Clinical Calculation
5th Edition

Chapter 12
Pediatric Dosage
Pages 211 - 232

Pediatric Dosage

- There are several methods for calculating pediatric medication dosage based on various combinations of age, height, weight, body surface area and adult dose.
- Due to variation above the concern about overdosing or under dosing medication for infants and children is of prime importance.

General considerations in administering oral and parenteral medications to children (read page 212)

- Positive identification – compare name tag
- Double check, double check, double check
- Maintaining security of drug
- Make sure child is awake before administrating any medication
- Talk their talk
- Maintain firm but friendly manner, gave praise, and confort following administration
- Restrain child gently but firmly, ask for assistance if needed
- Some child are unable to swallow pills, crush and dissolve if allowable. Administer liquid in a cup, spoon, dropper or syringe.

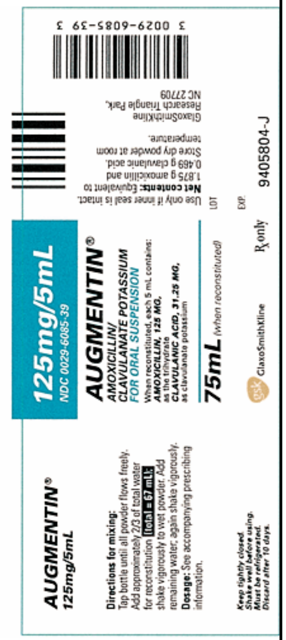
Pediatric dosage based on body weight – oral medication

- Bascally calculations are done similar to adult calculations, smaller weight, smaller dosage administered.
- Starting factor = body weight
- On small calculation, you may have to drop down to gtt instead of mL (1mL = 15gtt)
- In small calculation you may have to rounds to hundredths place.

The child's weight is 77 lb. How many mL of the reconstituted supply of Augmentin should the child receive per dose for the following order? Round answer to the nearest tenth of a mL.

Order: *Augmentin oral suspension 20 mg per kg per day PO in divided doses every 8 hours*

See information on label shown.



Starting Factor: 77 lb

Answer Unit: mL

Equivalents: 2.2 lb = 1 kg, 20 mg of medication = 1 kg, 125 mg = 5 mL

Conversion Equation:

$$77\text{ lb} \times \frac{1\text{ kg}}{2.2\text{ lb}} \times \frac{20\text{ mg per day}}{1\text{ kg}} \times \frac{5\text{ mL}}{125\text{ mg}} = 28\text{ mL per day}$$

Starting Factor: 28 mL per day

Answer Unit: mL per dose

Equivalent: 1 day = 3 doses

$$\frac{28\text{ mL}}{1\text{ day}} \times \frac{1\text{ day}}{3\text{ doses}} = 9.3\text{ mL per dose}$$

The child's weight is 66 lb. How many mL of the reconstituted supply of amoxicillin should the child receive per dose for the following order?

Order: *amoxicillin oral suspension 25 mg per kg per day PO in divided doses every 8 hours*

Available Supply: Amoxil 250 mg per 5 mL

Starting Factor: 66 lb

Answer Unit: mL

Equivalents: 2.2 lb = 1 kg, 25 mg of medication = 1 kg, 250 mg = 5 mL

Conversion Equation:

$$66\text{ lb} \times \frac{1\text{ kg}}{2.2\text{ lb}} \times \frac{25\text{ mg per day}}{1\text{ kg}} \times \frac{5\text{ mL}}{250\text{ mg}} = 15\text{ mL per day}$$

Starting Factor: 15 mL per day

Answer Unit: mL per dose

Equivalent: 1 day = 3 doses

$$\frac{15\text{ mL}}{1\text{ day}} \times \frac{1\text{ day}}{3\text{ doses}} = 5\text{ mL per dose}$$

The child's weight is 55 lb. How many mL of the reconstituted supply of Vantin should the child receive per dose for the following order? Round answer to the nearest tenth of a mL.

