ mg (ordered amount)} \times \text{weight (NA)} \times 60 \text{ (minutes/hour)}}{4 \text{ mg/ml (drug concentration)}} = 15 \text{ mL/hour}$$

What if you have the rate and need to calculate the dose:

Example #4

Your 70 kg patient has dopamine (400 mg in 250 mL) running at 26 mL/hour. How many mcg/kg/min is the patient receiving?

You can use your same formula

1. Determine the amount of medication per mL.

$$400/250 = 1.6 \text{ mg/mL}$$

2. Do you need to convert your dose?

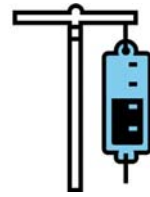
Yes 1.6 mg x 1000 = 1600 mcg)

3. Use your streamlined equation, but you will have an "X" to solve for

$$\frac{\text{"X"} \times (\text{Ordered amount of drug}) \times 70 \text{ (pt's weight)} \times 60 \text{ (minutes/hr)}}{1600 \text{ (Drug concentration)}} = 26$$

Solve for "X" by cross multiplying; $X = \frac{26 \times 1600}{70 \times 60} = \frac{41600}{4200} = 9.9$; round to 10 mcg/kg/min

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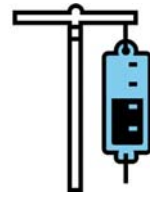


Work out the answers in the 10 sample questions below. The answers and formulas are on the following page. We encourage you to practice ALL the equations so that you are capable of correctly calculating IV medications seen in the ICU setting.

Practice Questions

1. Your patient has dobutamine ordered at 15 mcg/kg/min. the patient weighs 75 kg. The 250 mL IV bag has 500 mg of dobutamine in it. What rate will you set for your IV?
2. The order reads amiodarone 0.5 mg/min. You have 450 mg amiodarone in 250 mL fluid. What rate will you run your IV at?
3. Your patient is to receive nitroglycerine at 12mcg/min. Your IV bag has 50 mg of nitroglycerine in 250 mL. What rate will you set for your IV?
4. Your patient patient has a dobutamine IV drip running. The IV rate is 30 mL/hour. The IV bag has 500 mg of dobutamine in 250 mL of fluid. How many mcg/kg/min is your patient receiving?
5. Your patient is on a heparin drip with 20,000 units in a 250 mL bag of fluid. The order is to deliver heparin at 750 units per hour. What rate will you set for your IV? (**HINT: Since the rate is per hour, you will not have to multiply by 60 minutes!**)
6. Your patient has diltiazem ordered at 2 mg/hour. Your IV bag has 125 mg of medication in 500 mL. What rate will you set for your IV? (**HINT: Since the rate is per hour, you will not have to multiply by 60 minutes!**)
7. Your patient has vasopressin ordered at a rate of 0.2 units/min. Your IV bag has 200 units of vasopressin in a 500 mL bag. What rate will you set for your IV?
8. Your esmolol drip is running at 15 mL/hour. Your patient weighs 65 kg. The IV contains 2500 mg esmolol in 250 mL fluid. Your IV is running at how many mg/kg/min?
9. You have an order to run dopamine at 15 mcg/kg/min. Your IV bag has 500 mg dopamine in 500 mL. Your patient weighs 50 kg. What rate will you set for your IV?
10. You have an order to run nitroglycerine at 16 mcg/min. You have a solution of 50 mg of nitroglycerine in 250 mL fluid. What rate will you set for your IV?

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1. Your patient has dobutamine ordered at 15 mcg/kg/min. the patient weighs 75 kg. The 250 mL IV bag has 500 mg of dobutamine in it. You will run this at what rate?

Ordered amount of drug = 15 mcg/kg/min
Dose/mL (Drug concentration) = 500/250 = 2mg/mL
Convert to mcg = 2000 mcg/mL
Patient weight 75 kg

$$\frac{15 \text{ (Ordered amount of drug)} \times 75 \text{ (pt's weight)} \times 60 \text{ (min/hr)}}{2000 \text{ (Drug concentration)}} = 33.75 ; \text{ round to } 34 \text{ ml/hour}$$

2. The order reads amiodarone 0.5 mg/min. You have 450 mg amiodarone in 250 mL fluid. What rate will you run your IV at?

Ordered amount of drug = 0.5 mg/min
Dose/mL (Drug concentration) = 450/250 = 1.8 mg/mL
Convert ? not necessary
Patient weight NA

$$\frac{0.5 \text{ (Ordered amount of drug)} \times \text{NA} \text{ (pt's weight)} \times 60 \text{ (min/hr)}}{1.8 \text{ (Drug concentration)}} = 16.6; \text{ round to } 17 \text{ ml/hour}$$

3. Your patient is to receive nitroglycerine at 12mcg/min. Your IV bag has 50 mg of nitroglycerine in 250 mL. What rate will you set for your IV?

