Medicine Dosage - Applying Dimensional Analysis/Graphing to Healthcare

February 28, 2020

Instructions to student: Answer the following problems 1 and 2 by first identifying the units for the answer, then combine the given quantities in a way that gives those units, and finally calculate the answer. Problem 3 guides you through solving the problem.

1. The tranquilizer valium is sold in 2.0 mL syringes that contain 50.0 mg of the drug per 1.0 mL of liquid (50.0 mg/mL). If 25.0 mg is prescribed, how many mL should the nurse administer to the patient?

2. A safe dosage of chloroquine is 3.5 mg/kg every 6 hours for malaria treatment. If a child's mass is 28 kg, how much chloroquine should be administered to the child over a 24 hour period.

3. A patient was admitted to the hospital with a ruptured appendix. After surgery, the doctors prescribed morphine at a dose of 30 mg every 4 hours to manage pain. The half-life of morphine is 4 hours, which means that

the patient's body eliminates 50% of the medication after 4 hours. You need to determine the amount of medication in the patient's body after each dose.

(a) Consider one dose. The patient's body initially has 30 mg of the medication. How much medication is left after 4 hours?

Since 50% of the medication eliminates from the patient's body in 4 hours, 15 mg of the 30 mg initial dosage will be eliminated. So what is left is 15 mg.

(b) At the 4th hour, the patient is administered another dose of 30 mg. How much medication is in the patient after this second dose (don't forget what is left from the first dose!)?

50% of the first dosage, the 15 mg, remains in te patient's body after the 4th hour. Add to that the second dose, 30 mg, that makes what's in the patient's body at the 4th hour is 15+30 = 45 mg.

(c) Continue to answer questions (a) and (b) to complete the table below to determine the amount of medicine in the patient's bloodstream after each dose during the first 24 hours.

Hours since first dose	Amount of medicine (mg) in patient
0	30
4	
8	
12	
16	
20	
24	

4. From question 3, make a graph that shows the relationship between the amount of morphine (mg) in the patient and the time since the initial dose. Plot all 7 points in the table from 3c. What kind of graph would you use to connect these points to reflect the amount of medicine in the patient's body?

5. What trend do you see in the graph in question 4? Explain.

6. Morphine may be harmful if more than 60 mg is in the patient. Based on the table and graph, do you think that it will ever become harmful to the patient at this dosage? Explain your reasoning.