CHAPTER 19

Heparin Infusion Calculations

Objectives

The learner will calculate:
1. heparin dosages.
2. mL/hr flow rates for an EID.
3. hourly dosage infusing from mL/hr rate.

Suggested Review Questions

1. What does the nurse need to remember about the administration of heparin?
2. What is the usual daily adult dose of heparin when administered by continuous IV infusion?
3. How is dimensional analysis (DA) used to calculate the mL/hr infusion rate for IV heparin infusion dosages?
4. What is the DA equation for calculating the number of units of heparin infusing per hour when the mL/hr flow rate is known?

Answers to Review Questions

1. For safe patient care, the nurse needs to remember that heparin is a potent anticoagulant and the dose needs to be monitored carefully. Heparin can be administered via intermittent subcutaneous injection (usually every 12 hours) to prevent the formation of blood clots in high-risk patients. However, when a blood clot is present, the IV route is usually used to prevent the clot from becoming larger and also to prevent the formation of new clots. Heparin therapy is often initiated with an IV bolus dose followed by a continuous IV infusion using an electronic infusion device (EID). Heparin is supplied in USP units. The dose is often adjusted daily based upon results of daily coagulation studies (partial thromboplastin time).
2. The usual adult dose for heparin is between 20,000 and 40,000 units/day. The nurse needs to assess the daily dose and inform the prescriber when the dose exceeds 40,000 units in 24 hours.

3. When using DA to calculate infusion rates for heparin delivered IV using an EID, the equation should be written as follows:

\[
\frac{\text{mL}}{\text{hr}} = \frac{\text{volume of IV fluid in mL}}{\text{total number of units in volume}} \times \frac{\text{units in dose}}{\text{time (hr)}}
\]

4. The DA equation for calculating the number of units infusing per hour when the mL/hr flow rate is known is

\[
\frac{\text{units}}{\text{hr}} = \frac{\text{total number of units in volume}}{\text{volume of IV fluid in mL}} \times \frac{\text{IV rate in mL}}{\text{time (hr)}}
\]
Chapter 19: Heparin Intravenous Calculations

Additional Practice Problems

Use DA to calculate the amount of heparin needed to prepare the IV solutions, the heparin flow rates (mL/hr), or hourly heparin dosages (units/hr) as indicated below. Round all doses to nearest tenth. A volumetric pump is used to deliver all doses.

1. 1600 units/hr of heparin have been ordered. The pharmacy sends a bag of IV fluid with 25,000 units of heparin in 500 mL D5W. What is the hourly flow rate?

2. A solution of 35,000 units of heparin in 500 mL normal saline is to infuse at 2000 units/hr. What is the flow rate?

3. The patient has an infusion of 25,000 units of heparin in 500 mL D5W infusing at 32 mL/hr. The physician leaves the order, “Adjust the IV flow rate to deliver 1200 units of heparin/hr.” How should the flow rate of the current infusion be adjusted?

4. The patient has an infusion of 10,000 units of heparin in 250 mL D5W infusing at 12 mL/hr. How many units are being delivered each hour?

5. A patient who is to undergo open heart surgery is to receive a continuous infusion of heparin during the procedure. The order is for 35 units of heparin per kg/hr. The patient weighs 172 lb. The heparin solution available is 20,000 units in 500 mL normal saline. What is the flow rate for the ordered heparin solution?
6. A solution of 30,000 units of heparin in 500 mL normal saline is infusing at 22 mL/hr. How many units of heparin are being delivered each hour? 

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7. A solution of 40,000 units of heparin in 1 L of D5W is infusing at 35 mL/hr. How many units of heparin are being delivered each hour?

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8. A patient is to receive 650 units of heparin each hour. The solution available is 10,000 units of heparin in 250 mL of normal saline. What is the flow rate?

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9. The nurse needs to add 20,000 units of heparin to 500 mL of D5W. Referring to the label in Figure 19-1, how many mL of heparin will the nurse add?

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10. A patient is to receive 7500 units of heparin in 150 mL of normal saline. Referring to the label in Figure 19-1, how many mL of heparin will the nurse add to the IV solution?

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11. The physician ordered heparin 15 units/kg/hr for a patient who suffered an MI. On hand is 25,000 units of Heparin in 500 mL D5W. The patient weighs 157 lbs. What is the IV flow rate in mL/hr?

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12. Calculate the IV flow rate for a continuous infusion of heparin 25 units/hr. The label on the 500 mL pre-mixed heparin IV bag reads: heparin 1000 units.

13. An IV infusion 1200 units of heparin is ordered. On hand is heparin 20,000 units in 500 mL D5W. What is the mL/hr IV flow rate?

14. A continuous infusion of heparin at 27 units/kg/hr is ordered for a patient weighing 82 kg. On hand is a 500 mL bag of D5W labeled: heparin 50 units/mL. What is the mL/hr flow rate?

15. An IV infusion of heparin is infusing at 22 mL/hr. The label on the 250 mL IV bag reads: heparin 10,000 units. How many units of heparin are infusing each hour?
Solutions to Additional Practice Problems

Use DA to calculate the amount of heparin needed to prepare the IV solutions, the heparin flow rates (mL/hr), or hourly heparin dosages (units/hr) as indicated below. Round all doses to nearest tenth. A volumetric pump is used to deliver all doses.

