

Deacon's Challenge

No. 57 Answer

A 60 kg patient requires phenobarbitone to be given at 12 hourly intervals. Calculate the dose required to give an average steady state plasma concentration of 25 mg/L assuming that the clearance of the drug is 5 mL/h/kg and that both the bioavailability and salt conversion factors are 1.

Once a steady state has been achieved:

$$\text{Rate of drug administration} = \text{Rate of drug elimination}$$

The clearance of a drug is the volume of plasma from which the drug is completely cleared per unit of time. Therefore the rate of elimination (R_E) of the drug is the product of clearance (Cl) and plasma steady state concentration ($C_{p_{ss}}$):

$$R_E = Cl \times C_{p_{ss}}$$

The rate of administration of the drug (R_A) is the dose divided by the time between doses i.e. the dosing interval (τ):

$$R_A = \frac{\text{Dose}}{\tau}$$

Bioavailability and salt conversion factor are both 1 so do not need to be taken into account. Since in a steady state R_A and R_E are equal we can write:

$$\frac{\text{Dose}}{\tau} = Cl \times C_{p_{ss}}$$

which can be rearranged to give an expression for dose:

$$\text{Dose} = Cl \times C_{p_{ss}} \times \tau$$

12 • ACP News Issue 512 • December 2005

Questions MRCPath Short Questions MRCPath Short Questions

The clearance is given as 5 mL of plasma/h/Kg body weight but since concentration of the drug in plasma is given in mg per litre and the patient weighs 60 Kg it needs to be converted to litres of plasma/h/60 Kg. Therefore, divide the clearance by 1000 (to convert from mL to L) and multiply by 60:

$$Cl = \frac{5 \times 60}{1000} = 0.3 \text{ L/h/60 Kg}$$

Substitute this value for clearance and $C_{p_{ss}} = 25 \text{ mg/L}$ and $\tau = 12 \text{ h}$ to obtain the dose:

$$\text{Dose} = 0.3 \times 25 \times 12 = 90 \text{ mg}$$

Question 58

*** Christmas Special ***

The sales manager of a diagnostics company gives an area rep a crate containing 24 bottles of wine to distribute to his customers on Christmas Eve. The rep, being an enterprising fellow, decides to distribute the wine according to the number of orders placed by each lab. He decides to give a bottle of wine for each 100 packs of reagents purchased over the preceding year. He gives lab B twice as many bottles as lab A, lab C one less than lab B, lab D the same number as lab B and lab E twice as many as lab C. When he gets to lab F he decides to keep two bottles for himself and give this lab one bottle less than they are due. How many packs of reagent did he sell over the year?