Chapter 7: Methods of Calculation for Individualized Drug Dosing

OTHER

Body Surface Area by Square Root

1. Order: cyclophosphamide 500 mg/m$^2$ in 500 mL of normal saline solution (NSS) over 90 minutes
   Patient height and weight: 5 ft 10 in, 142 lb
   Drug available: cyclophosphamide 100 mg dilute with 5 mL of sterile water; yields 20 mg/mL
   a. What is the patient’s body surface area (BSA) (m$^2$)?
   b. What is the total dose?
   c. How many milliliters should you prepare?

   ANS:
   a. \[ \sqrt{\frac{70 \times 142}{3131}} = 1.78 \text{ m}^2 \]
   b. 500 mg/m$^2$ \[ 1.78 \text{ m}^2 = 890 \text{ mg} \]
   c. FE: 890 mg/100 mg \[ 5 \text{ mL} = 44.5 \text{ mL} \]

   OR
   \[
   BF: \frac{D}{H} \times \frac{890 \text{ mg}}{100 \text{ mg}} \times 5 \text{ mL} = 44.5 \text{ mL}
   \]

2. Order: cisplatin 50 mg/m$^2$ in 500 mL of NSS intravenously over 90 minutes
   Patient height and weight: 5 ft 6 in, 160 lb
   Drug available: cisplatin 100 mg/100 mL
   a. What is the patient’s BSA (m$^2$)?
   b. What is the total dose?
   c. How many milliliters should you prepare?

   ANS:
   a. \[ \sqrt{\frac{66 \times 160}{3131}} = 1.83 \text{ m}^2 \]
   b. 50 mg \[ 1.83 \text{ m}^2 = 91.5 \text{ mg} \]
   c. FE: 91.5 mg/100 mg \[ 100 \text{ mL} = 91.5 \text{ mL} \text{ or } 92 \text{ mL} \]

   OR
   \[
   BF: \frac{D}{H} \times \frac{91.5 \text{ mg}}{100 \text{ mg}} \times 100 = 91.5 \text{ mL}
   \]
For Questions 3 through 18, use the square root method and/or nomogram. Note discrepancies between methods.

3. Give dacarbazine 250 mg/m²/day 5 days.
   Patient height: 5 ft 10 in
   Patient weight: 173 lb What
   is the daily dose with:
   a. square root method?
   b. nomogram?

   ANS:
   a. \( \sqrt{\frac{70 \times 173}{3131}} = \sqrt{3.8677} = 1.96 \text{ m}^2 \)
   \( 250 \text{ mg/m}^2/\text{day} \times 1.96 \text{ m}^2 = 490 \text{ mg/day} \)

   b. Height 70 in, weight 173 lb, intersects 2.02 m²
   \( 250 \text{ mg/m}^2/\text{day} \times 2.02 \text{ m}^2 = 505 \text{ 500 mg/day} \)

4. Give 5-fluorouracil 450 mg/m²/wk. Patient height: 5 ft 6 in
Patient weight: 210 lb
What is the weekly dose with:
   a. square root method?
   b. nomogram?

ANS:
   a. $\sqrt{\frac{66 \times 210}{3131}} = \sqrt{4.4267} = 2.10 \, \text{m}^2$
   
   450 mg/m$^2$/wk $\times 2.10 \, \text{m}^2 = 945 \, \text{mg/wk}$

   b. Height 66 in, weight 210 lb, intersects 2.04 m$^2$
   
   450 mg/m$^2$/wk $\times 2.04 \, \text{m}^2 = 918 \, \text{mg/wk}$

5. Give leucovorin 200 mg/m$^2$/wk. Patient height: 5 ft 6 in
   Patient weight: 210 lb
   What is the weekly dose with:
   a. square root method?
   b. nomogram?

ANS:

   $80 \, \text{kg} \times 2.2 = 176 \, \text{lb}$

   a. $\sqrt{\frac{66 \times 210}{3131}} = \sqrt{4.4267} = 2.10 \, \text{m}^2$
   
   200 mg/m$^2$/wk $\times 2.10 \, \text{m}^2 = 420 \, \text{mg/wk}$

   b. Height 66 in, weight 210 lb, intersects 2.04 m$^2$
   
   200 mg/m$^2$/wk $\times 2.04 \, \text{m}^2 = 408.00 \, \text{mg/wk}$

6. Give cisplatin 30 mg/m$^2$/day 3 days.
   Patient height: 70 in
   Patient weight: 80 kg
   What is the daily dose with:
   a. square root method?
   b. nomogram?

