

Calculating and setting an IV drip rate



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■ Introduction

The IV flow rate, as calculated from a practitioner's order, is usually expressed as the total volume of IV solution infused over a prescribed interval or as the total volume infused in milliliters per hour. Many devices are available to regulate the flow rate of an IV solution, including several types of clamps, an IV flow regulator, and an electronic infusion device. (See [Using IV clamps](#).)



EQUIPMENT

USING IV CLAMPS

An IV clamp helps regulate an IV infusion's flow rate. The illustrations below show two common types of IV clamps: a roller clamp and a slide clamp.

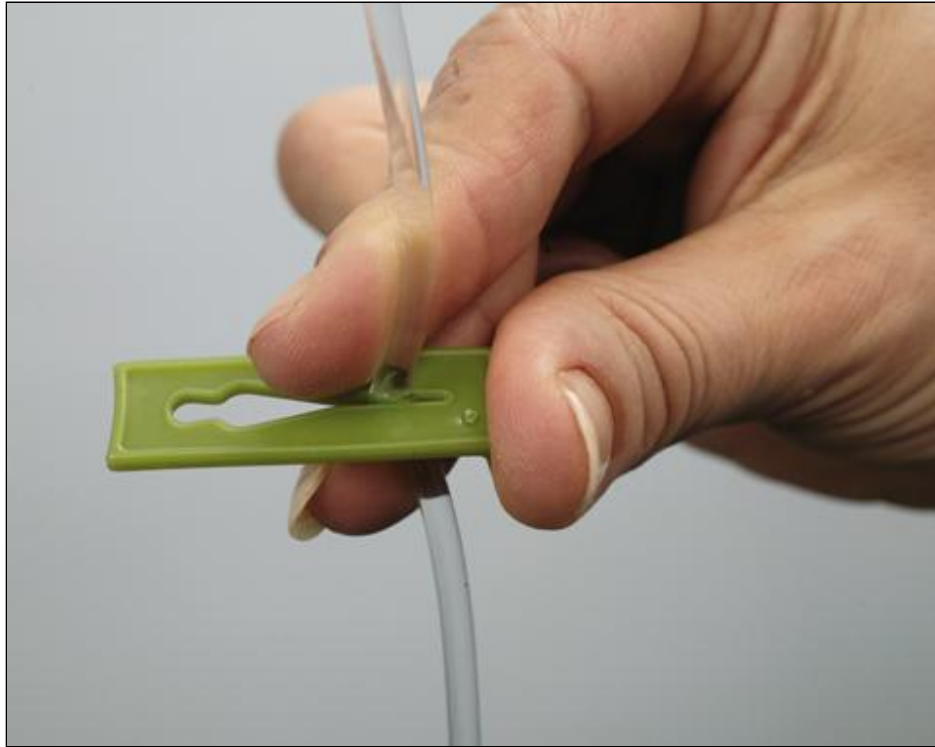
Roller Clamp

A roller clamp allows you to increase or decrease the flow through the IV line by turning a wheel (as shown below).



Slide Clamp

A slide clamp allows you to open or close the IV line by moving the clamp horizontally (as shown below). This type of clamp doesn't allow you to make fine adjustments to the IV flow rate.



An IV clamp measures IV flow rate in drops per minute; an IV infusion pump measures IV flow rate in milliliters per hour. An IV flow regulator can also be set to deliver the desired amount of IV solution in milliliters per hour. The IV flow regulator is less accurate than an electronic infusion pump and is most reliable when used with an inactive adult patient. Any flow regulating device allows easy monitoring of the IV flow rate with a time tape, which indicates the prescribed IV solution level at hourly intervals. (See the "[IV time tape use](#)" procedure.)

■ Equipment

- Watch with a second hand
- Optional: drip rate chart

Check the label on the IV administration set to determine how many drops per unit it delivers. A standard macrodrip IV administration set delivers from 10 to 20 drops/mL depending on the manufacturer. A microdrip IV administration set delivers about 60 drops/mL. A blood transfusion set delivers about 10 drops/mL. A commercially available adapter is available to convert a macrodrip set to a microdrip system.

■ Preparation of Equipment

Inspect all IV equipment and supplies. If a product is expired, is defective, or has compromised integrity, remove it from patient use, label it as expired or defective, and report the expiration or defect as directed by your facility.¹

■ Implementation

- Verify the practitioner's order.^[2]
- Gather and prepare the necessary equipment and supplies.
- Perform hand hygiene.^{[3][4][5][6][7][8][9][10]}
- Confirm the patient's identity using at least two patient identifiers.^[11]
- Provide privacy.^{[12][13][14][15]}
- Explain the procedure to the patient and family (if appropriate) according to their individual communication and learning needs *to increase their understanding, allay their fears, and enhance cooperation.*^[16]
- Calculate the proper IV drip rate or use a drip rate chart (if available). (See [Calculating IV flow rates.](#))



