Session 4: Calculation of Drip and flow rates (infusion rates)

Skills covered in this section include: calculating the volume of fluid delivered to a patient over a given time, rates of flow in ml/hour and rates of flow in drops/minute.

Examples for flow rates and drip rates (infusion rates)

A) CALCULATION OF VOLUME OF AN INFUSION

Example (1) The drip rate is set to deliver 50 ml per hour. How much fluid will the patient receive over i) 2 hours ii) 4 hours?

Volume (ml) = Rate (ml/hr) x Time (hr)

i) 50 ml/hr x 2 hr = 100ml

ii) 50ml/hr x 4 hr = 200 ml

B) CALCULATION OF TIME FOR AN INFUSION

Example (1) The patient is to receive 250 ml of normal saline. An infusion pump is set at 50ml/hr. How long will it take to give the solution?

\[
\text{TIME (hr)} = \frac{\text{VOLUME (ml)}}{\text{RATE (ml/hr)}}
\]

\[
= \frac{250\text{ml}}{50 \text{ml/hr}} = 5 \text{ hours}
\]

Example (2) A patient is to receive one litre of Hartmann’s solution. If an infusion pump is set at 120 ml/hr, how long will the pump take to give the solution?

\[
\text{TIME (hr)} = \frac{\text{VOLUME (ml)}}{\text{RATE (ml/hr)}}
\]

\[
= \frac{1 \times 1000\text{ml}}{120\text{ml}} = \frac{1000}{120} = \frac{25}{3} = 8.3 = 8 \text{ hours 20 minutes}
\]
C) CALCULATION OF RATES OF FLOW IN MILLILITRES PER HOUR
(ml/hour – given the time in hours)

Example (1)  A patient is to receive half a litre of fluid over 5 hours using an infusion pump. At how many millilitres per hour should the pump be set?

\[
\text{RATE (ml/hr)} = \frac{\text{VOLUME (ml)}}{\text{TIME (hr)}}
\]

\[
= \frac{\text{half a litre}}{5 \text{ hours}}
\]

\[
= \frac{500\text{ml}}{5 \text{ hours}} = \frac{500}{5}
\]

\[
= 100\text{ml/hr}
\]

Example (2)  A patient is to receive one litre of normal saline over 8 hours. At how many millilitres per hour should the pump be set?

\[
\text{RATE (ml/hr)} = \frac{\text{VOLUME (ml)}}{\text{TIME (hr)}}
\]

\[
= \frac{\text{one litre}}{8 \text{ hours}}
\]

\[
= \frac{1 \times 1000 \text{ ml}}{8}
\]

\[
= \frac{1000}{8} = 125 \text{ ml/hr}
\]
D) CALCULATION OF RATES OF FLOW IN MILLILITRES PER HOUR (ml/hr)

Example (1) 120 ml of fluid in a burette needs to be infused over 40 minutes. Calculate the flow rate required in ml/hour.

\[
\text{RATE (ml/hour)} = \frac{\text{VOLUME (ml)} \times 60}{\text{TIME (minutes)}}
\]

\[
= \frac{120 \text{ml} \times 60}{40}
\]

\[
= \frac{120 \times 60}{40} = 3 \times 60 = 180 \text{ml/hr}
\]

E) CALCULATION OF RATES OF FLOW IN DROPS PER MINUTE

In order to do this type of calculation you need to remember this formulae:

If the time is given in minutes use:

\[
\text{RATE (drops/min)} = \frac{\text{VOLUME (ml)} \times \text{DROP FACTOR (drops/ml)}}{\text{TIME (minutes)}}
\]

If the time is given in hours use:

\[
\text{RATE (drops/min)} = \frac{\text{VOLUME (ml)} \times \text{DROP FACTOR (drops/ml)}}{\text{TIME (hours)} \times 60}
\]

Example (1) A teenager is to receive 1200 ml of dextrose over 5 hours. The administration set delivers 20 drops/ml. Calculate the required drip rate in drops per minute.

\[
\text{RATE (drops/min)} = \frac{1200 \text{ ml} \times 20 \text{ drops/ml}}{5 \text{ hr} \times 60}
\]

\[
= \frac{1200 \times 20}{5 \times 60} = 20 \times 4 = 80
\]

\[
= 80 \text{ drops/minute}
\]
Exercise 1

1) A woman patient is receiving solution at a rate of 40ml/hour. How much fluid will the patient receive in: 
   a) half an hour?  
   b) 2 hours?  
   c) 10 hours?

2) Half a litre of normal saline is to be given to a patient. How long will this take if the infusion pump is set at 75ml/hour?

3) A girl patient is to receive 100ml normal saline. If the infusion pump is set to deliver 200ml/hour, how long will the infusion take?

4) One litre of solution is to be given over 8 hours. Calculate the required flow/hour rate for the infusion pump.

5) At what flow rate should an infusion pump be set if a patient is to receive 550ml over 11 hours?

6) A woman is to be given 500ml of dextrose over 8 hours. Calculate the hourly flow rate of an infusion pump.

