

# Tabbner's Nursing Care

THEORY AND PRACTICE  
9TH EDITION



Gabrielle Koutoukidis  
& Kate Stainton



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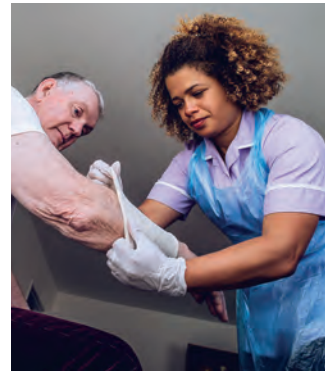
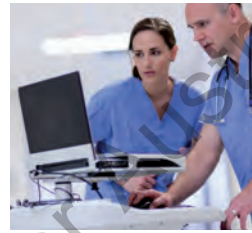
# Tabbner's Nursing Care

THEORY AND  
PRACTICE 9E

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# Tabbner's Nursing Care

THEORY AND  
PRACTICE 9E



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# Preface

The ninth edition of *Tabbner's Nursing Care* is contemporary, includes health informatics and technology, LGBTQIA+, COVID-19 content and a new chapter on readiness for practice. Written by a highly skilled team of editors and contributors, the book equips the learner to work within the digital world, and reflects the enrolled nursing scope of practice, assisting graduates to be competent, safe and able to work flexibly to adapt to changing and challenging healthcare environments. This new edition retains, and builds on, the strengths of previous editions that have made *Tabbner's Nursing Care* an essential resource for enrolled nursing students and their educators.

## The role of the Enrolled Nurse

The Enrolled Nurse is an essential member of the healthcare team, providing person-centred, safe and competent nursing care. Enrolled Nurses' responsibilities also include providing support and comfort, assisting with activities of daily living to enable individuals to achieve their optimal level of independence and providing for the emotional needs of people. Where state and territory law and organisational policies allow, Enrolled Nurses may administer prescribed medicines or maintain intravenous fluids, in accordance with their educational preparation.

Enrolled Nurses are required to be information-technology literate, with specific skills in the application of healthcare technology. Enrolled Nurses demonstrate critical- and reflective-thinking skills in contributing to decision-making, including reporting changes in health and functional status and individual responses to healthcare interventions. Enrolled Nurses work as part of the multidisciplinary healthcare team to advocate for, and facilitate, the involvement of individuals, their families and significant others in planning and evaluating care and progress towards health outcomes. The role also requires them to act as preceptors for students and other healthcare workers.

Career opportunities for Enrolled Nurses include acute care; perioperative, emergency, intensive and coronary care; aged care; rehabilitation; community, mental health and

general practice settings. In addition, Enrolled Nurses work in specialty areas such as education, technology in health-care, diabetes education, continence management, dementia management, lactation consultancy, workplace safety and wound care.

## Ninth edition of *Tabbner's Nursing Care*

Person-centred care while maintaining professional standards is the approach used throughout the textbook, allowing learners to appreciate the skill and scope required to be a safe and competent Enrolled Nurse. All chapters have been completely revised with a focus on critical thinking and problem-solving, quality and safety and evidence-based best practice, with national registration requirements addressed where appropriate.

The full-colour internal design enhances photographs and illustrations to provide clear and meaningful visual aids to learning.

The ninth edition has been carefully developed to fulfil the requirements of the Diploma of Nursing training package qualification (leading to registration with the Australian Health Practitioner Regulation Agency [Ahpra] to practise as an Enrolled Nurse). It provides a contemporary approach to nursing practice and is an invaluable teaching resource. The text provides the theoretical knowledge on the care that individuals may require in a range of healthcare settings and offers special features to enhance student learning of the material.

This edition has been fully updated by clinical and academic experts who are passionate about the education of Enrolled Nurses and the important role they play in healthcare settings. We are grateful for their enthusiasm and support throughout the writing process. In addition, we would like to thank the team at Elsevier for their hard work and perseverance in ensuring the publication of this edition.

