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Medication administration is one of the most commonly performed nursing responsibilities; however, it can be associated with significant harm. The Australian Commission on Safety and Quality in Health Care has created the Medication Safety Standard as part of its suite of National Safety and Quality Health Service Standards. This Standard aims to ensure that health care providers safely prescribe, dispense and administer appropriate medicines, and monitor medicine use. It also aims to ensure that consumers are informed about medicines, and understand their own medicine needs and risks.

As regulated health professionals, Registered Nurses are responsible and accountable to the Nursing and Midwifery Board of Australia (NMBA). The national *Registered nurse standards for practice*, along with the NMBA codes and guidelines, provide the framework of our nursing practice. The standards should be evident in all aspects of our practice, including medication administration.

Correct and safe administration of medication requires the nurse to understand maths by calculating and measuring medications correctly. This book has been designed as a quick reference to assist you in medication administration. However, it is not intended to be a replacement for more comprehensive mathematical books that can guide you further.

The book provides prompts and guidelines pertaining to information necessary to administer medications safely. It does this by:

- revisiting some basic mathematical calculations and conversions
- giving some useful information that can help you to consider whether your dosages are reasonable
- providing a reference to standard formulas
- revisiting essential information in terms of safe medication administration.

When working out dosages you are required to administer, the following steps should be used:

- Read the medication order/prescription thoroughly.
- Consider the patient's weight.
- Read the medication packaging.
- Determine what the dosage is.
- Use your mathematical conversion skills to convert measuring units if necessary.
- Apply the appropriate formula and calculate.
- Reflect on the dosage and access the appropriate drug information. Ask:
 - Is this dose reasonable?
 - Is this dose within normal range?
 - What are the consequences to the patient with this dosage?
- Check the dosage and your calculations.

There are a suite of National Standard Medication Charts (NSMC). These include: NIMC (acute or long stay); NIMC (paediatric); NIMC (paediatric long stay); Specialist inpatient medication (Clozapine titration and Subcutaneous insulin chart); Residential aged care facility (RACF) National residential medication chart (NRMC); and medication management plans. The NSMC which are the focus of this book are the NIMC (acute) and the Subcut insulin chart.

Maths revisited

■ MATHEMATICAL SYMBOLS

TERMINOLOGY	SYMBOL
Equal to	=
Not equal to	≠
Approximately equal to	≈
Greater than	>
Less than	<
Square root	√
Percent	%
Degree	°
Ratio	:

■ ORDER OF OPERATIONS

There are four fundamental operations used to solve mathematical problems. These are:

1. Addition +
2. Subtraction −
3. Multiplication ×
4. Division ÷

If a mathematical problem requires more than one operation, there is a rule of order for performing each. This is best

remembered as **BIDMAS** (the mnemonic 'Belly Itches Do Make A Scratch').

- 1st Brackets $()$
 2nd Index notation (or 'power of') e.g. $4^3 = 4 \times 4 \times 4$ (where 4 is the base and 3 is the index)
 3rd Division \div
 4th Multiplication \times
 5th Addition $+$
 6th Subtraction $-$

Please note, the 3rd and 4th operations (division and multiplication) have the same priority and should be performed in the order they first occur, moving left to right. This is also true for the 5th and 6th operations (addition and subtraction).

- Step 1 Calculate what is inside the brackets.
 Step 2 Do Index notation, or 'power of'.
 Step 3 Do \div or \times working from left to right, whichever comes first.
 Step 4 Do $+$ or $-$ working from left to right, whichever comes first.

	2nd	1st	4th	3rd	
	↓	↓	↓	↓	

Rule applied: $70 \div (2 + 3) - 2 \times 2 = 10$ (✓)
 $70 \div 5 - 2 \times 2$
 $14 - 2 \times 2$
 $14 - 4 = 10$

Rule not applied: $70 \div (2 + 3) - 2 \times 2 = 72$ (✗)

NUMBER FACT GRIDS

Below is an addition grid for quick reference with basic addition facts up to 20.

+	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	3	4	5	6	7	8	9	10	11	12
3	4	5	6	7	8	9	10	11	12	13
4	5	6	7	8	9	10	11	12	13	14
5	6	7	8	9	10	11	12	13	14	15
6	7	8	9	10	11	12	13	14	15	16
7	8	9	10	11	12	13	14	15	16	17
8	9	10	11	12	13	14	15	16	17	18
9	10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19	20

The multiplication grid is a useful tool for quick reference of multiplication tables up to $12 \times$.

\times	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

■ TIME

Time is one of the five rights of medication administration.

All medication charts should have drug times written in 24-hour time. For this reason, nurses must be familiar with the 24-hour clock (refer to page 10).

When using a 24-hour clock, midnight can present confusion regarding the day that is being referred to—it

is both the end of one day and the start of the next. When administering 'as needed' (prn) medications at midnight, it is recommended to use 2359 to signify the end of one day or 0001 to indicate the beginning of another. This provides clarity to others when reading your documentation or if you have to refer back to it (e.g. in a coroner's court).

Units of time and conversions

1 minute (min)	60 seconds (s)	52 weeks	1 year (y)
1 hour (h)	60 minutes	365 days	1 year
1 day (d)	24 hours	366 days	1 leap year
1 week (w)	7 days	12 months	1 year
2 weeks	1 fortnight	10 years	1 decade
4 weeks	1 month (mth)	100 years	1 century