ANS:

   $80 \, \text{kg} \times 2.2 = 176 \, \text{lb}$

   a. $\sqrt{\frac{70 \times 176}{3131}} = \sqrt{3.93} = 1.98 \, \text{m}^2$

   30 mg/m$^2$/day $\times 1.98 \, \text{m}^2 = 59.4 \approx 59 \, \text{mg/day}$

   b. Height 70 in, weight 80 kg, intersects 2.08 m$^2$
   
   30 mg/m$^2$/day $\times 2.08 \, \text{m}^2 = 62.4 \, \text{mg/day}$

7. Give cisplatinum 80 mg/m$^2$/wk. Patient height: 6 ft 2 in
   Patient weight: 186 lb
   What is the weekly dose with:
   a. square root method?
b. nomogram?

ANS:
\[
\begin{align*}
a. & \sqrt[2]{\frac{74 \times 186}{3131}} = \sqrt[2]{4.39} = 2.09 \text{ m}^2 \\
& 80 \text{ mg/m}^2/\text{wk} \quad 2.09 \text{ m}^2 = 167.2 \text{ mg/wk} \\

b. & \text{Height 74 in, weight 186 lb, intersects } 2.10 \text{ m}^2 \\
& 80 \text{ mg/m}^2/\text{wk} \quad 2.10 \text{ m}^2 = 168 \quad 170 \text{ mg/wk}
\end{align*}
\]

8. Give etoposide 120 mg/m^2/wk. 
Patient height: 74 in 
Patient weight: 70 kg 
What is the weekly dose with: 
a. square root method?  
b. nomogram?

ANS:
\[
\begin{align*}
a. & 70 \text{ kg } 2.2 = 154 \text{ lb} \\
& \sqrt{\frac{74 \times 154}{3131}} = \sqrt{3.639} = 1.90 \text{ m}^2 \\
& 120 \text{ mg/m}^2/\text{wk} \quad 1.90 \text{ m}^2 = 228 \text{ mg/wk} \\

b. & \text{Height 74 in, weight 70 kg, intersects } 2.06 \text{ m}^2 \\
& 120 \text{ mg/m}^2/\text{wk} \quad 2.06 \text{ m}^2 = 247.2 \quad 250 \text{ mg/wk}
\end{align*}
\]

9. Give Cytoxan 600 mg/m^2/wk. Patient height: 70 in 
Patient weight: 85 kg 
What is the weekly dose with: 
a. square root method?  
b. nomogram?

ANS:
\[
\begin{align*}
a. & 85 \text{ kg } 2.2 = 187 \text{ lb} \\
& \sqrt{\frac{70 \times 187}{3131}} = \sqrt{4.18} = 2.04 \text{ m}^2 \\
& 600 \text{ mg/m}^2/\text{wk} \quad 2.04 \text{ m}^2 = 1224 \text{ or } 1225 \text{ mg/wk} \\

b. & \text{Height 70 in, weight 85 kg, intersects } 2.08 \text{ m}^2 \\
& 600 \text{ mg/m}^2/\text{wk} \quad 2.08 \text{ m}^2 = 1248 \quad 1250 \text{ mg/wk}
\end{align*}
\]

10. Give Adriamycin 60 mg/m^2/wk. 
Patient height: 70 in 
Patient weight: 80 kg 
What is the weekly dose with: 
a. square root method?  
b. nomogram?

ANS:
\[
\begin{align*}
a. & 80 \text{ kg } 2.2 = 176 \text{ lb}
\end{align*}
\]
\[ \sqrt{\frac{70 \times 176}{3131}} = \sqrt{3.93} = 1.98 \text{ m}^2 \]

60 mg/m²/wk \hspace{1em} 1.98 m² = 118 mg/wk

b. Height 70 in, weight 85 kg, intersects 2.08 m²
60 mg/m²/wk \hspace{1em} 2.08 m² = 124.8 \hspace{1em} 125 mg/wk

11. Give vincristine 2 mg/m²/week.
Patient height: 62 in
Patient weight: 75 kg
What is the weekly dose with:
a. square root method?
b. nomogram?