EQUIPMENT

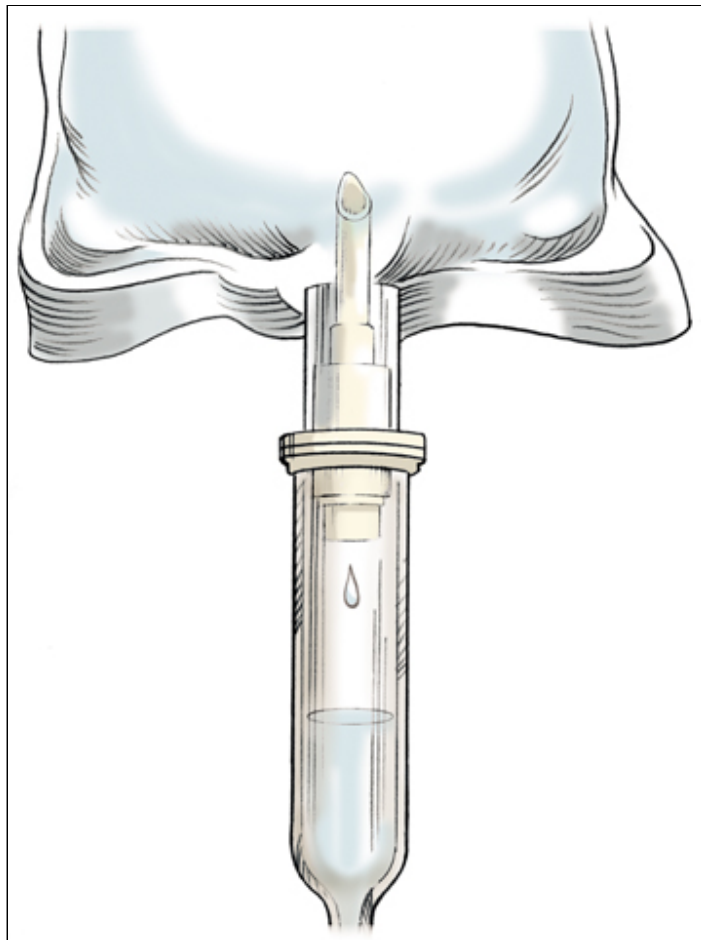
CALCULATING IV FLOW RATES

When calculating the IV flow rate of infused solutions, remember that the number of drops required to deliver 1 mL of solution varies with the type and manufacturer of the IV administration set used. To calculate the IV flow rate, you must know the calibration of the IV drip rate for each manufacturer's product. Use the formula below to calculate specific drip rates.

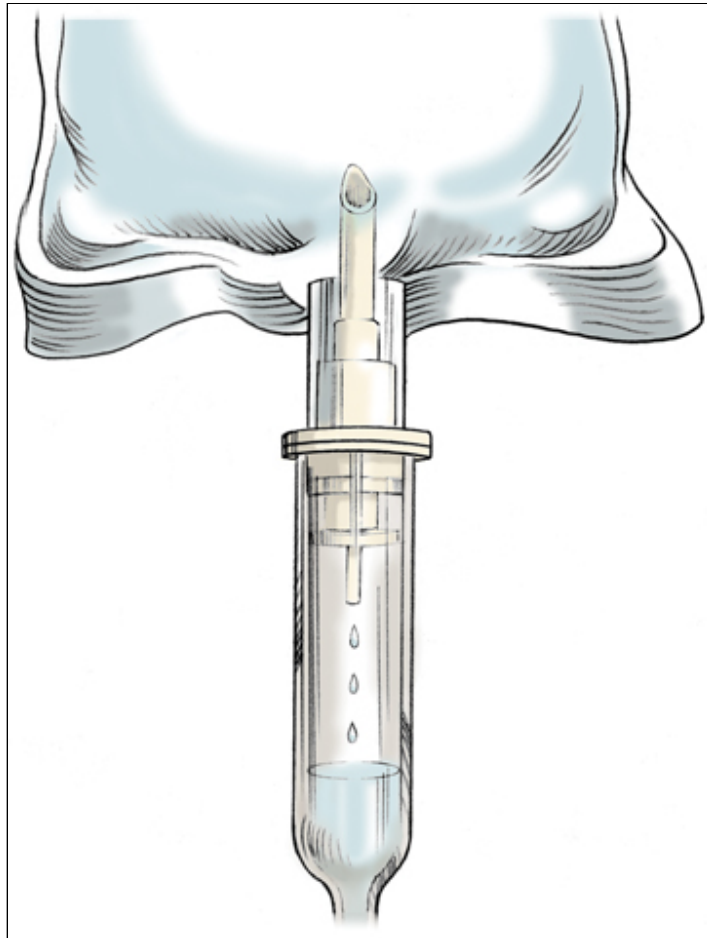
$$\frac{\text{volume of infusion (in mL)}}{\text{time of infusion (in minutes)}} \times \text{drip factor (in drops/mL)} = \text{drops/minute}$$

Macro drip administration set

A macro drip administration set (shown below) delivers 10 to 20 drops/mL.