7) A fluid of 100ml needs to be infused over 20 minutes. Calculate the flow rate required in ml/hour.

8) Calculate the required pump setting in ml/hour of 40ml of fluid for 20 minutes infusion time.

9) 75ml of fluid needs to be infused over 45 minutes. Calculate the flow rate required in ml/hour.

10) A fluid of 50ml containing 0.5g of penicillin required to be infused over 50 minutes. Calculate the flow rate required ml/hour.

11) A patient is prescribed 600ml of dextrose over 4 hours. The drip chamber delivers 30 drops/ml. Calculate the required drip rate in drops/minute.

12) An adult patient is to be given half a litre of normal saline over 5 hours using an IV set which gives 20 drops per ml. Calculate the required drip rate in whole numbers for drops per minute.
13) A male patient is to have 135ml of dextrose infused in 45 minutes. The administration set gives 20 drops/ml. Calculate the required drip rate in drops/minute.

14) A patient is to be given 480ml of blood over 3 hours using an infusion set which delivers 15 drops/ml. Calculate the drip rate in drops per minute.

15) A 350ml unit of packed cells is to be run over 2 hours using an IV set which delivers 30 drops/ml. Calculate the drip rate in whole numbers for drops per minute.
Questions for exam preparation for infusion and drip rates

Paper 1

1) 600 ml of dextrose 5% is to be given over 5 hours. The IV set delivers 30 drops per millilitre. Calculate the required drip rate in drops per minute.

2) A teenager is to receive 2400 ml of dextrose 5% over 8 hours. The IV set emits 15 drops/ml. Calculate the required drip rate in drops per minute.

3) 900 ml of normal saline is to be given to a patient over 9 hours using a giving set which emits 30 drops/ml. Calculate the required drip rate in drops per minute.

4) An adult male is to be given half a litre of normal saline over 10 hours using an IV set which gives 20 drops per millilitre. Calculate the required drip rate in drops per minute.

5) A female patient is to receive 1½ litres of fluid over 10 hours. The giving set delivers 20 drops/ml.

6) A burette contains 120 ml of fluid that needs to be delivered in 30 minutes. The administration set gives 20 drops/ml. Calculate the required drip rate in drops per minute.

7) An anaemic patient is prescribed 1 unit of packed cells over 5 hours. The unit of packed cells holds 350 ml. The IV set delivers 30 drops per ml. Calculate the required drip rate in drops per minute.

8) 300 ml of autologous blood is to be transfused over 4 hours using an administration set which gives 20 drops per ml. Calculate the required drip rate in drops per minute.

9) One unit of packed red cells is to be run over 3 hours. The unit of packed cells contains 350 ml. An IV set which emits 15 drops/ml is to be used.

10) An administration set which emits 15 drops/ml is to be used to give a 490 ml unit of autologous blood over 3½ hours. Calculate the required drip rate in drops per minute.
11) A patient has two intravenous lines. One line is being infused at 40 ml/hr; the other at 30 ml/hr. What volume of fluid would this patient receive in a 20 hour period?

12) At 08.00 hours, 2000 ml of dextrose 4% and ⅕ normal saline is set up to run at 80 ml/hr. At what time would the flask be finished?

13) At 9.00 am on a Tuesday, one litre of dextrose 5% is set up to run at 50ml/hr. When will the flask be finished?

14) A girl is to receive half a litre of dextrose. A flask is set up at 0800 hours running at 60 ml/hr. After 5 hours the rate is prescribed to be increased to 80 ml/hr. At what time will the IV be completed?

15) At 0430 hours, an infusion pump is set to deliver 1.5 L of fluid at a rate of 90 ml/hr. After 10 hours the pump is reset to 75ml/hr. Calculate the finishing time.

16) A patient is to receive one litre of dextrose 4% in ⅕ normal saline. For the first 3½ hours the fluid is delivered at 160ml/hr. A specialist then prescribes that the rate be slowed so that the remaining fluid will run over the next 8 hours. Calculate the required flow rate.

17) A patient is to receive 1.5 litre of Hartmann’s solution. If an infusion pump is set at 120ml/hr, how long will the pump take to give the solution?

18) An infusion pump is to be used to administer one litre of fluid over 10 hours. At what flow rate should the pump be set?

19) 100ml of fluid containing vancomycin 400mg has been added to a burette. The infusion is to be given over 45 minutes. Calculate the required pump setting in ml/hr, to the nearest whole number.

20) 600ml of normal saline is to be infused over 12 hours using a microdrop giving set. The set delivers 60 drops per millilitre. Calculate the required drip rate in drops per minute.
1) A patient is to be given 1 litre of fluid over 10 hours. The giving set emits 20 drops/ml. Calculate the required drip rate in drops per minute.

2) A female patient is to receive 2400 millilitres of Hartmann’s solution over 12 hours. Calculate the drip rate per minute if the administration set gives 15 drops/ml.

3) A patient is receiving fluid from two IV lines. One line is running at 60 ml/hr; the other at 70ml/hr. What volume of fluid would the patient receive IV over 10 hours?