ANS:
a. 75 kg \hspace{1em} 2.2 = 165 lb
\[ \sqrt{\frac{62 \times 165}{3131}} = \sqrt{3.26} = 1.80 \text{ m}^2 \]
2 mg/m²/wk \hspace{1em} 1.80 m² = 3.6 mg/wk

b. Height 62 in, weight 75 kg, intersects 1.78 m²
2 mg/m²/wk \hspace{1em} 1.78 m² = 3.56 \hspace{1em} 3.6 mg/wk

12. Give mitomycin 15 mg/m²/week.
Patient height: 65 in
Patient weight: 64 kg
What is the weekly dose with:
a. square root method?
b. nomogram?

ANS:
a. 64 kg \hspace{1em} 2.2 = 140.8 or 141 lb
\[ \sqrt{\frac{65 \times 141}{3131}} = \sqrt{2.927} = 1.71 \text{ m}^2 \]
15 mg/m²/wk \hspace{1em} 1.71 m² = 25.6 or 26 mg/wk

b. Height 65 in, weight 64 kg, intersects 1.75 m²
15 mg/m²/wk \hspace{1em} 1.75 m² = 26.25 \hspace{1em} 26 mg/wk

13. Give mitoxantrone 12 mg/m²/day 3 days.
Patient height: 5 ft 8 in
Patient weight: 150 lb
What is the daily dose with:
a. square root method?
b. nomogram?

ANS:
a. \[ \sqrt{\frac{68 \times 150}{3131}} = \sqrt{3.25} = 1.8 \text{ m}^2 \]
12 mg/m²/day \hspace{1em} 1.80 m² = 21.6 or 22 mg/day
b. Height 68 in, weight 150 lb, intersects 1.85 m²
12 mg/m²/day  1.85 m² = 22.2  22 mg/day

14. Give cytosine arabinoside 100 mg/m²/day 7 days.
Patient height: 5 ft 2 in
Patient weight: 130 lb
What is the weekly dose with:
  a. square root method?
  b. nomogram?

ANS:
  a. \( \sqrt{\frac{62 \times 130}{3131}} = \sqrt{2.57} = 1.6 \text{ m}^2 \)
    100 mg/m²/day  1.6 m² = 160 mg/day
  b. Height 62 in, weight 130 lb, intersects 1.65 m²
    100 mg/m²/day  1.65 m² = 165 mg/day

15. Give methotrexate 3.3 mg/m²/day 7 days.
Patient height: 72 in
Patient weight: 82 kg
What is the daily dose with:
  a. square root method?
  b. nomogram?

ANS:
  a. 82 kg  2.2 = 180.4 lb
    \( \sqrt{\frac{72 \times 180.4}{3131}} = \sqrt{4.148} = 2 \text{ m}^2 \)
    3.3 mg/m²/day  2 m² = 6.6 mg/day
  b. Height 72 in, weight 82 kg, intersects 2.10 m²
    3.3 mg/m²/day  2.10 m² = 6.93  6.9 mg/day

16. Give prednisone 60 mg/m²/day 7 days.
Patient height: 72 in
Patient weight: 84 kg
What is the daily dose with:
  a. square root method?
  b. nomogram?

ANS:
  a. 84 kg  2.2 = 184.8 or 185 lb
    \( \sqrt{\frac{72 \times 185}{3131}} = \sqrt{4.25} = 2.06 \text{ m}^2 \)
    60 mg/m²/day  2.06 m² = 123.7 or 124 mg/day
  b. Height 72 in, weight 84 kg, intersects 2.10 m²
    60 mg/m²/day  2.10 m² = 126 mg/day

17. Give idarubicin hydrochloride 12 mg/m²/day 3 days.
Patient height: 60 in
Patient weight: 60 kg
What is the daily dose with:
a. square root method?
b. nomogram?

