Medication Management

For Registered Nurses, Midwives and Enrolled Nurses (Medication Endorsed)

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To complete this mandatory competency you must achieve 100% accuracy in the Medication assessment quiz. This tutorial is to refresh your current knowledge in medication administration guidelines, basic maths and medication calculation formulas. Practice calculations are included in this tutorial.

For more information on Medication Management and the Quality Use of Medications, please visit the National Prescribing Service (NPS) MedicineWise website, http://www.nps.org.au/health-professionals/cpd/nurses

This Online Learning Program is endorsed by ACN according to our Continuing Professional Development Endorsed Course Standards. It has been allocated 1 CPD hour according to the Nursing and Midwifery Board of Australia – Continuing Professional Development Standard
Introduction

All registered Nurses (RN & EN's) and Midwives must be competent in all methods of administering medication even if they do not routinely give certain medications (e.g. intravenous drugs). There are differences in the Scope of Practice (for nurses and midwives) between the States and Territories and every individual nurse must make themselves aware of their specific Scope of Practice. If you are unsure of what your Scope of Practice entails, please refer to AHPRA.

Success in this course does NOT extend your Scope of Practice in relation to medication administration. You must also make yourself aware of local facility protocols regarding medication administration for your designated role.

The aim of the Medication Management eLearning Package is to refresh the nurses’ and midwives’ knowledge of medication administration guidelines, basic maths and medication calculations and give you an opportunity to practice commonly used calculations. Once the tutorial and the online quiz are complete, you will have demonstrated that you are able to perform calculations associated with drug administration with 100% accuracy.

The Medication Management eLearning package covers the Rights of medication, Routes of medication, altering forms of medication and safety in regards to medication management, Medication calculations: unit conversions, enteric (oral) medication calculations, injectable medication calculations and intravenous medication calculations.

Healthcare Australia (HCA) encourages all our staff to access the National Prescribing Service (NPS) MedicineWise Learning site, http://learn.nps.org.au/
The MedicineWise Learning site provides a range of additional courses to ensure that your practice is current with all education undertaken accruing CPD points.

Courses include:
- Medication Safety
- National inpatient medication chart;
- Quality use of medications (QUM) – why, what, how and who?
- QUM for health professional students;
- Antimicrobial modules;
- Medical tests; and
- Case studies.
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“Rights” of Medication Administration

Medication administration is not just about correct calculations; it is also about correct administration procedures. Nursing scope of practice requires the nurse to ensure safe medication practices. Research has shown the biggest percentage of errors occur due to being interrupted during the task. Avoiding interruptions is probably impossible however it is up to you to be well prepared before you start and encourage your team not to interrupt you during medication processes. In order safely administer medications it is expected you know the 8 Rights of Medication and adhere to these at all times.

1. Right patient/resident
   - Check the name on the order and the patient/resident.
   - Use 2 identifiers, including a photo when available.
   - Ask patient/resident to identify himself/herself.
   - When available, use technology (for example, bar-code system).

2. Right medication
   - Check the medication label.
   - Check the order.

3. Right dose
   - Check the order.
   - Confirm appropriateness of the dose using a current drug reference.
   - If necessary, calculate the dose and have another nurse calculate the dose as well.

4. Right route
   - Again, check the order and appropriateness of the route ordered.
   - Confirm that the patient/resident can take or receive the medication by the ordered route.

5. Right time
   - Check the frequency of the ordered medication.
   - Double-check that you are giving the ordered dose at the correct time.
   - Confirm when the last dose was given.
“Rights” of Medication Administration

6. Right documentation

- Document administration AFTER giving the ordered medication.
- Chart the time, route, and any other specific information as necessary. For example, the site of an injection or any laboratory value or vital sign that needed to be checked before giving the drug.

7. Right reason

- Confirm the rationale for the ordered medication. What is the patient/resident's history? Why is he/she taking this medication?
- Revisit the reasons for long-term medication use.

8. Right response

- Make sure that the drug led to the desired effect. If an antihypertensive was given, has his/her blood pressure improved? Does the patient/resident verbalize improvement in depression while on an antidepressant?
- Be sure to document your monitoring of the patient/resident and any other nursing interventions that are applicable.

Routes of Medication Administration

Administering medications is one of the most frequent procedures carried out by a healthcare professional. When swallowing difficulties cause non-compliance with medications this task becomes more challenging. When this happens an obvious solution might be to crush the tablet or open the capsule and add the medication to food or drink. Many tablets and capsules are not designed to be crushed or opened. This is called altering the form of the medication and may make it toxic to the patient, reduce the safety or change the effect it has. One example, crushing an extended release tablet can destroy the medication time release properties with the whole dose being released within a few minutes rather than the intended 12 or 24 hrs. Guidelines are available regarding which medications are suitable to crush. “Don’t rush to crush” is one publication by the Society of Hospital Pharmacists of Australia (SHPA). Also available via MIMs online.

