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Calculation Skills: Dyspepsia with unidentified cause

Dyspepsia is defined by NICE (2014) as ‘a complex of upper gastrointestinal tract symptoms which are typically present for four or more weeks’. These symptoms typically include heartburn, nausea, vomiting, acid reflux and upper abdominal discomfort, with up to 40% of the UK population affected annually (NICE, 2014). A systematic review undertaken by Ford et al (2015) found a higher prevalence amongst active smokers, women and those using NSAIDs.

Lifestyle factors should be considered as part of the management of dyspepsia, with strategies such as weight loss, stress reduction, reduction of alcohol intake, avoidance of potential trigger foods (such as coffee, fatty or spicy foods) and smoking cessation identified as having the potential to reduce symptoms (NICE, 2017).

Question 1

Michael is a 49 year old company director, who has presented with symptoms of dyspepsia. He is average weight, smokes 30 cigarettes per day, drinks one and a half bottles of red wine* per day and works on average, 60 hours per week without a lunch break. He is advised to reduce his alcohol intake, consider stress management techniques and is offered support with smoking cessation. At his follow-up appointment, Michael has reduced the number of cigarettes he smokes by 35%, reduced his alcohol intake to 14 units per week, and has ensured that he only works between 8am and 6pm Monday to Friday, taking a 1 hour lunch break.

*Michael’s preferred red wine contains 10 units of alcohol per 750ml bottle.

- (i) How many cigarettes does Michael now smoke per week (rounded up or down to the nearest whole number)?
- (ii) By what percentage has he reduced his alcohol consumption (rounded to 1 decimal point)?
- (iii) How many bottles of wine is Michael now drinking?
- (iv) By what percentage has he reduced his work hours?

Question 2

In line with NICE (2017) guidelines, Michael is to be prescribed one of the proton pump inhibitors (PPI) identified in table 1, at full-dose for 1 month.

PPI	Full dose	Cost for 28 pack of full-dose tablets
Omeprazole	20 mg once a day	£0.58
Lansoprazole	30 mg once a day	£0.57
Pantoprazole	40 mg once a day	£0.62
Rabeprazole	20 mg once a day	£0.99
Esomeprazole	20 mg once a day	£2.64

- (i) On the basis of the information in table 1, what is the average cost of treatment of dyspepsia with a PPI for 12 months, (assuming that the incidence of the drug being prescribed is the same for all five drugs)? Assume 28 tablets as one month's supply.
- (ii) How much more expensive (as a %) is the most expensive treatment than the least expensive treatment?

Question 3

As Michael's symptoms persisted, he was tested for *Helicobacter pylori* infection. The test results were positive and he is to be commenced on the following 7-day triple therapy regimen in line with NICE (2017) guidelines:

- esomeprazole 20 mg twice-daily and
- amoxicillin 1 g twice-daily and
- clarithromycin 500 mg twice-daily

Amoxicillin = £0.78 for 21 pack of 500mg capsules, clarithromycin = £1.95 for 14 pack of 500mg tablets.

- (i) Based on the price per tablets/capsule, what is the total cost of the seven day treatment
- (ii) Using metronidazole 400 mg twice-daily instead of clarithromycin 500 mg twice-daily would make the overall cost £0.49 more expensive. What is the price of one 400mg metronidazole tablet?

Metronidazole costs £3.67 for 21 400mg tablets

Answers

Question 1

- (i) $30 \div 100 = 0.3$
 $0.3 \times 65 = 19.5$
 20 (rounded up to the nearest whole number)
- (ii) 1.5 bottles per day
 $1.5 \times 10 = 15$ units per day
 $15 \times 7 = 105$ units per week
 $105 - 14 = 91$
 $(91 \div 105) \times 100 = 86.7\%$ (rounded to 1dp)
- (iii) $14 \div 10 = 1.4$ bottles per week
- (iv) $10 \times 5 = 50$ hours per week
 minus lunch breaks = $50 - 5 = 45$
 $60 \text{ hrs} - 45 \text{ hrs} = 15 \text{ hrs}$
 $15 \div 60 = 0.25 \times 100 = 25\%$

Question 2

- (i) $0.58 \times 12 = 6.96$
 $0.57 \times 12 = 6.84$
 $0.62 \times 12 = 7.44$
 $0.99 \times 12 = 11.88$
 $2.64 \times 12 = 31.68$
 $(6.96 + 6.84 + 7.44 + 11.88 + 31.68) \div 5 = \text{£}12.96$
- (ii) $2.64 \div 0.57 = 4.63 \times 100 = 463\%$

Question 3

- (i) 7 days esomeprazole (14 tablets) = $2.64 \div 2 = \text{£}1.32$
7 days amoxicillin (28 capsules) = $0.78 \div 3 = 0.26 \times 4 = \text{£}1.04$
7 days clarithromycin (14 tablets) = $\text{£}1.95$
 $1.32 + 1.04 + 1.95 = \text{£}4.31$

(ii) Overall cost of new triple therapy (with metronidazole instead of clarithromycin) has increased by $\text{£}0.49$. As the only drug changed is clarithromycin, this increased cost applies to the replacement of that drug. Therefore, cost of 7 days treatment with metronidazole = $\text{£}1.95 + \text{£}0.49 = \text{£}2.44$

Cost of 1 metronidazole tablet = $\text{£}2.44 \div 14$ (tablets) = $\text{£}0.17$

References

Ford, A., Marwaha, A., Sood, R., & Moayyedi, P. (2015). Global prevalence of, and risk factors for, uninvestigated dyspepsia: a meta-analysis. *Gut*, 64(7), 1049–1057. doi:10.1136/gutjnl-2014-307843

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