Medication Calculation Practice Problems

Below is a section of the list of medications that are programmed in the Alaris IV Pump's Guardrail Drug Library. During your orientation you will learn more about the Alaris pumps as applicable to your role. For the medication test review, use this table to work problems 1- 7 when determining the standard concentration. This information will be provided for you on the test.

Drug	Standard Concentration (<1 kg)	Standard Concentration (1 - <5 kg)	Standard Concentration (5 - <40 kg)	Standard Concentration (40kg & Above)	Fluid Restricted
Alprostadil (PGE)	10 mcg/mL [10 mL]	10 mcg/mL [25 mL]	10 mcg/mL [50 mL]		20 mcg/mL 5+ kg ONLY [50 mL]
Alteplase		1 mg/mL [10 mL]	1 mg/mL [25 mL]	1 mg/mL [50 mL]	
Aminocaproic acid		20 mg/mL [60 mL]	20 mg/mL [250 mL]	20 mg/mL [500 mL]	100 mg/mL < 40 kg [50 mL] >40 kg[100 mL]
Amiodarone (PIV)	2 mg/mL [25 mL]	2 mg/mL [25 mL]	2 mg/mL [50 mL]	2 mg/mL [150 mL]	NONE
Amiodarone(CVL)	6 mg/mL [25 mL]	6 mg/mL [25 mL]	6 mg/mL [50 mL]	6 mg/mL [150 mL]	NONE
Argatroban	1 mg/mL [25 mL]	1 mg/mL [25 mL]	1 mg/mL [50 mL]	1 mg/mL [50 mL]	NONE
Baclofen (IT trial)		50 mcg/mL [3 mL]	50 mcg/mL [3 mL]	50 mcg/mL [3 mL]	NONE
Bumetanide		0.1 mg/mL [10 mL]	0.25 mg/mL [30 mL]	0.25 mg/mL [60 mL]	0.25 mg/mL <5kg ONLY [25 mL]
Calcium chloride		20 mg/mL [150 mL]	20 mg/mL [150 mL]	20 mg/mL [150 mL]	50 mg/mL CVL ONLY [60 mL]
Cisatracurium	*0.5 mg/mL* [25 mL] No FR	0.5 mg/mL [25 mL]	1 mg/mL [50 mL]	1 mg/mL [200 mL]	2 mg/mL <40kg – 50 Ml >40kg – 100 mL
Chlorothiazide	5 mg/mL [25 mL]	10 mg/mL [25 mL]	10 mg/mL [50 mL]	10 mg/mL [50 mL]	NONE
Dexmedetomidine		4 mcg/mL [50 mL]	4 mcg/mL [50 mL]	4 mcg/mL [100 mL]	NONE
DoBUTamine	2,000 mcg/mL (premix)[10 mL]	2,000 mcg/mL (premix)[50 mL]	2,000 mcg/mL (premix)[50 mL]	4,000 mcg/mL (premix)[250 mL]	<5 kg 4,000 mcg/mL [25 mL] 5+ kg-10 mg/mL [50 mL]
DOPamine	1,600 mcg/mL (premix) [10 mL]	1,600 mcg/mL (premix) [50 mL]	1,600 mcg/mL (premix) [50 mL]	3,200 mcg/mL (premix) [250 mL]	<5 kg 3,200 mcg/mL [25 mL] >5 kg -10 mg/mL[50 mL]
EPINEPHrine	0.01 mg/mL [25 mL]	0.01mg/mL [50 mL]	0.05 mg/mL [50 mL]	0.1 mg/mL [250 mL]	<5 kg – 0.1 mg/mL [25 mL] 5+ kg - 1 mg/mL [50 mL]
Epoprostenol		5 mcg/mL [100 mL] (5,000 ng/mL)	5 mcg/mL [100 mL] (5,000 ng/mL)	5 mcg/mL [100 mL] (5,000 ng/mL)	Run as basic infusion
Esmolol		10 mg/mL (premix) [50 mL]	10 mg/mL (premix) [250 mL]	10 mg/mL (premix) [250 mL]	20 mg/mL (premix) [100 mL]
FentaNYL	10 mcg/mL [10 mL] No FR	10mcg/mL [25 mL]	50 mcg/mL [40 mL]	50 mcg/mL [60 mL]	50 mcg/mL 1-5kg ONLY [20 mL]
Furosemide	2mg/mL [3 mL] No FR	2mg/mL [25 mL]	2mg/mL [50 mL]	2mg/mL [100 mL]	10 mg/mL >1 kg ONLY [50 mL]