The Guiding Principles of medication management in residential aged Care Facilities (2012) write “Wherever possible, oral dose forms of medicines should not be altered. Some medicines must not be altered at all and if administration is an issue, an alternative medicine or different forms of the medicine should be considered. Alternative forms that may be available include dispersible tablets, liquids, topical applications, patches, intranasal sprays, suppositories, injections or stable extemporaneous mixtures (local pharmacy prepared mixtures). Where the form of a medicine is altered to assist administration, such as by crushing, care must be taken that the alteration does not result in reduced effectiveness, a greater risk of toxicity or other harm, an unacceptable presentation to the resident in terms of taste or texture, or a risk to work health and safety. It is important to ensure the crushed medicine can be easily swallowed and that adequate fluid is given with altered dose forms to aid ingestion.

Cross-contamination of one resident’s medicine with that of another can occur where the same crushing tool is used for more than one resident without proper cleaning between residents. This can have serious consequences (for example if a resident is allergic to a medicine such as penicillin)."

Before crushing medications always check that they are approved to do so and ensure cleaning of equipment used to crush medications between patients. The decision to crush medications should be at the direction of GP and/or speech pathologist and pharmacy.

With the increasing use of Enteral feeding tubes/ PEG/PEJ feeds there is also the need to be aware of the guidelines for administering medications via these Enteral feeding tubes.
Medication Administration via Enteral feed tubes

Enteral feeding tubes provide access to the stomach or jejunum (small intestine). They bypass obstructions, reduce discomfort or provide nutrition where the patient is unable to eat. When administering medications via an enteral tube the route should be stated on the patients medication chart and should match the type of enteral tube, eg. Nasogastric (NG), Percutaneous endoscopic gastrostomy (PEG), Nasojejunal (NJ) or Percutaneous endoscopic jejunostomy (PEJ).

Never assume that a medication can be given via a feeding tube- always check with Pharmacy/ or refer to “approved lists”.

For a medication to be able to be absorbed and used it needs to be delivered to the correct part of the gastrointestinal tract. Some medications are designed for absorption into the stomach, such as digoxin; so by administering via the jejunum will reduce its absorption and overall effect. Doses of any medications with altered form may need doses adjusted. If a medication is not having the desired effect or the patient experiences diarrhoea, the Doctor, pharmacist and dietician may need to review the patient’s feeding routine. Some feeds may stop absorption of medications such as Phenytoin; feeds need to be stopped 2 hours before and for 2 hours after (always check local facility protocols).

Medications should not be added directly to enteral feeds and feeding tubes should be flushed with water before and after each medication is administered.

Best practice for positioning person receiving medications via enteral feeds should be propped up at 30 degrees, and remain upright for 30mins - 1hr following medications and feeds.
Guidelines for Medication Administration via Enteral feed tubes

Always check local Policies and Procedures

Infection Control and Safety

• Wash hands and wear gloves.

DO: Prepare and administer medications separately
    Flush after each medication and on completion
    Deliver medication slowly and steadily

DO NOT: Force medication or fluid into the tube
        Mix medication with feed

Tube Blockage

• Inadequate flushing is the most common cause of tube blockage.
• Using the wrong formulation of medication can also cause tube blockage.
• If flushing with warm water does not unblock the tube, seek specialist advice, do not apply excessive force.

Medicines that should not be crushed

• Enteric Coated (EC): The coating is designed to resist gastric acid to protect the drug and/or reduce gastric side effects.

• Modified/Slow Release (MR, SR, LA, XL): These are tablets or capsules that are specifically designed to release the drug over a long period of time. Crushing these will cause all the drug to be released at once and may cause toxic side effects.
Intramuscular (IM) Injections

“Some time ago a new-graduate nurse taught me how to give an intramuscular injection. No, really… After studiously watching one of our senior staff give an intramuscular (IM) injection, the new-grad informed us that, in fact, she was not taught to give injections into the upper-outter quadrant. This is where I had been sticking my needles for many years now, and I have given thousands (if not millions) of injections this way. But I was wrong. And I still see many nurses who are continuing to administer intramuscular injections this way.” Ian Miller

Complications from IM injections include abscess, cellulitis, tissue necrosis, granuloma, muscle fibrosis, contractures, haematoma, and injury to blood vessels, bones and peripheral nerves, due to this it is important we follow best practice guidelines when delivering medications via this route. Before giving the injection palpate the muscle to make sure the muscle can support the amount of medication being given.