Order: *Vantin oral suspension 20 mg per kg per day PO in divided doses every 12 hours*

See information on label shown

Starting Factor	Answer Unit
55 lb	mL

Equivalents: 2.2 lb = 1 kg, 20 mg of medication = 1 kg, 100 mg = 5 mL

Conversion Equation:

$$55\text{ lb} \times \frac{1\text{ kg}}{2.2\text{ lb}} \times \frac{20\text{ mg per day}}{1\text{ kg}} \times \frac{5\text{ mL}}{100\text{ mg}} = 25\text{ mL per day}$$

Starting Factor	Answer Unit
25 mL per day	mL per dose

Equivalent: 1 day = 2 doses

$$\frac{25\text{ mL}}{1\text{ day}} \times \frac{1\text{ day}}{2\text{ doses}} = 12.5\text{ mL per dose}$$

Calculating pediatric dosage - injections

- If medication is based on patients weight then we still calculated in the same manner as an adult.
- Due to pediatrics having smaller weight, the amount of dosage calculated fits the patients dosage correctly.

The child's weight is 61 lb. How many mL of tobramycin should the child receive per dose for the following order? Round answer to the nearest tenth of a mL.
Order: *tobramycin 7.5 mg per kg of body weight per day IM to be administered in divided doses q8h*
Available Supply: 80 mg per 2 mL

Starting Factor	Answer Unit
61 lb	mL

Equivalents: 2.2 lb = 1 kg, 7.5 mg of medication = 1 kg, 80 mg = 2 mL

Conversion Equation:

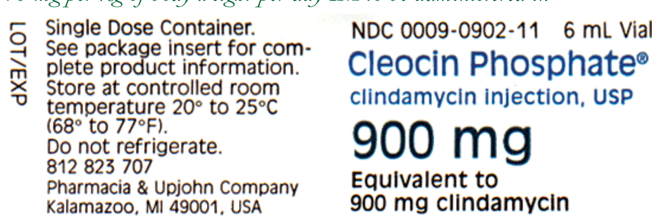
$$61 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} \times \frac{7.5 \text{ mg per day}}{1 \text{ kg}} \times \frac{2 \text{ mL}}{80 \text{ mg}} = 5.2 \text{ mL per day}$$

Starting Factor	Answer Unit
5.2 mL per day	mL per dose

Equivalent: 1 day = 3 doses (q8h)

$$\frac{5.2 \text{ mL}}{1 \text{ day}} \times \frac{1 \text{ day}}{3 \text{ doses}} = 1.7 \text{ mL per dose}$$

The child's weight is 78 lb. How many mL of Cleocin Phosphate should the child receive per dose for the following order? Round answer to the nearest tenth of a mL. See label for available supply
Order: *Cleocin Phosphate 10 mg per kg of body weight per day IM to be administered in divided doses q6h*



Starting Factor	Answer Unit
78 lb	mL

Equivalents: 2.2 lb = 1 kg, 10 mg of medication = 1 kg, 900 mg = 6 mL

Conversion Equation:

$$78 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} \times \frac{10 \text{ mg per day}}{1 \text{ kg}} \times \frac{6 \text{ mL}}{900 \text{ mg}} = 2.4 \text{ mL per day, rounded}$$

Starting Factor	Answer Unit
2.36 mL per day	mL per dose

Equivalent: 1 day = 4 doses (q6h)

$$\frac{2.4 \text{ mL}}{1 \text{ day}} \times \frac{1 \text{ day}}{4 \text{ doses}} = 0.6 \text{ mL per dose}$$

Calculating pediatric dosage - IVs

- Calculation of IV dosage also similar to the calculation of the adult.

The child's weight is 40 kg. How many mg of nitroprusside sodium should the child receive per hr? Round answer to the nearest tenth of a mg per hr.
Order: *nitroprusside sodium 2 mcg per kg per min IV. Dilute 30 mg in 250 mL D5 1/2NS.*
Available Supply: nitroprusside sodium 50 mg per 2 mL

Starting Factor	Answer Unit
40 kg	mcg per min

Equivalents: 2 mcg per min = 1 kg

Conversion Equation:

$$40 \text{ kg} \times \frac{2 \text{ mcg per min}}{1 \text{ kg}} = 80 \text{ mcg per min}$$

Starting Factor	Answer Unit
80 mcg per min	mg per hr

Equivalents: 60 min = 1 hr, 1000 mcg = 1 mg

Conversion Equation:

$$\frac{80 \text{ mcg}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{1 \text{ mg}}{1000 \text{ mcg}} = 4.8 \text{ mg per hr}$$