Drug	Standard Concentration (<1 kg)	Standard Concentration (1 - <5 kg)	Standard Concentration (5 - <40 kg)	Standard Concentration (40kg & Above)	Fluid Restricted
Glucagon		0.04 mg/mL [24 mL]	0.04 mg/mL [24 mL]		
Heparin	10 units/mL [25 mL] No FR	100 units/mL (premix) [25 mL]	100 units/mL (premix) [50 mL]	100 units/mL (premix) [250 mL]	NONE
Heparin for ECMO Pump Only		100 units/mL (premix) [25 mL]	100 units/mL (premix) [60 mL]	500 units/mL [60 mL]	500 units/mL < 40 kg [60 mL]
Insulin in NS	0.1 unit/mL [25 mL]	0.1 unit/mL [25 mL]	1 unit/mL [50 mL]	1 unit/mL [50 mL]	< 5 kg - 0.5 unit/mL [25mL] 5+ kg - 10 unit/mL [50 mL]
Isoproterenol	0.01 mg/mL [25 mL]No FR	0.02 mg/mL [25 mL]	0.06 mg/mL [50 mL]	0.06 mg/mL [50 mL]	0.06 mg/mL 1-<5kg ONLY [50 mL]
Ketamine		5 mg/mL [25 mL]	5 mg/mL [50 mL]	5 mg/mL [200 mL]	10 mg/mL [50 mL]
Labetalol		1 mg/mL [25 mL]	1 mg/mL [50 mL]	1 mg/mL [200 mL]	5 mg/mL <40kg [50 mL] >40kg [200 mL]
Levothyroxine (Organ Donor)		5 mcg/mL [60 mL]	5 mcg/mL [60 mL]	5 mcg/mL [60 mL]	
Lidocaine	8 mg/mL [25 mL] No FR	8 mg/mL (premix) [25 mL]	8 mg/mL (premix) [50 mL]	8 mg/mL (premix) [250 mL]	20 mg/mL >1kg ONLY [50 mL]
LORazepam		1 mg/mL [25 mL]	1 mg/mL [50 mL]	1 mg/mL [50 mL]	2 mg/mL [50 mL]
Magnesium		40 mg/mL [25 mL]	40 mg/mL [50 mL]	200 mg/mL [20 mL]	200 mg/mL <40kg ONLY [20 mL]
Midazolam	0.5 mg/mL [10 mL]No FR	0.5 mg/mL [25 mL]	1 mg/mL [50 mL]	1 mg/mL [50 mL]	1 <5 kg - 1 mg/mL [15mL] 5+ kg - 5 mg/mL [50 mL]
Milrinone	100 mcg/mL [25 mL] No FR	200 mcg/mL (premix) [25 mL]	200 mcg/mL (premix) [50 mL]	200 mcg/mL (premix) [100 mL]	1-5 kg 1 mg/mL [25 mL] > 5 kg 1 mg/mL [50 mL]
Morphine	0.5 mg/mL [10 mL] No FR	0.5 mg/mL [25 mL]	1 mg/mL [50 mL]	1 mg/mL [50 mL]	1 <5 kg - 1 mg/mL [15mL] 5+ kg - 5 mg/mL [50 mL]
Naloxone		4 mcg/mL [50 mL]	4 mcg/mL [50 mL]	4 mcg/mL [100 mL]	100 mcg/mL [50 mL]
NiCARdipine		0.1 mg/mL [25 mL]	0.2 mg/mL (premix) [200 mL]	0.2 mg/mL (premix) [200 mL]	1.5 mg/mL [50 mL]
Nitroglycerin	0.1 mg/mL [25 mL] No FR	0.2 mg/mL (premix) [25 mL]	0.2 mg/mL (premix) [50 mL]	0.2 mg/mL (premix) [250 mL]	1 mg/mL 1-<40kg [50 mL] >40kg [250 mL]
Nitroprusside	0.1 mg/mL [25 mL] No FR	0.2 mg/mL [25 mL]	0.2 mg/mL [50 mL]	0.2 mg/mL [250 mL]	1 mg/mL >1kg ONLY [50 mL]
Norepinephrine	0.016 mg/mL [10 mL] No FR	0.016mg/mL [20 mL]	0.05 mg/mL [20 mL]	0.1 mg/mL [40 mL]	1 <5 kg - 0.1 mg/mL [20mL] 5+ kg - 1mg/mL [4 mL]
Octreotide	5 mcg/mL in NS [25 mL] No FR	5 mcg/mL in NS [25 mL]	10 mcg/mL in NS [50 mL]	10 mcg/mL in NS [150 mL]	50 mcg/mL in NS >1kg ONLY [50 mL]
Pancuronium	0.5 mg/mL [25 mL]	0.5 mg/mL [25 mL]	0.5 mg/mL [50 mL]	0.5 mg/mL [100 mL]	
PENTobarbital		8 mg/mL in NS [25 mL]	8 mg/mL in NS [50 mL]	8 mg/mL in NS [150 mL]	50 mg/mL in NS [50 mL]
Phenylephrine	0.01 mg/mL [25 mL] No FR	0.02 mg/mL [50 mL]	0.05 mg/mL [50 mL]	0.1 mg/mL [200 mL]	1 mg/mL >1kg ONLY [50 mL]
Procainamide	4 mg/mL [25 mL] No FR	4 mg/mL [25 mL]	4 mg/mL [50 mL]	4 mg/mL [250 mL]	8 mg/mL >1kg ONLY [50 mL]
Propofol	*10 mg/mL* (premix) [20mL]	10 mg/mL (premix) [20 mL]	10 mg/mL (premix) [50 mL]	10 mg/mL (premix) [100 mL]	Larger Volume 5-<40kg [100 mL]
Rocuronium		2 mg/mL [30 mL]	10 mg/mL [60 mL]	10 mg/mL [60 mL]	10 mg/mL < 5kg ONLY[30 mL]