4) At 0700 hours, 1000 millilitre of dextrose 5% is set up to run at 80 ml/hr. At what time will the flask be finished?

5) The solution is to run at 75ml/hr for the first 6 hours, then the rate is to be reduced to 50 ml/hr. Calculate the total time required to give ½ litre of volume.

6) A male patient is receiving one litre of dextrose 5% at a rate of 20 ml/hr. How much of the solution will he receive over: a) 2 hrs? b) 5 hrs? c) 10 hrs?

7) One litre of Hartmann’s solution is to be given over 8 hours. Calculate the required flow rate of a volumetric infusion pump.

8) 100 ml of fluid containing 600 mg of vancomycin is to be given over 50 minutes. Calculate the required pump setting in ml/hr.

9) 500 ml of Hartmann’s solution is to be given over 8 hours. The IV set delivers 20 drops/ml. What is the required drip rate?

10) A patient is to be given one unit of packed cells over 3 hours. Calculate the drip rate in drops/min if the unit of packed cells holds 600 ml and the giving set emits 20 drops per ml. Give the answer to the nearest whole number.

11) 1200 ml of fluid is to be given IV. The fluid is run at 70 ml/hr for the first 5 hours then the rate is reduced to 60 ml/hr. Calculate the total time taken to give the whole fluid.

12) A patient is to receive 1600 ml of normal saline IV. The infusion pump is set at 80ml/hr. How long will the fluid last?
13) 75 ml of fluid containing 1.5 g of flucloxacillin is to be infused over 45 minutes. Calculate the required pump setting in ml/hr.

14) A child is prescribed 120 ml of Hartmann’s solution to be given over 5 hours. The micrcodrip delivers 60 drops/ml. Calculate the required drip rate in drops/min.

15) A unit of autologous blood is to be given to a patient over 4 hours. The unit of blood contains 480 ml and the giving set delivers 30 drops/ml. Calculate the drip rate in drops/min.

16) A child is prescribed cloxacillin. The recommended dosage is 50 mg/kg/day, 4 doses daily. Calculate the size of a single dose if the child’s weight is 22 kg.

17) A young boy weighing 19 kg is to be given cephalothin. The recommended dosage is 60 mg/kg/day, 4 doses daily. What should be the size of a single dose?

18) The recommended dosage for capreomycin sulphate is 20 mg/kg/day, 3 doses daily. Calculate the size of a single dose for a girl weighing 27 kg.

19) A child is prescribed penicillin V. The recommended dosage is 50 mg/kg/day, 4 doses daily. If the child’s weight is 18 kg, calculate the size of a single dose.

20) A child is to be given capreomycin sulphate. The recommended dosage is 20 mg/kg/day, 3 doses per day. Calculate the size of a single dose if the child’s weight is 24 kg.
1) An infusion set is running 50 mls/hour, it started at 06.00. What volume has been infused by 11.30am?

2) An infusion pump starts at 22.00 for 80 mls/hour intake. What volume will be infused by 3.30 in the morning?

3) A patient is receiving 60 ml of fluid IV at a rate 60 ml/hour. How many hours will it take to infuse the total amount of fluid?

4) What will be the flow rate in mls per hours for fluid of 700 mls to be given in 3-5 hours?

5) 700 ml of fluid is to be given over 5 hours. At what rate in drops per minute should it drip if the IV set delivers 20 drops per millilitre?

6) A patient is receiving fluid at the rate of 40 ml per hour, how much will have been infused in 3 hours and 15 minutes?

7) A patient is receiving fluid at the rate of 90 ml per hour, how much will have been infused in 3.67 hours?

8) A patient is receiving fluid at the rate of 100ml per hour. How much will have been infused in 2.25 hours?

9) 200 mls of fluid is to be infused over 10 hours. The set delivers 120 drops per ml, how many drops per minute is required?

10) 600 ml of fluid is to be infused over 12 hours. What will be the drop rate per minute if the set delivers 60 drops per ml?

11) Calculate the flow rate in ml/hour if a 150ml of fluid needs to be infused over 20 minutes.

12) Calculate the flow rate in ml/hour if a 100ml of fluid needs to be infused over half an hour.

13) 100 ml of fluid is to be given in 45 minutes. Calculate the required pump setting in ml/hour to the nearest whole.
14) A female patient is to receive one litre of Hartmann’s solution over 6 hours. Calculate the drip rate/minute if the IV set gives 15 drops/ml.

15) A child is prescribed 60 ml/hour of normal saline. The microdrop delivers 60 drops/ml. Calculate the required drip rate in drops per minute.

16) A patient is prescribed 1200 ml of dextrose over 4 hours. The drip chamber delivers 20 drops/ml. Calculate the required drip rate in drops/minute.

17) An administration set which emits 30 drops/ml is to be used to give 960 ml of blood over 3 hours. Calculate the drip rate in drops per minutes.

18) A 700 ml of packed cells is to be run over 5 hours using an IV giving set which delivers 30 drops/ml. Calculate the drip rate in drops per minute.