**IV Fluid Administration**

**TipSheet**

Intravenous (IV) solutions and medications are delivered directly into a vein of a patient through an IV infusion set.

Examples of IV fluids: 5% dextrose (D$_5$W), normal saline (NS), milliequivalents of electrolytes (e.g. 20 mEq of KCl).

The **flow rate** (measured as gtt/min) can be adjusted by a clamp on the tubing, or by an IV pump, or by an electronic device.

Infusion sets come in different sizes. The larger the diameter of the tubing, the larger the drop. The number of drops required to make up 1 mL of fluid is called the **drop factor** (gtt/mL).

Macrodrip sets: 10, 15 or 20 gtt/mL drop factor.
- Used for flow rates of 125 mL/h or more (i.e. large volume of fluid to be infused).

Microdrip sets: 60 gtt/mL drop factor.
- Used for flow rates of 50 mL/h or less.

To do calculations related to IV fluid administration, the following formulas should be used:

**Formula 1:**

\[
\frac{\text{Volume (mL)}}{\text{Time (min)}} \times \text{Drop factor (gtt/mL)} = \text{Drip rate (gtt/min)}
\]

**Formula 2:**

\[
\frac{\text{Volume (mL)}}{\text{Time (h)}} = \text{Flow rate (mL/h)}
\]
IV FLUID ADMINISTRATION TIPSHEET

Tips for Calculations:
- Make sure that all measurements are in the same units. If necessary, convert units to be the same.
- To convert from hours to minutes, multiply the number of hours by 60 min/h.
- To convert from minutes to hours, divide the number of minutes by 60 min/h.
- Try to reduce the numbers before performing the division or multiplication. Remember that any number on the “top” can be reduced with any number on the bottom.
- Always check for a reasonable answer. Does the calculated amount make sense?

Example 1 – Calculating Drip Rate:
The physician’s order states, “Infuse 600 mL of 0.9% NS over 3 hours.” The drop factor is 60 drops/mL. How many drops per minute should be given to fulfill this order?

| Givens: | Volume = 600 mL  
|         | Time = 3 hours  
|         | Drop factor = 60 gtt/mL |
| Need to know (specify unit): | Drip rate (gtt/min) = ? |
| Solution: | Step 1: Unit conversion.  
|           | Notice that time in the formula is in minutes. The time given in the question is 3 hours. We must convert this to minutes.  
|           | $3 \text{ h} \times \frac{60 \text{ min}}{1 \text{ h}} = 180 \text{ min}$.  
|           | Step 2: Drip rate calculation.  
|           | Drip rate = $\frac{\text{volume}}{\text{time}} \times \text{drop factor}$  
|           | Drip rate = $\frac{600 \text{ mL}}{180 \text{ min}} \times 60 \text{ gtt/mL}$  
|           | Drip rate = $\frac{20}{3} \times 60$  
|           | Drip rate = 20 x 20  
|           | Drip rate = 400 gtt/min  
|           | Therefore, the nurse should set the IV at 400 drops per minute. |
Example 2 – Calculating Flow Rate:
The order says, “2.5 L NS IV in 20 h.” Calculate the flow rate in mL/h.

| Givens: | Volume = 2.5 L  
|         | Time = 20 hours |
| Need to know (specify unit): | Flow rate (mL/h) = ? |
| Solution: | Step 1: Unit conversion.  
|           | Notice that we need to calculate a flow rate in mL/H. However, the volume ordered is 2.5 L. Our first step is to convert 2.5 L into mL.  
|           | $2.5 \text{ L} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 2500 \text{ mL}$ |
|           | Step 2: Flow rate calculation.  
|           | Flow rate = $\frac{\text{volume (mL)}}{\text{time (h)}}$  
|           | [Plug in the known values.] |
|           | Flow rate = $\frac{2500 \text{ mL}}{20 \text{ h}}$  
|           | [Simplify.] |
|           | Flow rate = $\frac{250}{2} \text{ mL/h}$  
|           | [Divide.] |
|           | Flow rate = 125 mL/h  
|           | [The answer seems reasonable.] |
|           | Therefore, the flow rate for this order is 125 mL/h. |
Example 3 – Calculating Total Volume Infused:
If 1800 mL of D₅W is to be infused intravenously at a rate of 100 mL/h, how long will it take?

| Givens:          | Volume = 1800 mL  
<table>
<thead>
<tr>
<th></th>
<th>Flow rate = 100 mL/h</th>
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</thead>
<tbody>
<tr>
<td>Need to know (specify unit):</td>
<td>Time (h) = ?</td>
</tr>
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</table>
| Solution:       | **Step 1: Re-arrange formula**  
|                 | In order to find the time, we will need to re-arrange the volume flow rate formula.  
|                 | Flow rate (mL/h) = \( \frac{\text{volume (mL)}}{\text{time (h)}} \)  
|                 | Using cross-multiplication, we get:  
|                 | **Time (h) = \( \frac{\text{volume (mL)}}{\text{flow rate (mL/h)}} \)**  
|                 | **Step 2: Time calculation.**  
|                 | Time = \( \frac{1800 \text{ mL}}{100 \text{ mL/h}} \)  
|                 | **[Plug in the known values.]**  
|                 | Time = 18 h  
|                 | **[Simplify.]**  
|                 | **Time = 18 h**  
|                 | **[The answer seems reasonable.]**  
|                 | Therefore, it will take 18 hours for 1800 mL of D₅W to be infused at a rate of 100 mL/h.  |