

Case Study for Math Calculations

MR is a 74 y/o male who presented with persistent mild cough, concerning for recurrent sinus malignancy. Work-up revealed a new malignancy: T4N1 non-small cell lung cancer. The plan is to begin definitive chemoradiotherapy. He is now presenting to you for his first dose of chemo. You obtain the following information:

- Weight: 77 kg
- Height: 5'9"
- BP: 149 / 65 P: 71 RR: 18 T: 97.8 F

Lab Test	MR's Lab Values	Reference Range
CBC		
WBC	6.3 x 10 ³ /cu mm	(3.8 - 10.6 x 10 ³ /cu mm)
Differential:		
Basophils	0 %	(0 -1%)
Eosinophils	3.8 %	(0 - 6%)
Lymphocytes	14 %	(13 - 44%)
Monocytes	9.5 %	(4 - 13%)
Neutrophils:		
Bands	0%	(0%)
Segmented	71.3%	(40 - 60%)
Platelets	302 K	(156 -369K)
Hgb	8.3 gm/dl	(13 - 17 gm/dl)
Hct	25.1 %	(38 - 48%)
 Chemistry		
Na+	139 mEq/L	(136 - 146)
K+	3.5 mEq/L	(3.5 - 5.0)
Cl-	109 mEq/L	(98 - 107)
Phos	3.2 mg/dl	(2.5 - 4.6)
Glucose	145 mg/dl	(70 - 99)
BUN	15 mg/dl	(8 - 26)
Cr	0.9 mg/dl	(0.5 - 1.4)
Mg	2.0 mEq/L	(1.6 - 2.3)

Calculate MR's ANC:

$$\text{ANC} = \frac{(\% \text{ neutrophils} + \% \text{ bands}) \times \text{WBC}}{100}$$

Show your work:

$$\text{ANC} = (71.3 + 0) \times 6300$$

$$\text{ANC} = 0.713 \times 6300$$

$$\text{ANC} = 4,492$$

Is patient neutropenic? (circle answer) Yes No
If yes, who and how neutropenic is the patient?

Let's do another:

Lab Test	Lab Values	Reference Range
CBC		
WBC	0.9 x 10 ³ /cu mm	(3.8 - 10.6 x 10 ³ /cu mm)
Differential:		
Basophils	0 %	(0 - 1%)
Eosinophils	0 %	(0 - 6%)
Lymphocytes	2 %	(13 - 44%)
Monocytes	10 %	(4 - 13%)
Neutrophils:		
Bands	2%	(0%)
Segmented	84%	(40 - 60%)
Platelets	10 K	(156 -369K)
Hgb	7.8 gm/dl	(13 - 17 gm/dl)
Hct	22 %	(38 - 48%)

Calculate ANC:

$$\text{ANC} = \frac{(\% \text{ neutrophils} + \% \text{ bands})}{100} \times \text{WBC}$$

Show your work:

$$\begin{aligned} \text{ANC} &= (84 + 2) \times 900 \\ \text{ANC} &= (0.86) \times 900 \\ \text{ANC} &= 774 \end{aligned}$$

Is patient neutropenic? (circle answer) Yes No
 If yes, who and how neutropenic is the patient?

Grade 3

The physician orders weekly nab-paclitaxel (Abraxane) 40mg/m² and carboplatin (Paraplatin) with an AUC 2 for the patient to receive with CRT. The physician calculates MR's drug doses at:

- nab-paclitaxel (Abraxane): 75 mg
- carboplatin (Paraplatin): 207 mg

The physician hand you MR's orders to check. You must calculate MR's drug doses for nab-paclitaxel and carboplatin.

