IV INFUSION PUMPS

PURPOSE

To familiarize and acquaint the transfer Paramedic with the skills and knowledge necessary to adequately maintain IV infusion pumps and their respective agents in the interfacility transfer environment.

OBJECTIVES

COGNITIVE

- ☑ Differentiate between an IV controller and an IV pump
- ☑ Recall the tips for using an IV controller
- ☑ Differentiate between a peristaltic pump and a piston pump
- ☑ Name the two primary indications for the use of an infusion pump
- ☑ Describe the two basic infusion pump controls
- ☑ Describe the three basic pump alarms
- ☑ Explain why being alert for extravasation is important with IV infusion pumps

PSYCHOMOTOR

- ☑ Observe the proper steps in setting up an IV pump/controller
- ☑ Demonstrate the proper steps in setting up an IV pump/controller
- ☑ Properly adjust an IV setting given a scenario in which the infusion rate is altered en route

AFFECTIVE

- ☑ Explain the rationale for periodically moving the tubing in an IV controller
- ☑ Defend the reasoning for not using a peristaltic pump on “fragile” solutions
- ☑ Explain the rationale for evacuating air from the tubing and the drip chamber in infusion pumps
- ☑ Explain the rationale for setting the volume control about 50 cc less than the volume in the bag

OVERVIEW

Some pharmacologic agents, such as heparin, require precise methods for administering very specific amounts of the medication over a very specific time frame. That is one of the purposes of IV infusion pumps.

Additionally, IV pumps help prevent fluid overload by limiting the amount of fluid administered. IV pumps will also alert the transport paramedic to potential problems, such as a reduced flow, occlusions or a low battery. Finally, the IV infusion pump, as the name implies, provides pressure to the solution. This helps in two ways. First, it assists in maintaining IV patency and second, it aids in overcoming any potential resistance. Resistance may be in the form of an indwelling problem in the patient (i.e., excessive vasoconstriction) or due to a small diameter of infusion tubing.

Numerous IV pumps exist on the market today thus preventing a detailed explanation of each individual type. However, there are certain generic similarities that exist between each manufacturer's brand. The IV pumps that will be in use by the transport paramedic consist of two principle types, peristaltic and piston-driven.

IV CONTROLLERS

Controllers achieve their action in dispensing the proper amount of fluid by regulating the gravity flow. The flow is regulated by compressing the tubing to allow a specific number of drops in the drip chamber per minute. These devices tend to not be as accurate as the IV pumps since the size of the drops cannot be controlled.

TIPS FOR THE USE OF IV CONTROLLERS

- Make sure the drip chamber is 30 inches above the patient's infusion site. This is the height at which these devices are calibrated.
- Make sure the drip chamber is no more than half full.
- Make sure no liquid is clinging to the sides in the upper portion of the drip chamber. This will tend to throw off the machines reading.
- On a long distance transport it is a good idea to periodically (every few hours) move the tubing in the pump to prevent the latex from becoming damaged.

TYPES OF IV PUMPS

PERISTALTIC IV PUMPS

Peristaltic pumps derive their name by the "wave-like" action of the medication when it is delivered to the patient. The administration tubing is attached to the device and the pump applies pressure. This is accomplished by means of a rotating wheel which squeezes the medication through the infusion set. The medication action is very similar to the peristalsis that occurs in the intestines hence the name. These devices are very accurate, however, due to the squeezing nature of fluid delivery they are not the best choice for fragile solutions such as blood.

PISTON DRIVEN PUMPS

Piston driven IV infusion pumps are similar to the action of a piston in an automobile. As the piston or plunger moves forward, a specific amount of medication is delivered. Piston driven pumps usually require IV tubing designed for the device. This tubing will generally have a cartridge containing the plunger. Like the peristaltic IV pumps, these intravenous infusion devices are highly accurate. Unlike the previously mentioned pump the piston driven pump is an excellent choice for fragile fluid products.

INDICATIONS

There are two primary indications for the use of infusion pumps:

- Administer a specific amount of a pharmacologic agent
- Prevention of fluid overload

PUMP CONTROLS

IV infusion pumps are designed for ease of use. To that end there are two basic controls that the transport paramedic needs to consider:

- Flow rate
  - ✓ Usually expressed in ml/hr
  - ✓ Adjust the flow rate according to the specific manufacturer's instructions supplied with the device
- Volume settings
  - ✓ Used to preset a specific amount of drug to be administered. Once this has been accomplished the infusion stops.

PUMP ALARMS

Consult the manufacturer's operators manual for specific messages that may be displayed concerning pump alarms. There are, however, three generic messages that could be shown by the infusion pump:

- No flow
- ✓ Tubing clamped
- High pressure occlusion
- ✓ Tubing clamped
- ✓ Device has occluded
- ✓ Device has infiltrated
- Volume infused
- ✓ Preset volume has been delivered to the patient
- ✓ Previous volume setting has not been deleted from programming

TIPS FOR THE USE OF IV PUMPS

- Follow the manufacturer's instructions when connecting the infusion tubing to the IV pump
- Be certain that all air is evacuated prior to attempting the infusion. Not only will this help prevent the chance of an air embolism, but it will aid in reducing any flow problems.
- When changing the IV, or opening the door of the infusion unit, be sure to clamp off the latex tubing. This will help reduce the chance of a fluid and/or medication overload
- Position the IV infusion pump to prevent any accidental jarring which may alter the initial administration rates.
- Fill the drip chamber completely to help reduce the introduction of air bubbles into the circuit.
- If using a peristaltic type pump, periodically move the tubing (every few hours) in the unit to help prevent damaging the latex tube.
- Be alert for signs of infiltration. Since these pumps force fluid into the tubing, much more fluid may extravasate before the liquid has a difficulty in flowing. An IV without a pump typically stops when resistance from the tissue is met. Pumps easily overcome this resistance.
- Set the volume control for approximately 50 ml less than the volume in the IV bag. This will prevent the tubing from being completely emptied prior to the container being changed.