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Theophylline

Find the answers to the following questions for a 5 year old, 20 kg girl with a serum creatinine of 0.1 mmol/L (Patient B):

The target concentration for theophylline for the treatment of bronchoconstriction is 10 mg/L. Tablets of theophylline contain 250 mg. An elixir contains 80 mg/15 mL.
Hint: Adult age and renal function do not influence V or CL for theophylline

- A. What is the predicted volume of distribution?
- B. What is the predicted clearance?

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Theophylline

<i>Parameter</i>	<i>Value</i>
F (oral)	1
V Liters	35
CLr L/h	0
CLh L/h	2.8

Typical values for a 70 kg person

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Theophylline

Find the answers to the following questions for a 5 year old, 20 kg girl with a serum creatinine of 0.1 mmol/L (Patient B):

The target concentration for theophylline for the treatment of bronchoconstriction is 10 mg/L. Tablets of theophylline contain 250 mg. An elixir contains 80 mg/15 mL.
Hint: Age and renal function do not influence V or CL for theophylline

- A. What is the predicted volume of distribution?
- B. What is the predicted clearance?
- C. What loading dose is required?

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Theophylline

Find the answers to the following questions for a 5 year old, 20 kg girl with a serum creatinine of 0.1 mmol/L (Patient A):

The target concentration for theophylline for the treatment of bronchoconstriction is 10 mg/L. Tablets of theophylline contain 250 mg. An elixir contains 80 mg/15 mL.
Hint: Age and renal function do not influence V or CL for theophylline

- A. What is the predicted volume of distribution?
- B. What is the predicted clearance?
- C. What loading dose is required?
- D. What maintenance dose is required?

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Rules of PNA and PMA

Fraction of adult maintenance dose

Typical Weight Kg	PMA or PNA	Fraction Adult Dose	Rule of PMA+PNA Error	'true' % Adult Dose
1	25 weeks	1/300	10%	0.3
1	30 weeks	1/120	1%	0.8
3	Full Term	1/30	1%	3.3
6	3 mo	1/10	8%	9.3
7	6 mo	1/6	24%	13.4
9	1 year	1/5	3%	19.5
12	2 years	1/4	-4%	26.1
19	5 years	1/3	-11%	37.4
34	10 years	1/2	-14%	58.5
50	15 years	3/4	-3%	77.4
70	Adult	1		100.0

Weight is combined with post-natal age (PNA) and post-menstrual age (PMA) to predict the typical dose as a % of the adult dose.

The coloured areas of the table show the fraction of adult maintenance dose that would be expected for infants and children. The fractions are based on the theoretical size and maturation model for typical drug clearance with some approximation to make the numbers easier to remember. The 'rule of PMA+PNA' has an acceptable error for clinical dose prediction.

Although maturation is best described by a non-linear relationship it is quite well approximated by a linear function of PMA.