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Calculation Skills: Whitlow

A whitlow, also known as a felon, is a closed space infection of the distal finger pulp (Franko and Abrams, 2013), commonly presenting as redness, tenderness and swelling (NICE, 2016). McDonald et al (2011) state that the most common cause of infection to the hand area is staphylococcus aureus, and causes up to 80% of staphylococcal whitlows (NICE, 2016). Whitlows can also be caused by the herpes virus and are known as herpetic whitlows, with symptoms often also including blistering (NHS, 2017).

No UK data is available but data from America suggests that staphylococcal whitlow (including paronychia), accounts for a third of hand infections, whilst the prevalence of herpetic whitlow is 2.4 per 100,000 annually (NICE, 2017).

Question 1

Referring to table 1 and assuming that the American figures reflect the UK prevalence of herpetic whitlow, answer the following questions:

- (i) How many cases of staphylococcal whitlow would you expect to have seen in town E in 2017?
- (ii) What would you expect the combined annual prevalence of herpetic whitlow to be in towns A, B and C to be? Round your answer up or down to the nearest whole number.
- (iii) In which town did 0.12% (rounded to two decimal points) of its population have a hand infection in 2017?

Table 1: Incidence of hand infection		
UK Town	Population	2017 cases of hand infection
A	20,700	6
B	6,700	3
C	61,600	24
D	37,700	18
E	12,400	15

Question 2

NICE (2016) recommend the treatment regime identified in table 2, for staphylococcal whitlow.

- (i) Rupert, aged 21 years, has a staphylococcal whitlow and is prescribed flucloxacillin. He is prescribed the highest recommended dose. Both 250mg and 500mg capsules are available. Prescribing the fewest number of capsules, how many will need to be prescribed to complete the 7 day course?
- (ii) Sally is 4 years old and weighs 16kg. She is prescribed clarithromycin. What daily dose will Sally require?
- (iii) Abigail is a 30 year old breastfeeding mother who is allergic to penicillin. She is prescribed the lowest recommended dose of erythromycin for a whitlow. How much erythromycin (in grams) will she have taken on completion of the 10 day course?
- (iv) Tom is a 7kg infant, what is the daily dose of clarithromycin that he would need?

Table 2: Recommended treatment regimen			
	Drug	Age	Dose
First Line	Flucloxacillin	Adults & children over 10 years	250mg to 500mg, four times a day
		Children 2-10 years	125 mg to 250 mg, four times a day
		Children 1 month to 2 years	62.5 mg to 125 mg, four times a day
Alternative if allergic to penicillin	Clarithromycin	Adults and children older than 12 years	250 mg to 500 mg, twice daily
		Children 1 month to 12 years according to body weight:	
		less than 8 kg	7.5 mg per kg twice daily
		8–11 kg	62.5 mg twice daily
		12–19 kg	125 mg twice daily
		20–29 kg	187.5 mg twice daily
		30–40 kg	250 mg twice daily
Alternative if allergic to penicillin / and if breastfeeding	Erythromycin	Adults and children older than 8 years	250 mg to 500 mg, four times a day
		Children 2–8 years	250 mg, four times a day
		Children 1 month to 2 years	125 mg, four times a day

Question 3

Stan has a recurring herpetic whitlow and is to be treated with acyclovir as it is less than 48hours since the whitlow developed. The recommended dose is 200mg, five times daily, for five days but because he is immunosuppressed, the dose is to be doubled. Due to swallowing difficulties, he is prescribed oral suspension 200mg/5ml.

- (i) What amount of oral suspension is needed for a daily dose?
- (ii) How much oral suspension will need to be prescribed to enable the duration of the course to be extended by 40%?

Question 4

Public Health England (2015) wants to reduce antimicrobial resistance, with a reduction in the prescribing of antibiotics identified as one of the key strategies. They reported a 6.5% increase in antibiotic consumption over a 4 year period, expressed as a defined daily dose (DDD) per 1000 of the population.

- (i) Assuming the increase was consistent over the 4 year period, what percentage would the increase have been over the first 6 months? (rounded up or down to one decimal point).
- (ii) The defined daily dose (DDD) of antibiotics per 1000 people was 21.6 in 2011. What was the DDD in 2015? (rounded up or down to the nearest whole number)
- (iii) Assuming a 5% drop in antibiotic consumption from the 2015 DDD by 2020, what will the 2020 DDD be?

Answers

Question 1

- (i) $15 \div 3 = 5$
- (ii) Prevalence rate = $2.4/100,000$ or $0.0024/100 = 0.0024\%$
 Combined population = 89,000
 $89,000 \div 100 \times 0.0024 = 2.136$
 annual prevalence = 2 (rounded down)
- (iii) Town A = $6 \div 20,700 \times 100 = 0.03$
 Town B = $3 \div 6,700 \times 100 = 0.05$
 Town C = $24 \div 61,600 \times 100 = 0.04$
 Town D = $18 \div 37,700 \times 100 = 0.05$
 Town E = $15 \div 12,400 \times 100 = 0.12$
 Answer is town E

Question 2

- (i) Course = $(500\text{mg} \times 4) \times 7 = 14000\text{mg}$
 $14000 \div 500 = 28$ capsules
- (ii) $125\text{mg} \times 2 = 250\text{mg}$
- (iii) Course = $(250\text{mg} \times 4) \times 10 = 10000\text{mg} / 10\text{g}$

$$(iv) \quad (7.5 \times 7) \times 2 = 105\text{mg}$$

Question 3

Stan has a recurring herpetic whitlow and is to be treated with acyclovir as it is less than 48 hours since the whitlow developed. The recommended dose is 200mg, five times daily, for five days but because he is immunosuppressed, the dose is to be doubled. Due to swallowing difficulties, he is prescribed oral suspension 200mg/5ml.

$$(i) \quad \text{Daily dose} = 400 \text{ mg} \times 5 = 2000 \text{ mg}$$

$$2000 \quad 200 \times 5 = 50\text{mls}$$

$$(ii) \quad \text{Normal course} = 5 \text{ days}$$

$$40\% = \frac{5}{100} \times 40 = 2 \text{ days}$$

$$\text{Extended course} = 2 + 5 = 7 \text{ days}$$

$$50\text{ml} \times 7 = 350\text{ml}$$

Question 4

Public Health England (2015) wants to reduce antimicrobial resistance, with a reduction in the prescribing of antibiotics identified as one of the key strategies. They reported a 6.5% increase in antibiotic consumption over a 4 year period.

$$(i) \quad 6.5\% \text{ over 4 years} = 0.8\% \text{ over 6 months (rounded down)}$$

$$(ii) \quad (21.6 \div 100) \times 6.5 = 1.404 \quad 21.6 + 1.404 = 23.04 \quad 23 \text{ (rounded down)}$$

$$(iii) \quad 2015 = 23 \quad 5\% = (23 \div 100) \times 5 = 1.15 \quad 23 - 1.15 = 21.85$$

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