IM Injection sites include:

Sites of the thigh (Rectus femoris and Vastus Lateralis): These muscles are located in the thigh. It is easily accessible in a sitting, lying position, absorption of medications is slower than in the arm but faster than in the buttocks. To properly mark the rectus femoral muscle, divide the front of the thigh into 3 equal parts from the top to the bottom of the thigh. The needle should go into the middle third. Up to 2 ml can be given in this site

The Dorsogluteal site: commonly known as the upper outer quadrant site for IM injections and located by dividing the buttock into four equal quadrants. This site is no longer promoted and has a number of problems that have been identified:

- The presence of major nerves and blood vessels in this area including the sciatic nerve and superior gluteal artery. Despite being taught that you would avoid this by choosing the upper outer quadrant, there have been injuries to the sciatic nerve causing problems ranging from foot drop to paralysis of the lower limb.

- The thick layer of fat tissue in the area can result in poor absorption rates. Studies have shown that the depth of muscle in this area is often greater than the length of IM needles, hence resulting in subcutaneous injections rather than desired IM.

- Pain receptors in the subcutaneous layer resulting in more painful injections.
The **Ventralgluteal IM injection site**: This site in the hip provides the greatest thickness of gluteal muscle, it does not have nerves and blood vessels nearby and has a narrower layer of fat than is present in the upper outer quadrant. This is the **preferred site for the buttocks**.

**Ventralgluteal injection site.**

The ventrogluteal (VG) site is located halfway between the hip and the head of the femur. One method to locate the correct site is having the person lie on their side:

1. Place the heel of your hand (use your L hand if injecting into the patient’s R VG and vice-versa) over the patient’s greater trochanter (the knobbly top part of the long bone in the upper leg), and feel for the anterior superior iliac spine with your index finger.

2. The middle finger then slides across to make a V pointing up to the iliac crest.

3. The injection site is in the middle of this V.

4. Wipe site with alco-wipe in a circular motion and allow to dry.

5. Use your fingers in V shape to spread skin taut.

6. Insert needle at 90 degree angle. Take care as you are inserting needle in proximity to your fingers.

7. **There is no evidence for the need to aspirate the plunger when using the VG site.**

8. Inject medication slowly (around 10 seconds per ml), remove needle quickly, and gently apply pressure to site for 10 seconds.
The Deltoid site: The deltoid muscle is located in the upper arm, just below the shoulder. The injection is given in the centre of an upside down triangle 2-5cm below the acrimonion process. Provides ease of access in the top of the arm, it is a relatively small area and muscle mass. Give only 1-2ml of fluid or less in this site. Do not use this site for IM injections if the person is very thin or muscle is small.

The Z track: Can be used when giving any IM medication. IM injections are designed to place medication deep into the muscle tissue. The tracking technique reduces pain and prevents medication spreading through the subcutaneous tissue.

1. Apply gentle traction on the skin to pull it away from the injection site (about 2-3 cm). Use your non-dominant hand.

2. Inject (slowly) with needle at 90 degrees to skin surface.

3. Withdraw needle quickly.

4. Release skin.

Images from Ian Miller  The Nurse Path: Helping nurses find their way  
Transdermal Patches

A transdermal patch is an adhesive patch which is placed on the skin to deliver a prescribed amount of medication over a period of time. Some examples of patches commonly used include analgesia patches e.g. Fentanyl, Norspan, durogesic etc. drugs to treat angina e.g. glyceryl trinitrate (GTN), nicotine patches, hormones and for motion sickness. Advantages of this route of medication administration are that it can provide a regular dose and improve compliance. Some limitations to this form of medication is local skin irritation, not all drugs are suitable for this form, it is not suitable to patients who have decreased peripheral blood flow such as shocked patients and it can be expensive. Wearing too many patches can cause an overdose ie. When previous patch not removed.

Medicated patches should be written up in the medication chart, including name of medication, strength of the patch in mg or micrograms per hour, frequency patch is to be changed, and when patch is to be removed. When patch is to remain longer than 24 hours the prescriber would normally cross out days during which it is to remain in place.

Frequently there is an additional form to be completed which documents the history in regards to when it was applied, location of application, when removed and disposal of. Only one patch should be worn at a time unless dose required cannot be achieved with one patch.

Applying a patch:

- Clean dry and unbroken skin area and ensure free of any powders, oils and lotions.

- Carefully open the packaging, if using scissors be careful not to cut the patch. Do not use a patch that has been cut or damaged.

- Press down firmly with the palm of your hand, press around the edges with your fingers to ensure smooth adherence- may take 20-30 second to get good adhesion.