**Gabby Koutoukidis**  
**Kate Stainton**

# CHAPTER 20

## Key Terms

absorption  
active ingredient prescribing  
adverse effects  
allergic reactions  
biotransformation  
blood products  
chemical name  
compliance  
deltoid muscle  
distribution  
enteral  
excretion  
first-pass metabolism  
generic name  
half-life  
high-risk medicines (HRMs)  
intramuscular (IM) injection  
intravenous (IV) injection  
medication action  
medication metabolism  
medication safety  
needleless intravenous system  
parenteral  
pharmacodynamics  
pharmacokinetics  
pharmacology  
poisons schedules  
protein bound  
Quality Use of Medicines (QUM)  
subcutaneous injection  
Tall Man lettering  
therapeutic index  
therapeutic medication monitoring  
topical  
trade name  
vastus lateralis muscle  
ventrogluteal region  
Visual Infusion Phlebitis Score (VIPS)

# Administration and monitoring of medications and intravenous therapy

*Heather Redmond*

## Learning Outcomes

At the completion of this chapter and with further reading, learners should be able to:

- Define the key terms.
- Identify the different formulations of medications.
- Identify a medication by generic and trade names.
- List the medication administration routes.
- Discuss factors affecting medication absorption.
- Define 'first-pass metabolism' and discuss its impact on medication dosage.
- Discuss the role of plasma proteins in medication distribution.
- Compare enzyme induction and enzyme inhibition.
- List the organs involved in medication excretion.
- Discuss reasons for therapeutic medication monitoring.
- Define medication action, desired outcome, side effects, toxic effects, allergic reactions and medication interactions.
- Discuss legal and other responsibilities of the Enrolled Nurse (EN) regarding medication administration.
- Demonstrate an ability to accurately calculate medication dosages for administration.
- Demonstrate knowledge of correct preparation and administration of subcutaneous, intramuscular, intradermal and intravenous medications and infusions; topical skin preparations; oral preparations; ophthalmic, otic and nasal drops; vaginal instillations; rectal preparations; and inhalers.
- Demonstrate an understanding of the actions of the different medication groups in order to monitor medication effectiveness.
- Show an understanding of safe handling of hazardous substances.
- Discuss the importance of discharge planning and education in individual compliance with medication therapy.

## CHAPTER FOCUS

Medications are an important part of many treatment regimens. They are the most common treatment given in healthcare settings and, as a result, a higher incidence of medication errors and adverse medication reactions occur (ACSQHC 2021a). Administering medications is one of a nurse's key responsibilities and should be treated with the importance it deserves. It is therefore vital for the nurse to have both the knowledge and the skills to administer medications safely and accurately (Frotjold & Bloomfield 2021). Medication administration offers nurses the opportunity to increase knowledge and skills, to observe the individual for expected and unexpected actions and to ensure that individuals have been adequately educated about medications. The topics included in this chapter provide the nurse with the foundations to administer medications safely and competently to individuals.

## LIVED EXPERIENCE

Joan says she is 82 now and is getting a bit old to manage her medications on her own. She has a community care package in place, which allows her to access services so that she can live somewhat independently and not have to go into a nursing home. Joan states that her family do not live nearby and would like her to go into residential care, but she feels she is managing well at home even though she has heart failure and a jittery heartbeat. Joan also uses her wheeie walker since she says is a bit unsteady now and gets a bit puffed. Despite this, she is a social butterfly and attends trips twice a week with others using the community provider. Joan mentions that she does struggle with taking her medications—there seems to be a lot and she particularly hates her water tablet that she takes in the morning and at lunchtime, which stops her from enjoying her community outings. She discloses that she quite often misses her morning tablets when they go on bus trips to avoid having to get the bus to stop every time she needs to go to the toilet. It is so embarrassing with everyone watching. Joan says, 'I hope I am not causing any damage to my ticker by not taking the medications when I go out.'

Joan, 82 years old

## INTRODUCTION

'Pharmakon' is the Greek word for 'drug', and **pharmacology** is the study of the actions, uses and adverse effects of drugs on living systems (Knights et al 2023). Drugs and poisons are controlled substances defined by the *Drugs, Poisons and Controlled Substances Act 1981* and the *Drugs, Poisons and Controlled Substances Regulations 2017*. The terms 'drugs' and 'poisons' are defined together as prescription medicines; pharmacy-only medicines; drugs of dependence; chemicals for household, industrial and chemical use; and veterinary medicines (Knights et al 2023). The definition of a drug is any substance that produces a biological effect when introduced into the body (Ritter et al 2023). The term 'drug' can be further divided into medicinal drugs (or medications) (which are substances used in treatment, prevention, diagnostic, curative and health maintenance) and non-medicinal drugs (or social drugs). The distinction between the two is not always clear since some non-medicinal substances can be used in a medicinal way (e.g. caffeine is included in some preparations to treat migraine) and some medicinal substances can be used in non-medicinal ways (e.g. opioid analgesia such as codeine phosphate may be used recreationally for its mind-altering properties). In the general community, however, the term 'drugs' tends to be associated with non-prescription or illicit substances, and 'medications' is the common term used for prescribed drugs that have the intention of producing a therapeutic effect (Ritter et al 2023). Drugs can be

categorised by the way in which they affect our bodies: depressants—slow down the function of the central nervous system; hallucinogens—affect your senses and change the way you see, hear, taste, smell or feel things; stimulants—speed up the function of the central nervous system. Some drugs affect the body in many ways and can fall into more than one category (Department of Health and Aged Care 2021). The term 'poison' as referred to under the definition of drugs, however, is 'any substance that harms the body or causes death' (Knights et al 2023). Medicinal medicines given at high doses may also have similar effects to a poison.