Drug	Standard Concentration (<1 kg)	Standard Concentration (1 - <5 kg)	Standard Concentration (5 - <40 kg)	Standard Concentration (40kg & Above)	Fluid Restricted
Sildenafil	0.08 mg/mL [20 mL]	0.08 mg/mL [50 mL]	0.08 mg/mL [50 mL]		
SUFentanil* anesthesia only		5 mcg/mL [20 mL]	10 mcg/mL [40 mL]	10 mcg/mL [40 mL]	1 <5 kg 10 mcg/mL [40 mL]
Terbutaline		0.2 mg/mL [25 mL]	0.2 mg/mL [50 mL]	0.2 mg/mL [50 mL]	1 mg/mL [25 mL]
Theophylline		1.6 mg/mL (premix) [25 mL]	1.6 mg/mL (premix) [500 mL]	1.6 mg/mL (premix) [500 mL]	NONE
Vasopressin DI		0.001 unit/mL [50 mL]	0.01 unit/mL [50 mL]	0.1 unit/mL [250 mL]	1 unit/mL 1+ kg ONLY [50 mL]
Vasopressin GI Bleed/Shock	0.1 unit/mL [25 mL]	0.1 unit/mL [50 mL]	1 unit/mL [50 mL]	1 unit/mL [250 mL]	NONE
Vecuronium	0.5 mg/mL [25 mL] No FR	0.5 mg/mL [25 mL]	1 mg/mL [50 mL]	1 mg/mL [100 mL]	2 mg/mL >1kg ONLY [50 mL]

Medication Calculation Practice Problems

1. **You have an order for Dobutamine to run at 5mcg/kg/min.**
   The label on the syringe states:

Patient Label on Syringe	
D10 in water injection	50 ml
Dobutamine injection 40 mg/ml	100 mg
wt 3.54 kg	
final concentration = Dobutamine 2,000 mcg/ml	

Your patient weighs 3.54 kg. What is the standard concentration for this patient's weight?

Using your Standard Concentration list, determine the standard concentration. Does this match the concentration listed on the syringe label?

Now calculate how many ml will be delivered in an hour (the rate of the pump).

Use this formula:

$$\text{ml/hr} = \frac{\text{(ordered dose) (kg) (time frame)}}{\text{standard concentration available}}$$

The formula would be:

$$\text{ml/hr} = \frac{\text{(5 mcg/kg/min) (3.54) (60 min)}}{\text{2000mcg/ml}}$$

NOTE: All units of measure must match. The unit of measure for the ordered dose must match the unit of measure for standard concentration.