The child's weight is 40 kg. What should the flow rate be in mL per hr to infuse 4.8 mg per hr?
Order: *nitroprusside sodium 2 mcg per kg per min IV. Dilute 30 mg in 250 mL D5 1/2NS.*
Available Supply: nitroprusside sodium 50 mg per 2 mL

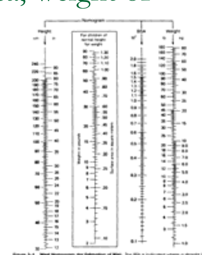
Starting Factor	Answer Unit
4.8 mg per hr	mL per hr

Equivalents: 30 mg = 250 mL

Conversion Equation:

$$\frac{4.8\text{ mg}}{1\text{ hr}} \times \frac{250\text{ mL}}{30\text{ mg}} = 40\text{ mL per hr}$$

Calculating pediatric dosage based on body surface area, weight or age



- Nomogram - Figure 12.11

$$Child's\ BSA\,(m)^2 \times \frac{adult\ dose}{1.7m^2} = \_\_\_\_\_\_\_\_(Child's\ Dose)$$

- Clark's rule - uses the weight of the child and the weight of average adult. (all ages)

$$Child's\ dose = \frac{weight\ of\ child\ in\ pounds}{150lbs} \times adult\ dose$$

- Fried's Rule - designed for computing dosage for infants. (age < =2 years)

$$Infant's\ dose = \frac{age\ in\ months}{150} \times adult\ dose$$

Application of dimensional analysis using BSA estimates

$$Child's\ BSA\,(m)^2 \times \frac{adult\ dose}{1.7m^2} = \underline{\qquad\quad}(Child's\ Dose)$$

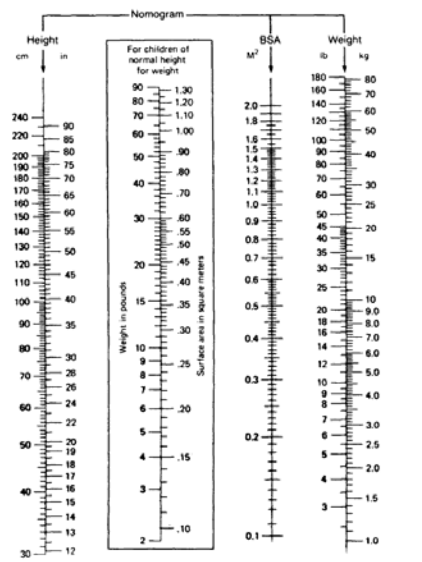
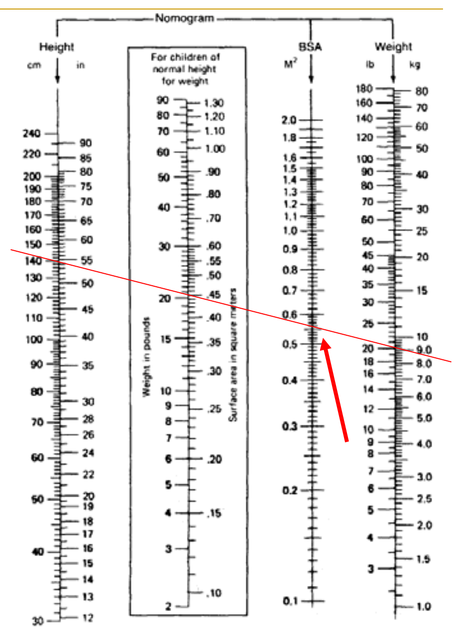


Figure 3–1. West Nomogram (for Estimation of BSA). The BSA is indicated where a straight line connecting the height and weight intersects the BSA column or, if the patient is roughly of normal proportion, from the weight alone (enclosed area). (Nomogram modified from data of E. Boyd by C. D. West; from Vaughan, V. C., and R. J. McKay, eds., *Nelson Textbook of Pediatrics*, 12th ed., Philadelphia: Saunders, 1983.)