Calculate MR's BSA: 77kg 169lbs 69in 175cm

Pounds = Kg x 2.2

Kilograms = lbs ÷ 2.2

Inches = cm ÷ 2.54

centimeters = in x 2.54

$$\text{BSA (m}^2\text{)} = \sqrt{\frac{(\text{inches}) \times \text{weight (lbs)}}{3131}}$$

$$\sqrt{\frac{\text{height (cm)} \times \text{weight (Kg)}}{3600}}$$

Show your work:

$$\begin{aligned} \text{lbs} &= 77 \times 2.2 \\ \text{lbs} &= 169.4 \end{aligned}$$

$$\begin{aligned} \text{cm} &= 69 \times 2.54 \\ \text{cm} &= 175 \end{aligned}$$

$$\text{BSA} = \sqrt{\frac{69 \times 169}{3131}}$$

$$\text{BSA} = \sqrt{\frac{175 \times 77}{3600}}$$

$$\text{BSA} = \sqrt{\frac{11661}{3131}}$$

$$\text{BSA} = \sqrt{\frac{13475}{3600}}$$

$$\text{BSA} = \sqrt{3.7243}$$

$$\text{BSA} = 1.93$$

$$\text{BSA} = \sqrt{3.7430}$$

$$\text{BSA} = 1.93$$

Calculate MR's nab-paclitaxel dose:

$$\text{Drug dose} = \text{ordered dose} \times \text{BSA}$$

Show your work:

$$\begin{aligned} \text{dose} &= 40 \times 1.93 \\ \text{dose} &= 77 \text{ mg} \end{aligned}$$

You determine that your dose is not the same as the dose the physician ordered. You must follow the 10% rule to determine if the written dose (dose calculated by the physician) is safe to administer.

Calculate the 10% rule:

Method 1:

$$\text{Upper Limit} = \text{your dose} \times 1.10$$

$$\text{Lower Limit} = \text{your dose} \times 0.90$$

Method 2:

$$10\% = \text{your dose} \times 0.1$$

$$\text{Upper Limit} = \text{your dose} + 10\%$$

$$\text{Lower limit} = \text{your dose} - 10\%$$

Show your work:

$$UL = 77 \times 1.10$$

$$LL = 77 \times 0.90$$

$$UL = 84.7$$

$$LL = 69.3$$

$$10\% = 77 \times 0.1$$

$$10\% = 7.7$$

$$UL = 77 + 7.7$$

$$LL = 77 - 7.7$$

$$UL = 84.7$$

$$LL = 69.3$$

The safe administration range is 69.3 mg - 84.7 mg.

Is the physician's dose safe to administer (circle your answer) Yes No

Calculate MR's carboplatin dose:

$$\text{Male CrCl} = \left(\frac{(140 - \text{age}) \times \text{Weight in Kilograms}}{72 \times \text{Serum Creatinine}} \right)$$

Calvert Formula

$$\text{Dose in mg} = \text{AUC} \times (\text{CrCl} + 25)$$

Show your work:

$$\text{male crcl} = \left(\frac{(140 - 74) \times 77}{72 \times 0.9} \right)$$

$$\text{crcl} = \left(\frac{66 \times 77}{64.8} \right)$$

$$\text{crcl} = \frac{5082}{64.8}$$

$$\text{crcl} = 78.4$$

$$\text{dose} = \text{AUC} \times (\text{crcl} + 25)$$

$$= 2 \times (78 + 25)$$

$$= 2 \times (103)$$

$$\text{male dose} = 206$$

Female

$$\text{crcl} = \left(\frac{(140 - 74) \times 77}{72 \times 0.9} \right) \times 0.85$$

$$\text{crcl} = \left(\frac{66 \times 77}{64.8} \right) \times 0.85$$

$$\text{crcl} = \left(\frac{5082}{64.8} \right) \times 0.85$$

$$\text{crcl} = 78.4 \times 0.85$$

$$\text{crcl} = 66.6$$

$$\text{Dose} = 2(67 + 25)$$

$$\text{dose} = 2(92)$$

$$\text{Female dose} = 184$$

What would MR's carboplatin dose be if he were a female? 184