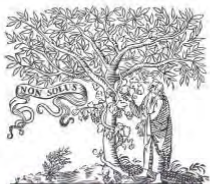# Paediatrics
and Medications

A RESOURCE FOR GUIDING NURSES IN MEDICATION ADMINISTRATION

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ELSEVIER

Paediatrics and Medications

A Resource for Guiding Nurses in Paediatric Medication Administration

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About the book

This guide has been prepared with an emphasis on the process of medication administration to the paediatric patient. It is not a resource relating to specific medications or pharmacology.

While this guide may be a useful resource it does not replace or override guidelines, policy and procedures of the organisation in which an individual using this guide is employed.

While every effort has been made to ensure that the content of this guide is accurate, no responsibility will be taken for inaccuracies, omissions or errors. The authors do not accept liability to any person or information obtained from this publication or for loss or damages incurred because of the reliance on the material contained in this guide.

Introduction

Paediatrics and medications: a resource for guiding nurses in paediatric medication administration is a guide only. Nurses have a significant responsibility in safely administering medication to the paediatric patient. This resource is meant to be a companion guide to pharmacology texts by providing complementary information about the process of medication administration to children with an emphasis on medication safety.

The paediatric patient receiving medication

The aim of administering medication to the paediatric patient is to do so in a safe and efficient manner. The nurse needs to understand:

- Their own scope of practice
- Basic maths and calculating drug dosages
- Assessment of the paediatric patient
- Consent
- The education of the paediatric patient and caregiver about medications
- Legal requirements and responsibilities associated with medication administration to the paediatric patient
- Administration considerations for the paediatric patient.

Contents

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Scope of practice, maths and calculating drug dosages

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Scope of practice

Nurses need to ascertain whether administering medication to a paediatric patient is within their scope of practice. The table below provides an overview of the scope of practice for different nursing roles in the Australian context.

Bachelor Degree Nursing Students or Diploma Nursing Students	Yes	If content has been covered in the relevant university or diploma course, assessment has occurred, it is within the stated scope of practice and direct supervision is present. However, students should always confirm their scope of practice with their program coordinator. A student cannot be a second independent person checking medication
Assistant in Nursing (AIN)	No	This is not in the AIN's scope of practice

| Graduate Diploma/ Enrolled Nurse (EN) | Yes | The EN must have medication endorsement and a second approved person checking the medication |
| Graduate/Registered Nurse (RN) | Yes | The RN must follow organisation policy regarding checking the medication |

Basic maths and calculating drug dosages

There is a basic level of maths that nurses should be well versed in with regards to safe medication administration. The following section addresses some important elements (Tables 1.1–1.6).

Basic formulae for calculation of drug doses

ORAL MEDICATIONS SOLIDS/LIQUIDS

$$\frac{\text{Strength required}}{\text{Strength in stock}} \times \frac{\text{Volume}}{1} = \text{Amount required}$$

TABLE 1.1	24-hour clock	
	AM	PM
12	1200	2400
1	0100	1300
2	0200	1400
3	0300	1500
4	0400	1600
5	0500	1700
6	0600	1800
7	0700	1900
8	0800	2000
9	0900	2100
10	1000	2200
11	1100	2300
12	1200	2400

Box 1.1
An example of dose calculation by weight and recommended dosage

Step 1

Look up in the relevant resource, for example, the *Australian Medicines Handbook* (AMH), MIMS online or Hospital IV Guidelines for the recommended dosage of a prescribed drug per kg

For example:

A paediatric patient is to be given ampicillin. The recommended dosage is 80 mg/kg/day divided by four doses over four doses over 24 hours (per day). The nurse must check the single dose prescribed

The paediatric patient weight is 27 kg:

- *27 kg × 80 mg/kg/day = 2160 mg/day*

Then:

- *2160 mg ÷ 4 doses = 540 mg/dose*

Check that the dose prescribed is within the recommended range. If not, do not proceed until the dose is questioned with the prescribing doctor

Step 2

If the dose is within the recommended range, use the appropriate formula to work out how much to give

If the doctor has prescribed a dose of 540 mg and the label on the ampicillin bottle reads 100 mg of ampicillin in every 5 mL, the nurse uses the following formula to work out the amount to give:

$$\frac{\textbf{\textit{Strenght required}}}{\textbf{\textit{Stored Strength}}} \times \frac{\textbf{\textit{Volume}}}{\textbf{\textit{1}}}$$

$$\frac{540\,\text{mg}}{100} \times \frac{5}{1} = 5.4\,\text{mL}$$

Step 3

The workings of the calculations should be double-checked with a second medication-endorsed person

