

INTRAVENOUS DRIP CALCULATION

Introduction

An important part of nurse's role is to ensure that drug dose is calculated and administered appropriately. This includes administering oral medications and intravenous infusions. It is essential that the nurse has a good knowledge and understanding of basic mathematical and arithmetic skills in relation to drug calculation. Giving medications in the health care set up involves not only what and when to give but also how much to administer. Dosing calculations is just as important as knowing what to give. Medications are available in various forms and it is crucial for nurses to know how to calculate all those at the tip of their fingers. Basically, there are three formulas which help the nurses to work on dose calculation which are volume infusion, bolus and continuous infusion. Also, it depends on the equipment used to deliver medicine. Ideally a needle and syringe are used to draw medicine through ampoule and vial then loaded into fluid bottles readily available or 50cc syringes to start with an infusion.

Note :

When the nurse starts intravenous drip it is necessary to use drip chamber and keep a note of how many drops deliver 1ml of fluid. There are two different styles of administration drip sets (gtt/set). One is a macro set that uses larger drops to add to 1 ml. Most macro sets are either 10, 15 or 20 drops to make 1 ml. The other drip set is a micro set, and it either takes 45 or 60 drops to make 1 ml.



When giving most medications via continuous infusion, micro drip sets are the preferred method. One easy way to differentiate the two is by looking into the drip chamber. A clinician will see a micro set adapter that looks like a small silver pin coming from the bag end of the chamber. This pin causes the drops to be tiny, hence the term micro set. Some medications that are infused come in a glass vial. If this is the case, make sure to use a drip tubing that has a vent port to allow air into the bottle. Without this air entering the glass vial/bottle, the release of the fluid will eventually cause a suction, and the medication will stop flowing.

Preparing a dose calculation is best done with the use of a calculator, particularly in a stressful situation. If not, errors are likely. One wrong decimal place can become a ten-fold error that can cause life-threatening complications for patients. An excellent way to prepare for standard drip rates and concentrations is to develop a chart with the drip rates already calculated for ease. Caution should also be used when doing so. With different manufacturers and pricing wars, it is very common for a company to change the vial and concentration without notifying providers. If providers become complacent in this situation, the patient could become injured, and the providers might be liable.

Dose calculations should always be performed before the medicine is mixed if the nurse is giving an infusion. Doing the math before mixing allows a person to change the numbers to reach a better drip-rate. It is difficult to count 600 gtt/min using a 60 gtt/set but changing the drip set to a ten gtt/set can decrease your rate to 100 gtt/min and make your treatment more manageable.

The aim of this study is to introduce the basic principles of numeracy and the specifics of calculating drug dosages to help staff nurses gain the knowledge and skills to meet the best standards. This covers basic arithmetic principles and use worked examples to illustrate each area to help develop staff nurses knowledge and understanding. Enrolling for this learning module will help them to learn drug calculation skill and administer and monitor medicines and intravenous therapy which is specially designed to teach precise dosage calculation formulas and methods depending on the requirements of critically ill patients.

Purpose of medication calculation for nurses:

- Drug administration and monitoring is primary duty often performed by nurses.
- Dose of drug depends on the weight of the patient and some other factors which nurses should be well versed.

- Liver function and kidney function has to be assessed before calculating dose of a particular medicine.
- Knowing the skill of drug calculation makes nurse more confident of her abilities as a healthcare professional and she is able to perform her duties more responsibly and with commitment.
- Medication calculation skill also make it possible to correctly interpret the instructions written by a physician.
- This skill allows the nurse to monitor a client for possible side effects of a drug and make decisions in discontinuing the medication in case of a severe reaction.
- Patient assessment becomes easy and alternative therapy can be prescribed by the physician in case of emergency.

FORMULA:

- a) Calculating drops per minute (drops/min or gtts/min)

$$\frac{\text{Volume to be given (mls)} \times \text{drip factor}}{\text{Time (hours)} \times 60 \text{ min}}$$

- b) Calculating millilitres per hour (ml/hr)

$$\frac{\text{Total volume (ml)}}{\text{Total time (hours)}} = \text{ml/hour}$$

- c) Calculating Infusion time

$$\frac{\text{Total volume to be infused}}{\text{millilitre per hour being infused}} = \text{Infusion time}$$

Intravenous drip calculation (drops/min)

- 1) The physician has ordered 1L of RL over 8 hours. The drop factor is 15 drops/ml. What will be the flow rate ?

Sol: $\frac{\text{Total vol. in ml}}{\text{Time in min}} \times \text{drop factor}$

$$= \frac{1000\text{ml}}{8 \times 60} \times 15$$

$$= 31.25$$

Ans = 31 drops/min

Intravenous drip calculation (ml/hr)

- 2) The physician has ordered 300ml of Ringer lactate (RL) over 6 hours. What will be the hourly rate ?

$$\text{Sol: } \frac{\text{Total vol. in ml}}{\text{Number of hours}} = \frac{300 \text{ ml}}{6 \text{ hours}}$$

Ans = 50 ml/hr

- 3) The physician has ordered 2L of NS 1/2 over 48 hours. What will be the hourly rate ?

$$\text{Sol: } \frac{\text{Total vol. in ml}}{\text{Number of hours}} = \frac{2000\text{ml}}{48 \text{ hours}} = 41.66....$$

Ans = 42 ml/hr

Intravenous drip calculation (Infusion time)

- 4) The physician has ordered 1L of RL to infuse at 200ml/hr. Started at 8am when will the infusion complete?

$$\text{Sol: Step 1: } \frac{1000\text{ml}}{200\text{ml}} \times 1 = 5 \text{ hours}$$

Step 2:

= started at 8 am + 5 hours

Ans = 13:00

References:

1. Potter and Perry's Fundamentals of nursing South Asia Second edition: Elsevier; July 2017
2. Carol Taylor, Pamela Lynn Jennifer L. Bartlett Fundamentals of nursing south Asian edition; Volume 1: Wolters Kluwer 2020
3. Padmaja Udaykumar Pharmacology for nurses Fifth edition: Jaypee; 2022
4. GL Chattri Nursing Drug Dosage and their calculations First edition Jaypee: 2017
5. Sheila J. Ogden, Linda K. Fluharty Calculation of drug dosages A workbook text; 11th edition; Elsevier; 2019
6. Muthuvenkatachalam S, Ambili M Venugopal Target High sixth edition; CBS Publisher; Jan 2021
7. Matt Vera BSN RN. Nursing pharmacology practice questions & test bank for NCLEX (500+ questions) [Internet]. Nurseslabs. 2021 [cited 2023 Feb 6]. Available from: <https://nurseslabs.com/nursing-pharmacology-nclex-practice-questions-test-bank/>