1. \[
\frac{mL}{hr} = \frac{\frac{2}{500} \text{ mL}}{\frac{25,000}{22}} \times \frac{16 \text{ units}}{1 \text{ hr}} = \frac{16}{2} = 32 \text{ mL/hr}
\]

2. \[
\frac{mL}{hr} = \frac{\frac{500 \text{ mL}}{35,000 \text{ units}}}{\frac{70}{2000 \text{ units}}} \times \frac{\frac{4}{2000 \text{ units}}}{1 \text{ hr}} = \frac{2000}{70} = 28.57 \text{ mL/hr} (\text{rounded to the nearest tenth}) = 28.6 \text{ mL/hr}
\]

3. \[
\frac{mL}{hr} = \frac{\frac{1}{500 \text{ mL}}}{\frac{25,000 \text{ units}}{50}} \times \frac{1200 \text{ units}}{1 \text{ hr}} = \frac{1200}{50} = 24 \text{ mL/hr}
\]

The current infusion is running at 32 mL/hr. The flow rate needed to deliver 1200 units/hr is 24 mL/hr. Therefore, the flow rate needs to be decreased by 8 mL/hr.

4. \[
\frac{\text{units}}{hr} = \frac{\frac{40 \text{ units}}{12 \text{ mL}}}{\frac{250 \text{ units}}{1}} \times \frac{12 \text{ mL}}{1 \text{ hr}} = 40 \times 12 = 480 \text{ units/hr}
\]

5. Insert conversion for lbs to kg into DA equation.
\[
\frac{mL}{hr} = \frac{\frac{1}{500 \text{ mL}}}{\frac{20,000 \text{ units}}{1}} \times \frac{\frac{\frac{7}{22} \text{ units}}{1 \text{ kg}}}{\frac{2.2 \text{ lbs}}{1 \text{ kg}}} \times \frac{172 \text{ lbs}}{8 \times 2.2} = \frac{1204}{17.6} = 68.40 = 68.4 \text{ mL/hr}
\]

6. \[
\frac{\text{units}}{hr} = \frac{\frac{60 \text{ units}}{1 \text{ mL}}}{\frac{500 \text{ units}}{1}} \times \frac{22 \text{ mL}}{1 \text{ hr}} = 60 \times 22 = 1320 \text{ units/hr}
\]
7. First convert L to mL; 1 L = 1000 mL

\[
\frac{\text{units}}{\text{hr}} = \frac{40,000 \text{ units}}{1000 \text{ mL}} \times \frac{35 \text{ mL}}{1 \text{ hr}} = 40 \times 35 = 1400 \text{ units/hr}
\]

8. mL/hr = \[
\frac{\text{1 mL}}{10,000 \text{ units}} \times \frac{65 \text{ units}}{1 \text{ hr}} = \frac{65}{4} = 16.25 \text{ mL/hr (rounded to the nearest tenth) = 16.3 mL/hr}
\]

9. Label states 10,000 units of heparin per 1 mL, therefore,

\[
\frac{\text{mL}}{\text{1 mL}} = \frac{20,000 \text{ units}}{10,000 \text{ units}} \times \frac{2 \text{ units}}{1} = 2 \text{ mL}
\]

Therefore, 2 mL of heparin will be withdrawn from the vial of heparin and added to the 500 mL bag of D5W.

10. mL = \[
\frac{\text{1 mL}}{20 \text{ units}} \times \frac{15 \text{ units}}{1} = \frac{15}{20} \]

= 0.75 mL (if rounded to the nearest tenth) = 0.8 mL

Therefore, 0.8 mL of heparin would be added to the 150 mL of normal saline.

Note: Heparin doses need to be very precise. Policy in many institutions is to calculate all heparin doses to nearest hundredth. Check your institution policy and instruct students to complete this problem accordingly. If this problem was calculated to the nearest hundredth, the correct response would be to add 0.75 mL of heparin to the 150 mL of normal saline. That could be easily done using a tuberculin syringe.

11. Insert conversion for lbs to kg into DA equation.

\[
\frac{\text{mL}}{\text{hr}} = \frac{1 \text{ mL}}{25,000 \text{ units}} \times \frac{15 \text{ units}}{\text{kg/hr}} \times \frac{1 \text{ kg}}{2.2 \text{ lbs}} \times \frac{157 \text{ lbs}}{50 \times 2.2} = \frac{2355}{110} = 21.40 = 21.4 \text{ mL/hr}
\]
12. \[
\frac{\text{mL}}{\text{hr}} = \frac{500 \text{ mL}}{1000 \text{ units}} \times \frac{25 \text{ units}}{1 \text{ hr}} = \frac{25}{2} = 12.5 \text{ mL/hr}
\]

13. \[
\frac{\text{mL}}{\text{hr}} = \frac{500 \text{ mL}}{20,000 \text{ units}} \times \frac{1200 \text{ units}}{1 \text{ hr}} = \frac{1200}{40} = 30 \text{ mL/hr}
\]

14. \[
\frac{\text{mL}}{\text{hr}} = \frac{500 \text{ mL}}{25,000 \text{ units}} \times \frac{27 \text{ units}}{82 \text{ kg/hr}} = \frac{2214}{50} = 44.28 \text{ mL/hr (rounded to nearest tenth)} = 44.3 \text{ mL/hr}
\]

15. \[
\frac{\text{units}}{\text{hr}} = \frac{10,000 \text{ units}}{250 \text{ mL}} \times \frac{22 \text{ mL}}{1 \text{ hr}} = 40 \times 22 = 880 \text{ units/hr}
\]