For example, if the ordered dose is in mg, then the standard concentration must be in mg, if mcg, then mcg, if units, units.

The ordered dose time must match the time frame in the equation. If the order is written in min, for example 5 mcg/kg/**min**, then the time frame is **60 minutes**. If the order is written in hour, then the time frame is 1 hour. For example 5 units/kg**/hr** then the time frame is **1 hour**.

The formula written with matching units would be:

$$\text{ml/hr} = \frac{(5\ \text{mcg/kg/min})\ (3.54)\ (60\ \text{min})}{\textbf{2000mcg/ml}}$$

Now solve for the answer.

2. You have an order for Dobutamine to run at 10 mcg/kg/min**.** Your patient weighs 18 kg.

   What is the standard concentration for this patient's weight?

   How fast will the pump run?

3. You have an order for Insulin to run at 0.08units/kg/hour. Your patient weighs 3.54 kg.

   What is the standard concentration for this patient's weight?

   How fast will the pump run?

4. You have an order for Heparin to run at 10 units/kg/hour. Your patient weighs 4.5 kg.

   How fast will the pump run?

5. You have an order for Insulin gtt @ 0.01 units/kg/hr. Your patient weighs 22 kg.

   How fast will the pump run?

6. You have an order for Epinephrine gtt @ 0.1 mcg/kg/min. Your patient weighs 12 kg.

   How fast will the pump run?

7. You have an order for Dopamine gtt @ 15 mcg/kg/min. Your patient weighs 0.98 kg.

   How fast will the pump run?

8. A 3100 gram neonate is to receive gentamicin sulfate 5.2 mg IV q 12 h. The vial contains 80 mg/2mL. How many milliliters should be administered for each dose?

   a. 0.13
   b. 0.31
   c. 0.61

9. A 4 year-old child who weighs 18 kg is to receive 0.1 mg/kg/hour of morphine sulfate via a continuous intravenous infusion. If the intravenous solution contains 1 mg of morphine sulfate per 10 ml, the infusion pump should be set to run at how many milliliters per hour?

   a. 0.18
   b. 1.8
   c. 18

Use the following formula to answer question 10:
<u>Formula to calculate a child's 24-hour fluid maintenance requirement</u>

100 ml/kg for first 10 kg of body weight
50 ml/kg for second 10 kg of body weight
20 ml/kg for each additional kg of body weight

10. A 7 month-old infant who weighs 11 kg is to receive intravenous fluids at 2/3 the maintenance rate. What should be the appropriate hourly rate of the infusion?

    a. 29 ml
    b. 32 ml
    c. 42 ml

11. A 22 month-old child weighing 10 kg is to receive penicillin-G 300,000 units IM. The penicillin-G is available in 5,000,000 units/vial and is to be reconstituted to a concentration of 1,000,000 units/ml. How many milliliters should the child receive?

    a. 0.03
    b. 0.3
    c. 3.0

12. A 5 year-old child who weighs 18 kg is to receive amoxicillin 13.3 mg/kg po q 8h. The medication is available as a liquid containing 250 mg/5 mL. How many milliliters should the child receive with each dose?

    a. 0.96
    b. 1.9
    c. 4.8

13. A 2 year-old child who has a body surface area (BSA) of 0.63 m2 is to receive 1.5 mg/m2 of a drug. The drug is available in 1 mg/ml vials. How many milliliters should the child receive?

    a. 0.68
    b. 0.95
    c. 1.9

14. A 4 month-old infant who weighs 7 kilograms has an order for 8 mg of ranitidine po **b.i.d.**. The recommended dosage range for this medication is 1 to 4 mg/kg per 24 hours. A nurse should recognize that the dosage ordered is

    a. within the normal range.
    b. lower than the normal range.
    c. higher than the normal range.

Answers

1. 0.53 ml/hr
2. standard concentration 2,000mcg/ml, 5.4 ml/hr
3. standard concentration 0.1 unit/ml, 2.8 ml/hr
4. 0.45 ml/hr
5. 0.22 ml/hr
6. 1.44 ml/hr
7. 0.55 ml/hr
8. a
9. c
10. a
11. b
12. c
13. b
14. a