- When removing previous patch use fingers to peel off slowly, fold in half- stick together and dispose of used patch according to local policy and procedure.

- Document- removal of old patch, document application date, time and location.
Safety Aspects of the Medication Trolley

Medications are stored according to the schedule recommended by the Standard for the Uniform Scheduling of Medicines and Poisons (abbreviated SUSMP) most commonly known are Schedule 2- Schedule 8 medications.

Nurses are given responsibilities in relation to safekeeping and dispensing of these medications. This includes the locked medication trolley, a drug storage room and a locked safe for storage of S8 medications.

Some basic principles in regards to these are:

If a medication trolley is unattended, all medications should be inside the trolley and locked.

A drug storage room usually has a key access requiring it to be locked at all times, and this door should not be propped open.

Access to this room is only for those approved for access.

S8 medicines under the Poisons Standard in Australia are defined as: substances that should be available for use but require restrictions relating to manufacture, supply, distribution, possession and use to reduce abuse, misuse and physical or psychological dependence.

S8 medications are stored in a locked safe within a locked room.

A register is required to record the receipt, issue and tally of all Schedule 8 (S8) medicines. Checks of S8 stocks occur at Handover by Registered Nurses when new staff arrives for the oncoming shift, when new stocks are received from pharmacy and at the time of dispensing S8 medications. The Registered nurse has the responsibility of keys for the DDA safe. Opening of this safe should always be done with 2 staff present and re-locked immediately after use.

Any errors in stock counts must be reported immediately to management.
Calculations:
Conversion of Mass – Metric System

This section shows you the relationship between kilograms, grams, milligrams and micrograms and how to convert from one form into another. This is of particular importance in drug calculations. We are often faced with a stock strength of a drug being in one form, but the drug order is asking for a different form. It is important to know the differing forms of mass (solid or liquid) from largest to smallest.

<table>
<thead>
<tr>
<th>LARGEST</th>
<th>SMALLEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLID</td>
<td>Grams</td>
</tr>
<tr>
<td>Kilograms</td>
<td>Milligrams</td>
</tr>
<tr>
<td>Grams</td>
<td>Micrograms</td>
</tr>
<tr>
<td>Milligrams</td>
<td>Millilitre</td>
</tr>
<tr>
<td>Litre</td>
<td></td>
</tr>
</tbody>
</table>

Common Metric Equivalents

Solid Mass

<table>
<thead>
<tr>
<th></th>
<th>Microgram</th>
<th>Milligram</th>
<th>Gram</th>
<th>Kilogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROGRAM</td>
<td>1</td>
<td>1000</td>
<td>1,000,000</td>
<td>1,000,000,000</td>
</tr>
<tr>
<td>MILLIGRAM</td>
<td>1000</td>
<td>1</td>
<td>0.001</td>
<td>0.000001</td>
</tr>
<tr>
<td>GRAM</td>
<td>1,000,000</td>
<td>1000</td>
<td>1</td>
<td>0.001</td>
</tr>
<tr>
<td>KILOGRAM</td>
<td>1,000,000,000</td>
<td>1,000,000</td>
<td>1000</td>
<td>1</td>
</tr>
</tbody>
</table>

Liquid Mass

<table>
<thead>
<tr>
<th></th>
<th>Millilitre</th>
<th>Litre</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILLILITRE</td>
<td>1</td>
<td>0.001</td>
</tr>
<tr>
<td>LITRE</td>
<td>1000</td>
<td>1</td>
</tr>
</tbody>
</table>
When converting to a SMALLER metric unit,

**MULTIPLY** by moving the decimal point to the **RIGHT**

<table>
<thead>
<tr>
<th>Example:</th>
<th>Convert 2.85 grams into milligrams</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Write down the equivalent</td>
<td>1g = 1000 mg</td>
</tr>
<tr>
<td>2) Multiply the value of the larger unit by the equivalent</td>
<td>2.85 x 1000</td>
</tr>
<tr>
<td>To convert, move the decimal point 3 places to the RIGHT</td>
<td>2.85 x 1000 = 2850 mg</td>
</tr>
</tbody>
</table>

When converting to a LARGER metric unit,

**DIVIDE** by moving the decimal point to the **LEFT**

<table>
<thead>
<tr>
<th>Example:</th>
<th>Convert 600 milligrams to grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Write down the equivalent</td>
<td>1g = 1000 mg</td>
</tr>
<tr>
<td>2) Divide the value of the larger unit by the equivalent</td>
<td>600 ÷ 1000</td>
</tr>
<tr>
<td>To convert, move the decimal point 3 places to the LEFT</td>
<td>600 ÷ 1000 = 0.6 g</td>
</tr>
</tbody>
</table>

Summary:
- To convert from larger to smaller units - *multiply by the equivalent*.
- To convert from smaller to larger units - *divide by the equivalent*. 
To avoid confusion with calculations and decimal points:

- Always place a '0' in front of a decimal point, e.g. 0.4
- Don't add a decimal point at the end unless necessary, e.g. write 2 mg, not 2.0 mg
- Avoid working with decimals where possible and convert to a smaller metric unit, e.g. write 250 mg rather than 0.25 g.

