

**JoVE: Science Education**  
**Initiating Maintenance Intravenous Fluids using Gravity Tubing**  
--Manuscript Draft--

Manuscript Number:	10274
Full Title:	Initiating Maintenance Intravenous Fluids using Gravity Tubing
Article Type:	Manuscript
Section/Category:	Manuscript Submission
Corresponding Author:	Katie Baraki UNITED STATES
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	
Corresponding Author's Secondary Institution:	
First Author:	Katie Baraki
First Author Secondary Information:	
Order of Authors:	Katie Baraki Madeline Lassche
Order of Authors Secondary Information:	

## Author Name

Katie Baraki, MS, RN; Madeline Lassche, MSNEd RN

## Clinical Skills Education Title

Initiating Maintenance Intravenous Fluids using Gravity Tubing

## Overview

Hospitalized patients frequently require administration of intravenous fluids to maintain fluid and electrolyte balance. Certain medical conditions that preclude oral fluid intake may necessitate intravenous fluid administration with or without electrolytes to prevent hypovolemia, dehydration and electrolyte imbalances. Pre-surgical and pre-procedure patients who require anesthesia are often required to be NPO (*Nil per os*, Latin for “nothing by mouth”) to prevent aspiration and to maintain hydration during the procedure. Post-surgical and post-procedure patients may also require intravenous fluid administration to increase intravascular volume following surgical blood loss.

Intravenous fluids can be delivered by different types of administrations sets: gravity flow infusion devices that rely on gravitation force to push the fluid to the patient’s bloodstream, and the infusion pumps, which use pump mechanism that generates positive pressure. While administering maintenance intravenous fluids using an infusion pump is the common approach, facility policy, availability of infusion pump equipment, and other limitations such as a power outage may necessitate using intravenous gravity tubing. This video describes the approach for initiating maintenance intravenous fluids using gravity tubing, as well as how to calculate and set the infusion drip rates.

## Procedure

1. General procedure considerations (review in the room, with the patient).

1.1 Upon first entering the patient’s room, wash hands with soap and warm water, and vigorous friction for at least 20 seconds. Hand sanitizers may be used if the hands are not visibly soiled, but vigorous friction should also be used.

1.2 At the bedside computer, log into the patient’s electronic health record and review the patient’s medical history, intake and output balance, vital signs, skin turgor and mucus membranes, and reviewing serum laboratory results. This review is conducted to confirm that the patient requires continuous intravenous fluid administration (aka maintenance IV Fluids).

1.3 At the bedside computer, pull up the Medication Administration Record (MAR).

1.4 Review the patient's MAR for maintenance IV fluid orders, including the type of maintenance IV fluid and rate of administration that are ordered. The fluids ordered and the administration rate must be appropriate for patient condition, admitting diagnosis, and fluid and electrolyte status.

1.5 Leave the patient's room, wash hands as described above (1.1).

2. Go to the Medication Preparation area (this area may be in a secured room or in a secured portion of the nurses' station) and **acquire the ordered maintenance IV fluid** bag and complete the first safety check using the 5 rights of medication administration (Refer to the video "Safety Checks for Acquiring Medications from a Medication Dispensing Device").

### **3. Acquire gravity IV tubing.**

#### **4. Prime the IV tubing.**

The purpose of the priming is to make sure that the air in IV tubing is fully replaced with the fluids to be infused. This is to ensure that no air is entering the patient's bloodstream.

4.1. Open the packaging of the IV fluid bag and IV tubing.

4.2. Holding the IV tubing in your non-dominant hand, slide the roller clamp towards the narrow clamp end to occlude the tubing, then place the tubing on the counter. Clamping the tubing will prevent air from being pulled into the tubing or fluid leaking from the tubing once the IV fluid bag is accessed and inverted.

4.3. Holding the bag in your non-dominant hand, grasp the IV bag port with your index finger and thumb of your non-dominant hand at the point that the IV bag port is connected to the IV bag.

4.4. With your dominant hand grasp the rubber pigtail that covers the IV bag port and pull, removing the pigtail and drop the rubber pigtail on the counter. Take care not to touch the IV bag port opening. If this occurs, the IV fluid bag is contaminated and a new bag should be acquired.

4.5. Pick up the IV tubing and hold the IV tubing spike between the middle finger and base of the thumb, and with your thumb and index finger, remove the protective cover from the IV tubing spike, and drop the cover on the counter.

4.6. While continuing to hold the IV bag as described in steps 4.2. and 4.3., hold the IV spike between your thumb and index finger of your dominant hand and insert the spike into the IV bag port using a gentle twisting motion.

4.7. With your non-dominant hand, invert the IV fluid bag and hold it near eye-level, while holding the IV drip chamber between the index and thumb of your dominant hand, and the tubing with your dominant hand. Gently squeeze the drip chamber until it is filled 1/3 to ½ full with IV fluid.