**Microdrip administration set**

A microdrip administration set (shown below) delivers about 60 drops/mL.

**Blood transfusion set**

A blood transfusion set (shown below) delivers about 10 drops/mL.



- After calculating the desired IV drip rate, remove your watch and hold it next to the IV drip chamber *so that you can observe your watch and the drops simultaneously*.
- Release the IV clamp and regulate the flow to the approximate IV drip rate. Then count drops of solution for 1 minute *to account for flow irregularities and to ensure the proper administration rate.*¹⁷
- Adjust the IV clamp, as necessary, and count drops of solution for 1 minute. Continue to adjust the IV clamp, and count drops until you achieve the correct IV flow rate.
- Monitor the IV flow rate closely, inspect the IV insertion site for complications, and assess the patient's response to therapy.
- Perform hand hygiene.^{3 4 5 6 7 8 9 10}
- Document the procedure.^{18 19 20 21 22}

■ Special Considerations

- Use an electronic infusion device for infusions that require precise flow control *to maintain patient safety*. Consider the use of a smart pump with dose-error reduction software and interoperability with electronic health records *to reduce the risk of infusion-related medication errors*. Make sure that alarm limits are set appropriately and that alarms are turned on, functioning properly, and audible to staff.^{2 23}
- The Joint Commission issued a sentinel event alert related to managing risk during transition to new International Organization for Standardization tubing standards that were designed to prevent dangerous tubing misconnections, which can lead to serious patient injury and death. During the transition, make sure to trace the tubing and catheter from the patient to the point of origin before connecting or reconnecting any device or infusion, at any care transition (such

as a new setting or service), and as part of the handoff process; route tubes and catheters having different purposes in different standardized directions; when there are different access sites or several bags hanging, label the tubing at both the distal and proximal ends; use tubing and equipment only as intended; and store medications for different delivery routes in separate locations.²⁴

■ Complications

Complications associated with calculating and setting an IV drip rate may include:

- excessively rapid IV flow rate
 - adverse drug effects
 - circulatory overload
 - heart failure and pulmonary edema
- excessively slow IV flow rate
 - insufficient intake of fluids, drugs, or nutrients.

■ Documentation

Documentation associated with calculating and setting an IV drip rate includes:

- date and time of procedure
- original IV flow rate when setting up a peripheral IV line
- adjustment to the IV flow rate
 - amount of adjustment
 - date and time
 - your initials
- patient's response to therapy
- complications
 - name of practitioner notified
 - date and time of notification
 - prescribed interventions
 - response to those interventions
- teaching provided to the patient and family (if applicable)
 - understanding of that teaching
 - follow-up teaching needed.

This procedure has been reviewed by the Academy of Medical-Surgical Nurses.



■ Related Procedures

- [Chemotherapy administration, intravascular \(IV\), pediatric](#)
- [Infiltration and extravasation management, home care](#)
- [IV alteplase administration for acute ischemic stroke](#)
- [IV alteplase administration for acute myocardial infarction](#)
- [IV cardiovascular drug administration](#)
- [IV cardiovascular drug administration, pediatric](#)
- [IV EPINEPHrine administration](#)
- [IV epoprostenol administration](#)
- [IV inotropic medication administration, home care](#)
- [IV insulin administration](#)
- [IV propofol administration](#)
- [IV treprostinil administration](#)

- [Oxytocin administration during labor and delivery](#)
- [Oxytocin administration, postpartum](#)
- [Patient-controlled analgesia](#)
- [Patient-controlled analgesia, pediatric](#)
- [Peripherally inserted central catheter \(PICC\) drug administration](#)
- [Tumor lysis syndrome, emergency patient care, oncology](#)

■ Related UpToDate Patient Teaching Handouts

- [How to care for a midline IV catheter](#)
- [How to care for a peripherally inserted central catheter \(PICC\)](#)
- [Midline IV catheter insertion](#)
- [Peripherally inserted central catheter \(PICC\) insertion](#)
- [What to watch for when you have an IV](#)

■ References

([Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions](#))

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Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions

The following leveling system is adapted from *Evidence-Based practice in nursing & healthcare: A guide to best practice*, Fifth edition, by Bernadette Mazurek Melnyk and Ellen Fineout-Overholt (2023).

Level I	Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)
Level II	Evidence from well-designed single RCTs (experimental)
Level III	Evidence from well-designed nonrandomized controlled trials (quasi-experimental), systematic reviews of a complete body of evidence, and intervention studies using mixed methods
Level IV	Evidence from well-designed case-control and cohort studies (observational)
Level V	Evidence from systematic reviews of qualitative and descriptive studies
Level VI	Evidence from single descriptive and qualitative studies, evidence-based practice implementation, and quality improvement projects

Level VII

Evidence from expert opinion, expert committee reports, and literature reviews

Data from Gyatt, G., & Rennie D. (2002). Users' guides to the medical literature. American Medical Association; Harris, R. P., et al. (2001). Current methods of the U.S. Preventative Services Task Force: A review of the process. American Journal of Preventative Medicine, 20, 21-35.