ANS:
a. $60 \text{ kg} \times 2.2 = 132 \text{ lb}$
$$\sqrt{\frac{60 \times 132}{3131}} = \sqrt{2.529} = 1.59 \text{ m}^2$$
$12 \text{ mg/m}^2/\text{day} \times 1.59 \text{ m}^2 = 19.1 \text{ or 19 mg/day}$
b. Height 60 in, weight 60 kg, intersects 1.60 m$^2$
$12 \text{ mg/m}^2/\text{day} \times 1.60 \text{ m}^2 = 19 \text{ mg/day}$

18. Give cytarabine 100 mg/m$^2$/day 7 days.
Patient height: 64 in
Patient weight: 65 kg
What is the daily dose with:
a. square root method?
b. nomogram?

ANS:
a. $65 \text{ kg} \times 2.2 = 143 \text{ lb}$
$$\sqrt{\frac{64 \times 143}{3131}} = \sqrt{2.92} = 1.7 \text{ m}^2$$
$100 \text{ mg/m}^2/\text{day} \times 1.7 \text{ m}^2 = 170 \text{ mg/day}$
b. Height 64 in, weight 60 kg, intersects 1.69 m$^2$
$100 \text{ mg/m}^2/\text{day} \times 1.69 \text{ m}^2 = 169 \text{ mg/day}$

19. Order: streptozocin 1000 mg/m$^2$ in 100 mL D5W over 2 hours
Patient's height and weight: 5 ft 2 in and 210 lb
Drug available: streptozocin 1 g powdered vial, reconstitute with 9.5 mL NS; yields 100 mg/mL
a. What is the patient's BSA (m$^2$)?
b. What is the total dose?
c. How many milliliters should you prepare?

ANS:
a. $\sqrt{\frac{62 \times 210}{3131}} = \sqrt{\frac{13020}{3131}} = \sqrt{4.158} = 2.04 \text{ m}^2$
b. $2.04 \text{ m}^2 \times 1000 \text{ mg/m}^2 = 2040 \text{ mg}$
$$\text{BF:} \frac{D}{H} \times V = \frac{2040 \text{ mg}}{100 \text{ mg} \times 1 \text{ mL}} = 20.4 \text{ mL}$$
c.

20. Order: methotrexate 3 mg/m$^2$ PO 2 weekly
Patient's height and weight: 5 ft 2 in and 130 lb
Drug available: methotrexate tablets 2.5 mg, 5 mg, 7.5 mg
a. What is the patient's BSA (m$^2$)?
b. What is the total dose?

ANS:

\[
\frac{\sqrt{62 \times 130}}{3\sqrt{3131}} = \frac{\sqrt{8060}}{3\sqrt{3131}} = \sqrt{2.57} = 1.60 \text{ m}^2
\]

b. 1.6 m\(^2\) \times 3 \text{ mg/m}^2 = 4.80 \text{ mg or 5 mg tablet twice a week}

21. Order: sargramostim 250 mcg/m\(^2\)/day, dilute in 50 mL and infuse over 2 hours
Patient’s height and weight: 5 ft 10 in and 215 lb
Drug available: sargramostim 500 mcg/mL
a. What is the patient’s BSA (m\(^2\))? 
b. What is the total dose? 
c. How many milliliters should you prepare?

ANS:

\[
\frac{\sqrt{70 \times 285}}{3\sqrt{3131}} = \frac{\sqrt{19950}}{3\sqrt{3131}} = \sqrt{6.37} = 2.5 \text{ m}^2
\]

b. 2.52 m\(^2\) \times 250 \text{ mcg/m}^2 = 630 \text{ mcg}

\[
\frac{630 \text{ mcg}}{500 \text{ mcg}} \times 1 \text{ mL} = 1.26 \text{ mL}
\]

c. 

22. Order: clofarabine 52 mg/m\(^2\) daily and infuse in 250 mL D\(_5\)W over 2 hours
Patient’s height and weight: 5 ft 4 in and 115 lb
Drug available: 20 mg/20 mL
a. What is the patient’s BSA (m\(^2\))? 
b. What is the total dose? 
c. How many milliliters should you prepare?

ANS:

\[
\frac{\sqrt{64 \times 115}}{3\sqrt{3131}} = \frac{\sqrt{7360}}{3\sqrt{3131}} = \sqrt{2.35} = 1.53 \text{ m}^2
\]

b. 1.53 m\(^2\) \times 52 \text{ mg/m}^2 = 79.56 \text{ mg or 80 mg}

\[
\frac{80 \text{ mg}}{20 \text{ mg}} \times 20 \text{ mL} = 80 \text{ mL}
\]