Use the BSA nomogram to determine the BSA in M^2 for the following child. Report answer to the nearest hundredth M^2. Child's height: 55 in Child's weight: 9 kg

0.55 m^2



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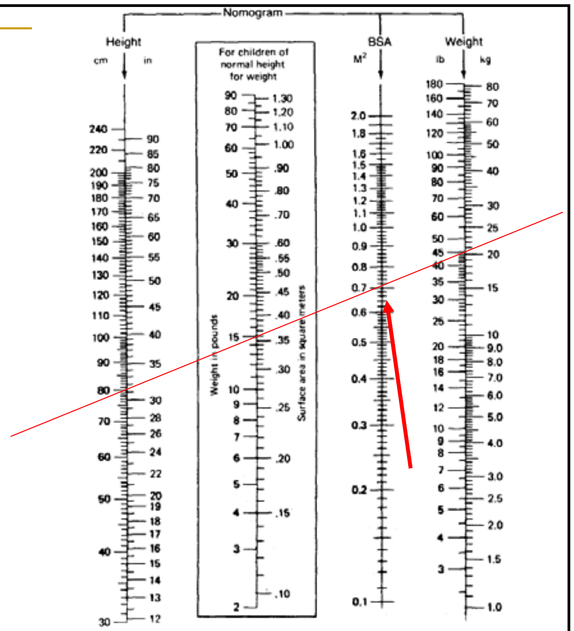
Use the BSA nomogram to determine the BSA in M^2 for the following child. Report answer to the nearest hundredth M^2.

Child's height: 80 cm

Child's weight: 20 kg

0.7 m^2



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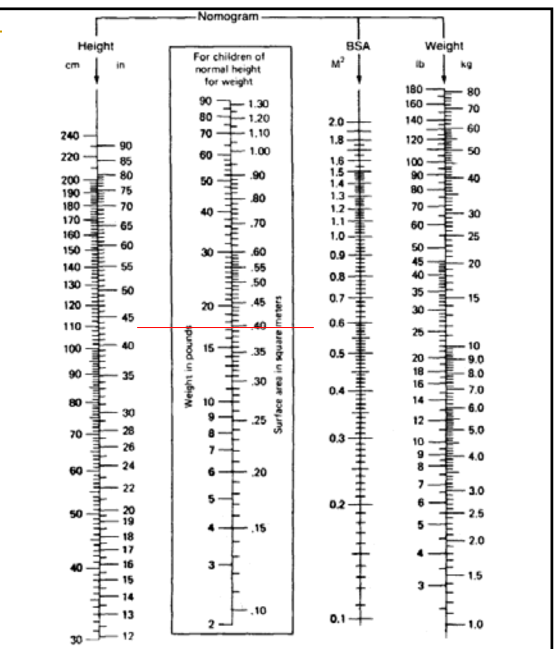
Use the BSA nomogram in Figure 12-11 of the textbook to determine the BSA in M^2 for the following child. The child is of normal height for his weight. Report answer to the nearest hundredth M^2.

Child's weight: 17 lb

0.39m^2



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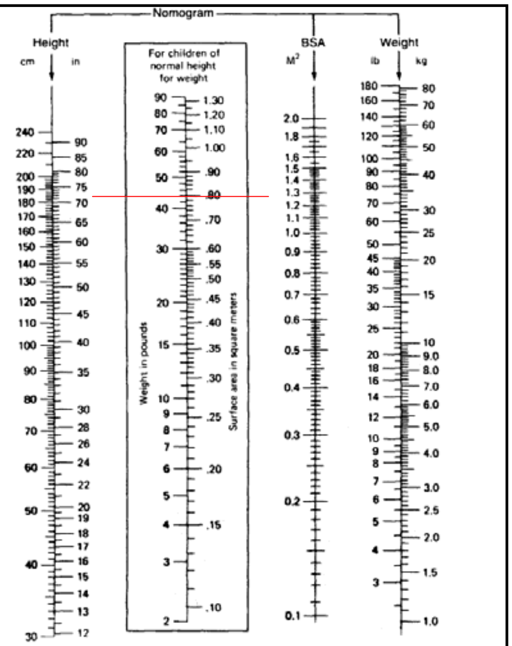
Use the BSA nomogram to determine the BSA in M^2 for the following child. The child is of normal height for his weight. Report answer to the nearest hundredth M^2.