### Practice Calculations: Unit Conversions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Convert 50 mcg into mg</td>
<td></td>
</tr>
<tr>
<td>2) Convert 1780 mg into g</td>
<td></td>
</tr>
<tr>
<td>3) Convert 445 mcg into mg</td>
<td></td>
</tr>
<tr>
<td>4) Convert 0.003g into mg</td>
<td></td>
</tr>
<tr>
<td>5) Convert 0.928 L into ml</td>
<td></td>
</tr>
<tr>
<td>6) Convert 100 mcg to mg</td>
<td></td>
</tr>
<tr>
<td>7) Convert 250g to mcg</td>
<td></td>
</tr>
<tr>
<td>8) Convert 12.5 mg to mcg</td>
<td></td>
</tr>
<tr>
<td>9) Convert 0.72L to ml</td>
<td></td>
</tr>
<tr>
<td>10) Convert 5450ml to Litres</td>
<td></td>
</tr>
</tbody>
</table>

*Find the answers to these practice questions on page 28*
Enteric (Oral) Medications Calculations

In your Scope of Practice, you will be required to administer enteric, or oral, medications. To calculate the correct amount required you will need to use the formula below.

**Formula for Tablets:**

\[
\text{Strength Required} = \frac{\text{No. of Tablets}}{\text{Stock Strength}}
\]

It is important that you change both the ‘strength required’ and ‘stock strength’ to the same mass or volume unit to correctly calculate the amount to administer. You may have to convert the figures to the same metric units prior to using the formula.

**Example:** The required dosage for a patient is 2 mg, however the stock strength of the medication is 400 mcg per tablet. How many tablets should be administered for the patient to receive the required dosage?

1) Convert all figures in the calculation to the required metric unit (mg)

\[
1 \text{ mcg} = 1000 \text{ mg} \\
400 \div 1000 = 0.4 \text{ mg}
\]

2) Fill out the formula

\[
\text{strength required} = \frac{2 \text{ mg}}{0.4 \text{ mg}}
\]

3) Calculate the required dosage for the patient

\[
2 \div 0.4 = 5 \text{ tablets}
\]
## Practice Calculations: Enteric (Oral) Medication Calculations

<table>
<thead>
<tr>
<th>Strength Required</th>
<th>Stock Strength</th>
<th>No. of Tablets Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 0.1g</td>
<td>50mg per tablet</td>
<td></td>
</tr>
<tr>
<td>2. 75mg</td>
<td>25mg per tablet</td>
<td></td>
</tr>
<tr>
<td>3. 1500mg</td>
<td>1.5g per tablet</td>
<td></td>
</tr>
<tr>
<td>4. 0.8g</td>
<td>200mg per tablet</td>
<td></td>
</tr>
<tr>
<td>5. 720mg</td>
<td>120mg per tablet</td>
<td></td>
</tr>
</tbody>
</table>

*Find the answers to these practice questions on page 29*
Injectable Medication Calculations

To calculate the required dosage of injectable medications, use the formula below:

**Formula for Volume:**

\[
\text{Strength Required} \times \frac{\text{Volume}}{\text{Stock Strength}} = 1
\]

**Example:** The required dosage for a patient is **5 mcg per kg**; the patient weighs 40kg. The stock strength of the medication is **100mcg per ml**. How many ml is required?

1) Calculate the strength required

\[
5 \text{mcg per kg} = \text{patient is 40kg} \\
5 \text{mcg} \times 40 = 200 \text{mcg}
\]

2) Fill out the formula

\[
\text{strength required} = 200 \text{mcg} \\
\text{stock strength} = 100 \text{mcg per ml}
\]

3) Calculate the required volume for the patient

\[
200 \div 100 = 2 \text{ ml}
\]

**Example:** The required dosage for a patient is **2.4 mg**. The stock strength of the medication is **600mcg per ml**. How many ml is required?

