LETTER

A Comprehensive Formula for Calculating the Infusion Rate of Medications Diluted with Infusion Solution

Mohammad Reza Soltani Zarandi¹ and Hadi Khoshab²*

¹Inspection Unit, Police Hospital, Kerman, Iran.
²School of Nursing and Midwifery, Bam University of Medical Sciences, Bam, Iran.

DEAR EDITOR,

Drug administration is an integral part of the nurse’s role [1], and drug calculations are one of the most important nursing care measures [2]. There are various calculating formulas for different drug orders and the multiplicity of these methods has led to the difficulty of various calculations [3] to the extent that one of the most common nursing errors is mistakes in the calculation of drug dosage especially, the infusion rate of drug solutions [4]. A single formula that can comprise all different aspects of the physician's order, drug dose, and type of infusion set used and ultimately can express infusion rate in terms of drops per minute (gtt/min) and milliliter per hour (ml/hr) can partly reduce this problem. Mistakes in calculating the infusion rate are more important in Iran because of the limited financial resources for supplying the infusion pumps and other automatic injecting devices that have the ability of drug calculation and infusion rate. In this research, researchers tried to innovate a simple, uniform and applicable formula that can be used for a wide range of infusions.

Two of the valid and widely used formulas and their limitations and disadvantages are:

A) [5]

\[
\text{Infusion rate (ml/hr)} = \frac{\text{Patient’s weight (kg)} \times \text{Dose (mcg, mg, or units/min)}}{\text{Drug concentration, infusion (mcg, mg, or units/mL)}} \times 60
\]

The most important limitations include:

(1) It is not able to calculate the infusion rate in gtt/min (because the type of infusion set is not included).

(2) The concentration of the drug should be available. Although the volume of drug solution and the amount of he drug (diluted) are usually present, the calculation of the concentration will prolong the process and the probability of errors increases.

(3) The dose of the drug should be in mcg, mg or a specified unit, while the drugs may be used in different units, such as gram.

(4) The units of drug dose and concentration should be identical, while this formula does not have the ability to make them identical.

B) [6]

\[
\text{ml/hour} = \frac{\text{volume to be infused} \times \text{dose} \times \text{weight} \times 60}{\text{amount if drug} \times 1,000}
\]

The most important limitations include:

(1) It is not able to calculate the infusion rate in gtt/min (because the type of infusion set is not included).

(2) The number 1000 is used for converting mg to mcg. Whereas, if the drug unit is in gram and the order is in mcg, then this formula is not applicable.

The benefits and advantages of our formula:

(1) It is able to calculate the infusion rate in gtt/min (Tips for using this formula No 5).

(2) There is no need to calculate drug concentration.

(3) It is applicable for any type of drug unit.

(4) It is able to make different dose units and drug units identical.

* Address correspondence to this author at School of Nursing and Midwifery, Bam University of Medical Sciences, Bam, Iran; Tel: 00989132425700; Fax: 003442510847; Email: hadikhoshab@gmail.com

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