Child's weight: 44 lb

$0.80 m^2$



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Use the BSA nomogram to determine the BSA in M2 for the child. Now find the child's dose of amoxicillin based on BSA. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Adult dose: amoxicillin 250 mg
Child's weight: 9 1/2 lb

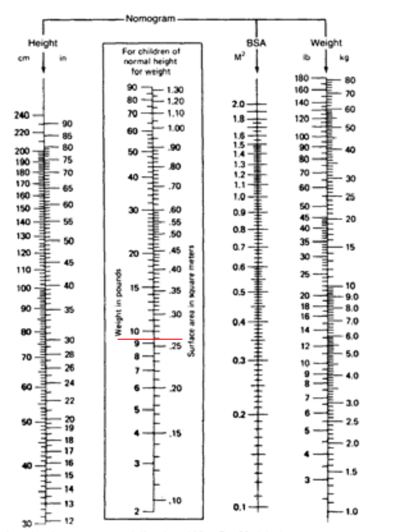
From nomogram, BSA $= 0.26\ M^2$

Starting Factor	Answer Unit
child's BSA (M^2) $0.26\ M^2$	child's dose in mg

Equivalents: $1.7\ M^2 = 250$ mg

Conversion Equation:

$$0.26\ M^2 \times \frac{250\text{ mg}}{1.7\ M^2} = 38\text{ mg, rounded}$$



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Use the Clark's Rule to find the child's dose of amoxicillin. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Adult dose: amoxicillin 250 mg
Child's weight: 9 1/2 lb

$$Child's\ dose = \frac{weight\ of\ child\ in\ pounds}{150 lbs} \times adult\ dose$$

$$Child's\ dose = \frac{9.5 lbs}{150 lbs} \times 250 mg = 15.8 mg = 16 mg$$

Use the Fred's Rule to find the 3months infant's dose of amoxicillin. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Adult dose: amoxicillin 250 mg
Child's weight: 9 1/2 lb

$$Infant's\ dose = \frac{age\ in\ months}{150} \times adult\ dose$$

$$Infant's\ dose = \frac{3\ months}{150} \times 250 mg = 5 mg$$

Use the BSA nomogram to determine the BSA in M2 for the child. Now find the child's dose of amoxicillin based on BSA. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Adult dose: garamycin 40 mg Child's weight: 41 lb

From nomogram: BSA= 0.76

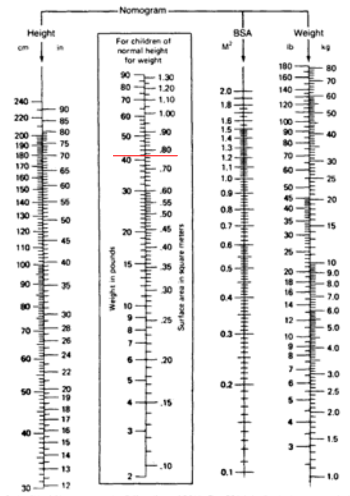
Starting factor: BSA

Answer unit : Child dose in mg

Equivalent: $1.7m^2$ = 40 mg

Conversion equation:

$$0.97m^2 \times \frac{40mg}{1.7m^2} = 17.9mg = 18mg$$



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Use the Clark's rule to find the child's dose of amoxicillin. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Adult dose: garamycin 40 mg
Child's weight: 41 lb

$$Child's\ dose = \frac{weight\ of\ child\ in\ pounds}{150lbs} \times adult\ dose$$

$$Child's\ dose = \frac{41lbs}{150lbs} \times 40mg = 10.9mg = 11mg$$

Use the Fried's rule to find the 1.5 year old child's dose of amoxicillin. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Adult dose: garamycin 40 mg
Child's weight: 41 lb

$$Infant's\ dose = \frac{age\ in\ months}{150} \times adult\ dose$$

$$Infant's\ dose = \frac{18\ months}{150} \times 40mg = 4.8mg = 5mg$$

Use the BSA nomogram to determine the BSA in M2 for the child. Now find the child's dose of amoxicillin based on BSA. Round answer to the nearest whole mg. The child's dose is based on the normal adult dose.
Adult dose: amoxicillin 250 mg
Child's weight: 18 kg
Child's height: 94 cm