1) Convert all figures in the calculation to the strength required metric unit (mg)

\[
1 \text{ mcg} = 1000 \text{ mg} \\
600 \div 1000 = 0.6 \text{ mg}
\]

2) Fill out the formula

\[
\text{strength required} = 2.4 \text{mg} \\
\text{stock strength} = 0.6 \text{mg per ml}
\]

3) Calculate the required volume for the patient

\[
2.4 \div 0.6 = 4 \text{ ml}
\]
### Practice Calculations: Injectable Medications

<table>
<thead>
<tr>
<th>Strength Required</th>
<th>Stock Strength</th>
<th>ml Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5000 units</td>
<td>2000 units per ml</td>
<td></td>
</tr>
<tr>
<td>2. 25mg</td>
<td>100mg per 2ml</td>
<td></td>
</tr>
<tr>
<td>3. 10mcg per kg</td>
<td>200mcg per ml</td>
<td></td>
</tr>
<tr>
<td>Client weighs 70kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 8mg</td>
<td>800mcg per ml</td>
<td></td>
</tr>
<tr>
<td>5. 3mg</td>
<td>800mcg per 2ml</td>
<td></td>
</tr>
</tbody>
</table>

*Find the answers to these practice calculations on page 30*
Intravenous Medication Calculations

Calculating drops per minute (dpm)

\[
\text{Total Volume to be infused (ml)} \times \frac{\text{Drop factor of set}}{\text{Time (in hours)}} = \frac{\text{60 (minutes)}}{}
\]

There are two types of IV giving sets used in Australia; the **Macro Drop Factor Giving Sets** and the **Micro Drop Factor Giving Sets**.

**Macro Drop Factor Sets** = 20 drops per ml (dpm)

(Known as an IV giving set)

(This is the most common dpm set used in Australia). This means that in every 1 ml of IV fluid, by using this particular set you will have 20 drops. Thinking of a flask of 1,000mls as a whole, this would equate to 20,000 drops being present by use of this macro drip set.

**Micro Drop Factor Sets** = 60 drops per ml (dpm)

(Known as an IV giving set)

This means that in every 1 ml of IV fluid, by using this particular set you will have 60 drops. Thinking of a flask of 1,000mls as a whole, this would equate to 60,000 drops being present by use of this micro drip set.

*Please Note: If the drop factor is not mentioned it is generally calculated at the Macro Drop Factor set rate of 20 dpm.*
Example:

200mls of IV fluid is to be given to a patient over 2 hours. The giving set drop factor has been set at 20 dpm. Calculate the drip rate?

\[
\frac{\text{Volume to be infused (ml)}}{\text{Time (in hours)}} \times \frac{\text{Drop factor of set}}{60 \text{ (minutes)}} = \text{drops per min required}
\]

\[
\begin{align*}
&= \frac{200}{2} \times \frac{20}{60} \\
&= 100 \times 0.33 = 33 \text{ per minute required}
\end{align*}
\]

Calculating flow rates when using pumps

\[
\frac{\text{Volume}}{\text{Time}} = \text{Flow Rate}
\]

Example:

A patient requires 1,000 ml over 12 hours. Find the ml per hour flow rate that must be transfused?

\[
\begin{align*}
\text{Volume} &= \frac{1000}{12} = 83 \text{ ml/hour}
\end{align*}
\]
Calculating flow rates when using a syringe pump

<table>
<thead>
<tr>
<th>1) Calculate the stock strength in the syringe</th>
<th>Dose Volume in Syringe</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) Calculate the flow rate</td>
<td>Strength Required x Volume = dose in ml/hr</td>
</tr>
<tr>
<td>Stock Strength</td>
<td>1</td>
</tr>
</tbody>
</table>

Example:
The required dose for a patient is 2.5mg per hour. The dose strength is 50mg with 50mls in the syringe pump. Calculate the flow rate required in ml per hour

\[ \frac{2.5\text{mg}}{50\text{mg}} \times \frac{50\text{ml}}{1} = 2.5\text{ml per hour} \]

IV Fluids, Injectable & Other Mixture/Solution Medication Calculations

Calculating IV Rates - ml per hour

\[ \text{Total Volume to be given (in ml)} = \text{ml per hr} \]

\[ \text{Time (in hours)} \]
Calculating IV Rates - Drops per Minute (dpm)

\[
\text{Total volume to be give (ml)} \times \text{Drop factor on the set} = \text{dpm}
\]

\[
\text{Time (in minutes)} \quad 1
\]

Calculating IV Rates - Time Remaining

\[
\text{Total volume remaining in mls} \times \text{drop factor on the set} = \text{minutes remaining}
\]

\[
\text{Drops per minute} \quad 1
\]

Example:
The volume remaining is 180 ml. The drop factor on the set is 60. The drops per minute (calculated when set up) is 30. How many minutes will it take to deliver the medication in full?

