

PHA 5127 (Fall, 2008)

Case Study #4

Q1. For the following situations, indicate whether the drug is: filtered, reabsorbed, actively secreted, or reabsorbed through transporters ((Assume GFR is 130 mL min^{-1} , urine flow is 1.5 ml min^{-1})

a). A drug with $f_u = 0.02$ and a $Cl_{REN} = 20 \text{ mL min}^{-1}$

$$Cl_{REN} = 20 \text{ mL} > f_u * GFR = 2.6 \text{ mL min}^{-1} \Rightarrow \text{actively secreted}$$

b). A drug with $f_u = 0.40$ and a $Cl_{REN} = 52 \text{ mL min}^{-1}$

$$Cl_{REN} = 52 \text{ mL min}^{-1} = f_u * GFR = 52 \text{ mL min}^{-1} \Rightarrow \text{filtered}$$

c). A drug with $f_u = 0.60$ and a $Cl_{REN} = 0.9 \text{ mL min}^{-1}$

$$Cl_{REN} = 0.9 \text{ mL min}^{-1} < f_u * GFR = 98 \text{ mL min}^{-1} \Rightarrow \text{reabsorbed}$$

$$Cl_{REN} = 0.9 \text{ mL min}^{-1} = f_u * \text{urine flow} = 0.9 \text{ mL min}^{-1} \Rightarrow \text{reabsorbed through passive diffusion}$$

d). A drug with $f_u = 1.0$ and a $Cl_{REN} = 0.3 \text{ mL min}^{-1}$

$$Cl_{REN} = 0.3 \text{ mL min}^{-1} < f_u * GFR = 130 \text{ mL min}^{-1} \Rightarrow \text{reabsorbed}$$

$$Cl_{REN} = 0.3 \text{ mL min}^{-1} < f_u * \text{urine flow} = 1.5 \text{ mL min}^{-1} \Rightarrow \text{reabsorbed through transporters}$$

Q2. A male patient is 5 ft 10 inches tall, 40 years old, and weights 80 kg. His serum creatinine is 1.5 mg/dl. Please estimate his GFR.

$$IBW = 50 + 2.3 \bullet 10 = 73 \text{ kg}$$

$$TBW = 80 \text{ kg} < 120\% IBW \Rightarrow \text{not an obese patient} \therefore \text{use IBW}$$

$$GFR = CrCL = \frac{(140 - 40) \bullet 73}{72 \bullet 1.5} = 68 \text{ ml / min}$$

Q3. Mark each of the following statements True or False.

- T **F** The maximum value of renal clearance can not exceed the glomerula filtration rate.
- T **F** The renal clearance of a drug (as determined by filtration and reabsorbtion) always depends on the tissue binding of the drug.
- T **F** Drinking a lot of water (urine flow is doubled) will increase significantly the renal clearance of aminoglycocsides.
- T **F** For an acidic drug with a pka of 1.0, adjustment of the urine pH within physiological ranges will significantly change the renal clearance.
- T **F** To determine the clearance of a drug, one needs to know whether the drug is a one or two compartment drug.
- T **F** Since creatinine is endogenous and predominantly eliminated by kidney, its clearance is a good estimation of renal active secretion.
- T **F** The larger the volume of distribution, the smaller the AUC of a given drug.

Q4. Define the term linear pharmacokinetics.

- no saturation of binding sites (linear protein binding)
- no saturation of enzymes or transporters
- CL and Vd are independent of dose
- AUC and C_t changed proportionally with drug dose change