4.8. With your thumb and index finger of your dominant hand, roll the clamp to the larger end of the clamp to open the tubing. This will allow fluid to flow freely into the tubing and air to be pushed out of the tubing.

4.9. When the fluid has reached the end of the tubing, clamp the tubing by holding the clamp between your thumb and index finger of your dominant hand, and roll the clamp towards the narrow end of the clamp with your thumb to occlude the tubing.

5.0. In the medication preparation area complete the second safety check using the 5 rights of medication administration. (Refer to the video “Safety Checks for Acquiring Medications from a Medication Dispensing Device”).

6.0. Acquire additional supplies including a 10mL normal saline flush and alcohol wipes.

6.1. If an IV pole is not available in the patient room, acquire one to take into the room.

### **Administration**

7.0. Upon first entering the patient’s room, set the IV fluid and tubing and additional supplies down on the counter and wash hands as described in step 1.1.

8.0. In the patient’s room, complete the third, and final, medication safety check adhering to the 5 rights of medication administration. (Refer to the video “Preparing and Administering Oral and Liquid Medications”).

9.0. Assess and flush the peripheral intravenous insertion site. (Refer to video “Assessing and Flushing a Peripheral Intravenous Line.”)

10.0. Hanging the IV fluid and connect the IV tubing to the PIV.

10.1. Holding the IV fluid bag in your dominant hand, align the one of the hooks at the top of the IV fluid pole with the hole in the top of the IV fluid bag and allow the IV fluid bag to hang.

10.2. Inspect the IV fluid line for air. If the line has air, repeat the steps 4.7-4.9 to remove the air from the IV fluid line.

10.3. Remove the paper ties from the IV tubing.

10.4. Wash hands as described in 1.1 and put on clean gloves.

10.5. Cleanse the PIV needless injection site.

10.5.1 Open an alcohol wipe and hold it with your dominant hand.

10.5.2 Holding the PIV needless injection site with your non-dominant hand, wrap the alcohol wipe around the PIV needless injection site and scrub the site with friction and intent (as if you were juicing an orange) for at least 15 seconds. Allow the needless injection site to dry while continuing to hold with your non-dominant hand, taking care not touch the site.

10.6. While continuing to hold the PIV needless injection site with between your thumb and forefinger of your non-dominant hand, with your dominant hand, grasp the IV tubing near the connection port and remove the plastic cap, taking care not to contaminate the inner portion of the connection port.

10.9. Attach the connection port of the tubing to the needless port of the PIV by pushing gently to insert the tip of the connection port into the center portion of the needless injection site and turning the outer portion of the connection port clockwise.

10.10. Calculate the IV drip rate.

10.10.1. Multiply the amount of fluid in mL to be administered each hour (from medication orders) by the drop factor (number of drops per milliliter of solution delivered for a drip chamber) , and then divide by 60 minutes. This will give you the number of drips per minute. The drop factor varies for different types and manufacturers of IV tubing, and can be found on the IV tubing packaging.

10.10.2. Divide the number of drops per minute by 4. This will give you the number of drops per 15 seconds.

10.11. Set the IV drip rate.

10.11.1. Hold a watch with your non-dominant hand next to the drip chamber of the IV tubing.

10.11.2 Holding the IV clamp in your dominant hand, gently slide the clamp roller towards the larger end of the clamp while looking at your watch and then the drip chamber. Count the number of drops seen in the drip chamber. Adjust the drip rate by rolling the clamp to increase or decrease the amount of drops until the amount of drops that occur within 15 seconds meets to the number of drops calculated in step 10.10.2.

10.12 Re-assess the PIV fluid site for leaking or swelling. Ask the patient if they are experiencing any pain as the IV fluid enters their line. The patient may report a cool feeling which is an expected finding.

11. Document the maintenance IV fluid administration in the patient's EHR.

11.1. In the patient's EHR, record the date, time and location/site of the PIV where the maintenance IV fluid was connected, and the peripheral intravenous site assessment. Record the assessment findings.

12. Discard waste in the appropriate receptacles.

13. Leave the patient room. Upon exiting the room, wash hands as describe in step 1.1.

## **Summary**

This video details the process for initiating maintenance IV fluids using gravity tubing. It is important to remember that maintenance intravenous fluids are a medication, and the five rights and three checks must be followed to prevent a medication error. It is also important to assess the patient's intravenous site and fluid status throughout administration of the maintenance intravenous fluid to prevent intravenous site complications and iatrogenic fluid overload. Common errors associated with administration of maintenance intravenous fluid include: neglecting to reassess the patient's condition to confirm continued need for maintenance intravenous fluid, failing to perform assessment of the peripheral intravenous site, and overlooking changes in provider orders for type of maintenance fluid and/or fluid administration rate.

## **Figures**

Figure 1: Parts of an IV bag

Figure 2: Parts of IV tubing