\[
180 \text{ml} 
\times \frac{60}{30 \text{dpm}} = 6 \times 60 = 360 \text{ minutes (or 6 hours)}
\]
<table>
<thead>
<tr>
<th>Calculation</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The total volume to be given is 30 ml over a 30 minute period. The drop factor is 15. How many drops per minute will be delivered?</td>
<td></td>
</tr>
<tr>
<td>2. The total volume to be given is 1400ml over a 10 hour period. The drop factor is 60. How many drops per minute will be delivered?</td>
<td></td>
</tr>
<tr>
<td>3. The total volume to be given is 990 ml over a period of 15 hours. The drop factor is 15. How many drops per minute will be delivered?</td>
<td></td>
</tr>
<tr>
<td>4. The volume remaining is 1100 ml. The drop factor is 20. The drops per minute (calculated when set up) is 19. How many minutes will this take to be delivered in full to the patient?</td>
<td></td>
</tr>
<tr>
<td>5. The volume remaining is 160 ml. The drop factor is 60. The drops per minute (pre-calculated) is 45. How many minutes will this take for the medication to be delivered in full?</td>
<td></td>
</tr>
</tbody>
</table>

Find the answers to these practice calculations on page 31
Medication Competency Checklist

Medications are an integral part of working as a nurse. It is reported 91% of aged patients have 5 or more medications daily. As a Healthcare Australia Nurse you are required to ensure safe medication practices. In order to do this it is expected you know the 8 rights of medication and adhere to these at all times. Below is a medication competency checklist. Please use this to check your practice.

1. Infection control standards maintained while correctly preparing medication for administration, including hand hygiene between patients/residents/clients
2. Knows 8 Rights of medication
3. Checks medication chart details are accurate
4. Checks medication pack/label for correct information
5. Verifies client identification against photo / ID band and clarifies when unsure
6. Positions client appropriately for medication administration
7. Does not leave medication on over way or delegates to another person for administration
8. Supervises and observes client to ensure swallowing of medication is completed appropriately
9. Documents/signs immediately following each individual client Administration
10. Identifies, assesses, evaluates and reports relevant clinical information to appropriate senior staff eg.1. If patient looks unwell, or reports feeling unwell - completes vital signs, positions client comfortably and safely and reports and documents what you have done and observed 2. if patient reports pain - assess patients pain score, reports and follows up patients wellbeing, also documents and if prn pain medication given and documents effect
11. Follows appropriate medication administration guidelines for administering eye drops/ointment, topical creams/patches and inhalation (eg. Puffers, nebuliser) medications
12. Aware of and follows medication management guidelines for DDA administration, always 2 qualified staff checking and signing (as per local protocol).

13. Performs a good standard of preparation for task and at completion of task ensures medication trolley is clean, organised and restocked in preparation for the next person

14. Does not leave the drug trolley/keys unattended at any time, does not leave drug room door open

15. Ensures medication is packed away and not left on drug trolley unattended

16. Clarifies/confirms all medication management requirements are completed and documented prior to leaving the medication round. This includes a final check all medications are signed for

The most common drug error is that of ‘omission’, when the drug is not available or the nurse cannot find it, or when a section of the drug sheet is missed. The opposite error occurs when the nurse fails to spot that treatment has ceased and carries on giving it. Do not administer a drug where the instructions are unclear or ambiguous, or the writing is illegible. Never make any assumptions or jump to conclusions about the prescriber’s intent; contact the doctor for clarification. Ensure documented and handed over as needed.

17. Performs final check of charts before leaving shift.
## Practice Calculation Answers

### Practice Calculations: Unit Conversions (pg 10)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Convert 50 mcg into mg</td>
<td>0.05mg</td>
</tr>
<tr>
<td>2) Convert 1780 mg into g</td>
<td>1.78g</td>
</tr>
<tr>
<td>3) Convert 445 mcg into mg</td>
<td>0.445mg</td>
</tr>
<tr>
<td>4) Convert 0.003g into mg</td>
<td>3mg</td>
</tr>
<tr>
<td>5) Convert 0.928 L into ml</td>
<td>928ml</td>
</tr>
<tr>
<td>6) Convert 100 mcg to mg</td>
<td>0.1mg</td>
</tr>
<tr>
<td>7) Convert 250g to mcg</td>
<td>250,000,000mcg</td>
</tr>
<tr>
<td>8) Convert 12.5 mg to mcg</td>
<td>12500mcg</td>
</tr>
<tr>
<td>9) Convert 0.72L to ml</td>
<td>720ml</td>
</tr>
<tr>
<td>10) Convert 5450ml to Litres</td>
<td>5.45L</td>
</tr>
</tbody>
</table>
### Practice Calculations: Enteric (Oral) Medication Calculations