TABLE 1.2   Example of fraction, decimal and percentage conversion

FRACTION	SIMPLIFIED FRACTION	TERMINOLOGY	DECIMAL FRACTION	PERCENTAGE
10/100	1/10	One-tenth	0.1	10%
25/100	1/4	One-quarter	0.25	25%
33/100	1/3	One-third	0.33	33%
50/100	1/2	One-half	0.5	50%

TABLE 1.3   Abbreviation and meaning

ABBREVIATION	MEANING
mL	millilitre
L	litre
kg	kilogram
g	gram
mg	milligram
mcg or microg	microgram
Unit(s)	International Units
m	metre
cm	centimetre

TABLE 1.4   Metric equivalents

VOLUME	
1 litre (L)	1000 millilitres (mL)
MASS	
1 kilogram (kg)	1000 grams (g)
1 gram (g)	1000 milligrams (mg)
1 milligram (mg)	1000 micrograms (microg)
LENGTH	
1 kilometre (km)	1000 metres (m)
1 metre (m)	100 centimetres (cm)
1 centimetre (cm)	10 millimetres (mm)

TABLE 1.5   Example of equivalents

0.5 kilograms	500 grams
0.5 grams	500 milligrams
0.5 milligrams	500 micrograms
0.5 litres	500 millilitres

TABLE 1.6   Common intravenous fluids selected for paediatrics

Sodium chloride 0.9%	Isotonic
Sodium chloride 0.9% and glucose 5%	Hypertonic
Glucose 5% in water	Isotonic

Tablet example: You are required to give paracetamol 1000 mg to a 17-year-old who weighs 80 kg. The stock available is 500 mg tablets.
The calculation is as follows:

$$\frac{1000 \text{ mg}}{500 \text{ mg}} \times \frac{1}{1} = 2 \text{ tablets}$$

Mixture example: You are required to give a 4-year-old paediatric patient who weighs 15 kg, paracetamol 225 mg. The stock strength available in elixir form is paracetamol 100 mg per mL.
The calculation is as follows:

$$\frac{225 \text{ mg}}{100 \text{ mg}} \times \frac{1}{1} = 2.25 \text{ mL}$$

PARENTAL MEDICATION

Solutions (IM, IV injections)

The formula is:

$$\frac{\text{Strength required}}{\text{Strength in stock}} \times \frac{\text{Volume of stock strength}}{1} = \text{Volume required}$$

Example: You are required to give a 15-year-old who weighs 65 kg, morphine 5 mg IMI (intramuscular injection). The stock strength available are morphine ampoules 10 mg per mL.
The calculation is as follows:

$$\frac{5 \text{ mg}}{10 \text{ mg}} \times \frac{1}{1} = 0.5 \text{ mL}$$

POWDERS

It is essential that the manufacturer's directions are followed. The directions will indicate the dilution and then the formulae can be applied.

Intravenous fluids infusions

When intravenous (IV) solutions are administered to the paediatric patient, an infusion pump and burette should be used. The volume in the burette should be set, for example, per hour. At each hour the volume infused should be checked and recorded on a fluid balance chart. Additionally, when intravenous fluids are infusing, the infusion site should be checked for stability and for signs of complications such as phlebitis or infiltration.

The volume of intravenous fluids to be ordered by the medical officer and administered to the paediatric patient is determined by the weight, age and hydration status of the child. The nurse has a responsibility to know what the volume of fluid per hour the paediatric patient should have.

Full maintenance of IV fluid rates can be calculated using Table 1.7.

TABLE 1.7 Maintenance intravenous fluids per hour	
WEIGHT (KG)	**ML/HOUR**
3–10 kg	4 × weight
10–20 kg	40 plus 2 × (weight minus 10)
20–60 kg	60 plus 1 × (weight minus 20)
Greater than 60	100 mL/hour

Example of calculated intravenous (IV) fluids per hour.

Please be reminded that it is the medical officer who orders the fluid and determines the rate; however, the nurse has a responsibility to understand what is considered to be an appropriate volume of fluid per hour according to, among other factors, the patient's hydration status, weight and age.

A paediatric patient weighs 10 kg.
The formula for the 10-kg patient is:
4 × weight (10 kg) = 40 mL per hour.
A paediatric patient weighs 20 kg.

The formula for the 20-kg patient is:
40 + 2 × (20–10) = 60 mL per hour.

When an IV fluid volume is ordered by the medical officer, including the set timeframe to be delivered overwritten on a fluid order chart, the nurse can then work out the volume per hour.

Example: You are caring for a 15-year-old who weighs 65 kg (maintenance fluid is 100 mL per hour). The fluid order is for 1 L of 0.9% sodium chloride over 12 hours.
To work out volume per hour, the calculation is as follows:
<u>Volume of fluid</u> divided by time in hours = Volume per hour.

Example: 1000 mL of 0.9 % saline over 12 hours:
<u>1000</u> divided by 12 = 83 mL per hour.