Ordered amount of drug = 12 mcg/kg/min
Dose/mL (Drug concentration) = 50/250 = 0.2mg/mL
Convert to mcg = 200 mcg/mL
Patient weight NA

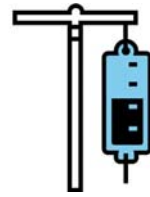
$$\frac{12 \text{ (Ordered amount of drug)} \times \text{NA} \text{ (pt's weight)} \times 60 \text{ (min/hr)}}{200 \text{ mcg/mL (Drug concentration)}} = 3.6 \text{ ml/hour}$$

4. Your patient has a dobutamine IV drip running. The IV rate is 30 mL/hour. The IV bag has 500 mg of dobutamine in 250 mL of fluid. Your patient weighs 65 kg. How many mcg/kg/min is your patient receiving?

Ordered amount of drug = X
Dose/mL (Drug concentration) = 500/250 = 2 mg/mL
Convert to mcg = 2000 mcg/mL
Patient weight 65

$$\frac{\text{“X” (Ordered amount of drug)} \times 65 \text{ (pt's weight)} \times 60 \text{ (min/hr)}}{2000 \text{ mcg/mL (Drug concentration)}} = 30 \text{ ml/hour}$$

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5. Your patient is on a heparin drip with 20,000 units in a 250 mL bag of fluid. The order is to deliver heparin at 750 units per hour. What rate will you set for your IV? (HINT: Since the rate is per hour, you will not have to multiply by 60 minutes!)

Ordered amount of drug = 750 units/hr
Dose/mL (Drug concentration) = 20,000/250 = 80 units/mL
Convert? Not necessary
Patient weight NA

$$\frac{750 \text{ (Ordered amount of drug)} \times \text{NA (pt's weight)} \times \text{NA (min/hr)}}{80 \text{ units/mL (Drug concentration)}} = 9.38; \text{ round to } 9 \text{ mL/hour}$$

6. Your patient has diltiazem ordered at 2 mg/hour. Your IV bag has 125 mg of medication in 500 mL. What rate will you set for your IV? (HINT: Since the rate is per hour, you will not have to multiply by 60 minutes!)

Ordered amount of drug = 2mg/hr
Dose/mL (Drug concentration) = 125/500 = 0.25/mL
Convert? Not necessary
Patient weight NA

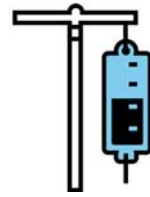
$$\frac{2 \text{ (Ordered amount of drug)} \times \text{NA (pt's weight)} \times \text{NA (min/hr)}}{0.25 \text{ units/mL (Drug concentration)}} = 8 \text{ mL/hour}$$

7. Your patient has vasopressin ordered at a rate of 0.2 units/min. Your IV bag has 200 units of vasopressin in a 500 mL bag. What rate will you set for your IV?

Ordered amount of drug = 0.2 units/min
Dose/mL (Drug concentration) = 200/500 = 0.4 units/mL
Convert? Not necessary
Patient weight NA

$$\frac{0.2 \text{ (Ordered amount of drug)} \times \text{NA (pt's weight)} \times 60 \text{ (min/hr)}}{0.4 \text{ units/mL (Drug concentration)}} = 30 \text{ mL/hour}$$

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8. Your esmolol drip is running at 15 mL/hour. Your patient weighs 65 kg. The IV contains 2500 mg esmolol in 250 mL fluid. Your IV is running at how many mcg/kg/min?

Ordered amount of drug = X
Dose/mL (Drug concentration) = 2500/250 = 10 mg/mL
Convert 10 x 1000 = 10,000
Patient weight 65

$$\frac{\text{"X"} \text{ (Ordered amount of drug)} \times \text{65 pt's weight} \times \text{60 (min/hr)}}{\text{10,000 mg/mL (Drug concentration)}} = \text{15 mL/hour}$$

Solve for "X" : $\frac{15 \times 10,000}{60 \times 65} = \text{38.5 mcg/kg/min}$

9. You have an order to run dopamine at 15 mcg/kg/min. Your IV bag has 500 mg dopamine in 500 mL. Your patient weighs 50 kg. What rate will you set for your IV?

Ordered amount of drug = 15 mcg/kg/min
Dose/mL (Drug concentration) = 500/500 = 1 mg/mL
Convert mg to mcg = 1 mg = 1000 mcg
Patient weight 50

$$\frac{\text{15 (Ordered amount of drug)} \times \text{50 (pt's weight)} \times \text{60 (min/hr)}}{\text{1000 mcg/mL (Drug concentration)}} = \text{45 mL/hour}$$

10. You have an order to run nitroglycerine at 16 mcg/min. You have a solution of 50 mg of nitroglycerine in 250 mL fluid. What rate will you set for your IV?

Ordered amount of drug = 16 mcg/kg/min
Dose/mL (Drug concentration) = 50/250 = 0.2 mcg/mL
Convert 0.2 x 1000 = 200
Patient weight NA

$$\frac{\text{16 (Ordered amount of drug)} \times \text{NA (pt's weight)} \times \text{60 (min/hr)}}{\text{200 mcg/mL (Drug concentration)}} = \text{4.8 (round to 5) mL/hour}$$