Pharmacology can further be subdivided into **pharmacokinetics**, which is the way the body affects the medication during absorption, distribution, metabolism and excretion, and **pharmacodynamics**, which are the effects of the medication on the body (e.g. therapeutic effect and side effects) (Knights et al 2023). Before considering these two areas of pharmacology, it is important to consider the process for naming medication, as well as medication formulations and administration routes.

### Medication names

The nurse should be aware that each medication has various names—chemical, generic and trade (brand or proprietary) names.

The **chemical name** provides an exact description of the medication's chemical composition, which is usually a temporary name until the generic name is assigned (Broyles et al 2019).

The **generic name** is given by the manufacturer who first develops the medication; it is then approved by the medicines regulatory authority (Knights et al 2023). Even generic names are not standardised, and nurses should be careful when using textbooks published in countries other than the one where they are practising nursing. Examples of different names used in different countries include adrenaline (Australia) = epinephrine (US), pethidine (Australia) = meperidine (US), and paracetamol (Australia) = acetaminophen (US). In 2013, the Therapeutic Goods Administration (TGA) commenced a process to align Australian drug names (active substance) and their excipients (inactive ingredients) with international non-proprietary names (INNs). The INN identifies a generic name for pharmaceutical substances or active ingredients to be recognised globally (WHO 2017). The Department of Health and Aged Care, TGA (2020) updates some medicine and ingredient names to be consistent with INNs where possible to provide clarity and reduce confusion for Australian consumers and health practitioners who travel internationally. Some medicines that are either more frequently used or have a higher risk took an additional 3 years to change, and dual labelling was used. This consisted of the new INN name and the old, approved name in parentheses afterwards. For example, 'frusemide' was displayed as 'furosemide (frusemide)' until 2023, after which it is now just referred to as 'furosemide' (its INN nomenclature) (Department of Health and Aged Care, TGA 2020; 2023b). Generic names are always written with a lower-case first letter (Knights et al 2023). Occasionally, a medication's generic name may describe its chemical compositions, such as with lithium carbonate or potassium chloride.

ACSQHC (2020a) outline **Tall Man lettering** as a typographic technique that can help differentiate between names of medicines that look alike or sound alike (LASA). It involves the use of mixed-case letters, with the tall letters within the medicine name capitalised to draw attention to the differences between similar medicine names. Two medications names may share several letters, which could potentially lead to confusion when prescribing or administering medication. For example, cefotaxime or ceftazidime are LASA medicines and by capitalising the different letters of the names, it becomes easier to differentiate between them, reducing the risk of medication errors. The Tall Man lettering applied to these medications is written as ceftOTAXime and CeftAZDime. The National Tall Man Lettering list aims to identify generic and brand name medicines that have the greatest risk for errors (ACSQHC 2020a). Tall Man lettering should be used when prescribing medicines on EMS, printing medicine labels, medicine libraries in smart pumps and in storage systems (ACSQHC 2020a).

Quality Use of Medicines (QUM) recommends that medications be prescribed using the generic rather than trade name (e.g. metronidazole rather than Flagyl). Generic prescribing avoids confusion, as some trade names are

similar, and may also reduce the cost of the medication for individuals as they can choose a cheaper alternative brand name (Knights et al 2023).