#### (pg. 9)

<table>
<thead>
<tr>
<th>Strength Required</th>
<th>Stock Strength</th>
<th>No. of Tablets Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 0.1g</td>
<td>50mg per tablet</td>
<td>1g = 1000mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 x 1000 = 100mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 = 2 tablets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>2. 75mg</td>
<td>25mg per tablet</td>
<td>75 = 3 tablets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>3. 1500mg</td>
<td>1.5g per tablet</td>
<td>1g = 1000mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1500 ÷ 1000 = 1.5g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5 = 1 tablet</td>
</tr>
<tr>
<td>4. 0.8g</td>
<td>200mg per tablet</td>
<td>1g = 1000mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8 x 1000 = 800mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>800 = 4 tablets</td>
</tr>
<tr>
<td>5. 720mg</td>
<td>120mg per tablet</td>
<td>720 = 6 tablets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>
## Practice Calculations: Injectable Medications (pg. 11)

<table>
<thead>
<tr>
<th>Strength Required</th>
<th>Stock Strength</th>
<th>ml Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 5000 units</td>
<td>2000 units per ml</td>
<td>5000 units = 2.5ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2000 units per ml</td>
</tr>
<tr>
<td>2. 25mg</td>
<td>100mg per 2ml</td>
<td>25mg = 0.5ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50mg (100mg ÷ 2 = 50mg per ml)</td>
</tr>
<tr>
<td>3. 10mcg per kg</td>
<td>200mcg per ml</td>
<td>700mcg = 3.5ml</td>
</tr>
<tr>
<td>Client weighs 70kg</td>
<td></td>
<td>10mcg x 70 = 700mcg (strength req.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200mcg</td>
</tr>
<tr>
<td>4. 8mg</td>
<td>800mcg per ml</td>
<td>800 ÷ 1000 = 0.8mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1mg = 1000mcg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16mg = 10ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8mg</td>
</tr>
<tr>
<td>5. 3mg</td>
<td>800mcg per 2ml</td>
<td>800 ÷ 1000 = 0.8mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1mg = 1000mcg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.4 (0.8mg ÷ 2 = 0.4mg per ml)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.5ml</td>
</tr>
</tbody>
</table>
### Practice Calculations: IV Calculations (pg.16)

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The total volume to be given is 30 ml over a 30 minute period. The drop factor is 15. How many drops per minute will be delivered?</td>
<td>$\frac{30 \times 15}{30} = 1 \times 15 = 15 \text{ dpm}$</td>
</tr>
<tr>
<td>2. The total volume to be given is 1400 ml over a 10 hour period. The drop factor is 60. How many drops per minute will be delivered?</td>
<td>$\frac{1400 \times 60}{10} = 140 \times 1 = 140 \text{ dpm}$</td>
</tr>
<tr>
<td>3. The total volume to be given is 990 ml over a period of 15 hours. The drop factor is 15. How many drops per minute will be delivered?</td>
<td>$\frac{990 \times 15}{15} = 66 \times 0.25 = 16.5 \text{ dpm}$</td>
</tr>
<tr>
<td>4. The volume remaining is 1100 ml. The drop factor is 20. The drops per minute (calculated when set up) is 19. How many minutes will this take to be delivered in full to the patient?</td>
<td>$\frac{1100 \times 20}{19} = 57.89 \times 20 = 1158 \text{ minutes}$ $1158 \text{ minutes} \div 60 = 19.3 \text{ hrs (0.3 x 60)} = 19\text{hrs 18 minutes}$</td>
</tr>
<tr>
<td>5. The volume remaining is 160 ml. The drop factor is 60. The drops per minute (pre-calculated) is 45. How many minutes will this take for the medication to be delivered in full?</td>
<td>$\frac{160 \times 60}{45} = 3.56 \times 60 = 214 \text{ minutes}$ $214 \text{ minutes} \div 60 = 3.57 \text{ hrs (0.57 x 60)} = 3\text{hrs 34 minutes}$</td>
</tr>
</tbody>
</table>
Congratulations

You have now successfully completed theoretical practice for the Medication Management eLearning package.

You should now complete the Medication management multi-choice quiz which requires 100% pass rate to successfully complete this course.

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Content correct as of August 2015.
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References and Further Study

http://www.alysion.org/dimensional/analysis.htm


Can I crush it? MIMs Australia viewed 2 July 2015.


Drugs and diseases Index line (n.d.) Jejunostomy feeding Tube viewed 29 Sept 2015
http://dxline.info/diseases/jejunostomy-feeding-tube

http://au.ixl.com/math/years

Guiding Principles of medication management in residential aged care facilities 2012
Department of Health and aging, Commonwealth of Australia. viewed 7 July 2015