From nomogram, BSA = $0.70\ M^2$

Starting Factor	Answer Unit
child's BSA (M^2) $0.70\ M^2$	child's dose in mg

Equivalents: $1.7\ M^2 = 250$ mg

Conversion Equation:

$$0.70\ M^2 \times \frac{250\ mg}{1.7\ M^2} = 103\ mg$$

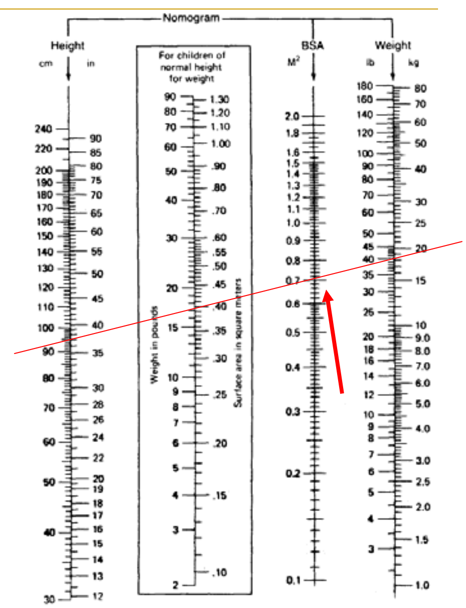


Figure 3–1. West Nomogram (for Estimation of BSA). The BSA is indicated where a straight line connecting the height and weight intersects the BSA column or, if the patient is roughly of normal proportion, from the weight alone (enclosed area). (Nomogram modified from data of E. Boyd by C. D. West; from Vaughan, V. C., and R. J. McKay, eds., *Nelson Textbook of Pediatrics*, 12th ed., Philadelphia: Saunders, 1983.)

Use the Clark Rule to find the child's dose of amoxicillin. Round answer to the nearest whole mg. The child's dose is based on the normal adult dose. Adult dose: amoxicillin 250 mg
Child's weight: 18 kg
Child's height: 94 cm

$$Child's\ dose = \frac{weight\ of\ child\ in\ pounds}{150 lbs} \times adult\ dose$$

$$18kg \times \frac{2.2lbs}{1kg} = 39.6lbs$$

$$Child's\ dose = \frac{39.6lbs}{150lbs} \times 250mg = 66mg$$

Note Clark’s rule required conversion to pounds before using the formula.

Use the BSA nomogram to determine the BSA in M^2 for the child. Now find the child's dose of amoxicillin. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Normal child's dose: meperidine 50 mg
Child's weight: 34 lb

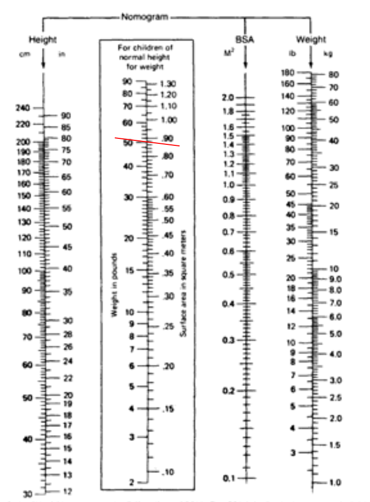
From nomogram, BSA $= 0.66\ M^2$

Starting Factor	Answer Unit
child's BSA (M^2) $0.66\ M^2$	child's dose in mg

Equivalents: $1.7\ M^2 = 50$ mg

Conversion Equation:

$$0.66\ M^2 \times \frac{50\ mg}{1.7\ M^2} = 33\ mg$$



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Use the Clark’s Rule to find the child's dose of amoxicillin. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Normal child's dose: meperidine 50 mg
Child's weight: 34 lb

$$Child's\ dose = \frac{weight\ of\ child\ in\ pounds}{150lbs} \times adult\ dose$$

$$Child's\ dose = \frac{34lbs}{150lbs} \times 50mg = 11.3mg = 11mg$$

Use the Fred’s Rule to find the 20months old child's dose of amoxicillin. Round answer to the nearest whole mg. The child is of normal height for her weight. The child's dose is based on the normal adult dose.
Normal child's dose: meperidine 50 mg
Child's weight: 34 lb

$$Infant's\ dose = \frac{age\ in\ months}{150} \times adult\ dose$$

$$Infant's\ dose = \frac{20\ months}{150} \times 50mg = 6.7mg = 7mg$$