The **trade name** (or brand or proprietary name) is the name under which a manufacturer markets a medication and is copyrighted to that particular medication. Others are restricted from using the trade name; therefore, there are multiple names for the same generic medication. Examples include the diuretic furosemide, marketed as Urex, Lasix, Frusid and Uremide, and antibacterial agent amoxicillin, marketed as Alphamox, Amoxil, Cilamox and Maramox. Trade/brand names are written with an initial upper-case letter. Individuals may wish to purchase a cheaper brand. Identification of the cheaper medication under a trade name is made easier using the generic name (as costs may vary dramatically between brands). In recent times, the Pharmaceutical Benefits Scheme (PBS) has allowed brand substitution for tablets of the same dose, unless the prescriber has ticked 'Brand substitution not permitted' on the prescription form (Knights et al 2023). While brand substitution can save the individual money, it can also cause confusion as the medication may appear different in colour (e.g. 40mg furosemide tablets can be white [Uremide] or yellow/cream [Lasix]), shape and packaging, which could result in the individual taking more than one form of the same medication. When changing medication brands, it is important to consider how much of the new branded drug reaches the systemic circulation unchanged (its bioavailability) compared to what the individual has been taking because some medications with the same generic name have been shown to have significant differing pharmacological effects (Broyles et al 2019). The prescriber may tick the box on the prescription 'Brand substitution not permitted' if it is known that a different brand name medication with the same generic name has a different chemical composition to other cheaper brand names (Knights et al 2023).

## Classification

Medications are allocated to a class or category, which have similar characteristics or actions on specific body systems. Antihypertensives have the primary action of reducing blood pressure and are divided into six categories: central and peripheral antiadrenergic agents, beta-adrenergic blockers, vasodilators, ACE inhibitors, angiotensin II antagonists and calcium channel blockers (Tiziani 2022). The medication prescribed will depend on the individual's symptoms and the desired effect, frequency required and cost. A combination of medications in the same class may be chosen to control an individual's blood pressure (an ACE inhibitor and a calcium channel blocker; amlodipine and benazepril) or from another medication class (an ACE inhibitor and a diuretic: furosemide/hydrochlorothiazide) (Tiziani 2022). A medication may also be classified into more than one class (e.g. aspirin is classified as an analgesic, antipyretic, anti-inflammatory and antiplatelet) (Frotjold & Bloomfield 2021).

## Quality use of medications

In 1985, the World Health Organization (WHO) called a Conference of Experts on the Rational Use of Drugs as it found that inappropriate prescription and use of medications was occurring globally. The WHO called on all healthcare professionals and governments to assist in developing their own National Medicinal Drug Policy. Australia responded to this by instituting the National Medicines Policy (NMP) released in 2000. The current NMP, which was released in December 2022, focuses on achieving for all Australians the world's best health, social and economic outcomes through a highly supportive medicines policy (Department of Health and Aged Care 2023a).

There are three central objectives of the NMP (Figure 20.1): equitable, timely, safe and affordable access to high-quality medicines and medicine related services; that there is judicious, safe and optimal use of medicines with a focus on person-centred care and informed choices; policy development is positive and sustainable to ensure the successful development of medicines and medicines-related services in Australia through world-class innovation and research (Department of Health and Aged Care 2022a; 2023a). This will ensure that medications that are prescribed, purchased over-the-counter or complementary are appropriate, safe and effective, and are used to promote the health outcomes of individuals (Frotjold & Bloomfield 2021).

The NMP definition of **Quality Use of Medicines (QUM)** is that medications are selected wisely; are appropriate, taking into consideration the individual and their health concerns as well as factors such as risks, benefits, alternative therapies, comorbidities, regimen, monitoring and associated costs; and are used safely and effectively to optimise health outcomes. In 2019, QUM and medicines safety was announced by the Council of Australian Governments Health Council as Australia's 10th National Health Priority. The ACSQHC have drafted a National Baseline Report on best practice models, new national standards and better medication management. These reports were released in 2023 and focus on residential aged-care facilities, the community and on supporting continuity of care for individuals who move between different parts of the healthcare system. The Australian Commission on Safety and Quality in Health Care National Indicators for Quality Use of Medicines (QUM) in Australian Hospitals is a set of indicators to collect data to measure the safety and quality of medicine use, and to inform and enable quality improvement (ACSQHC 2014). It is important that the QUM is a team approach encompassing those that prescribe, dispense and administer medicines as well as individuals who take the medicine (Frotjold & Bloomfield 2021). Central to the NMP is the promotion of QUM and medicines safety for the future health needs of individuals, families, carers and communities, achieved through collaboration with all partners.

### The prescriber's role

Medications are primarily prescribed by a medical officer; however, veterinarians, dentists, pharmacists and Nurse

Practitioners (NPs) can prescribe within a specific scope of practice (Frotjold & Bloomfield 2021). In addition, hospital policy may allow for Registered Nurses (RNs) to 'nurse initiate' medications from an approved list to certain hospitalised individuals (Frotjold & Bloomfield 2021). The person prescribing the medication must follow the QUM objectives to ensure the medication is appropriate and safe for the individual taking the medication. They also have the responsibility to ensure the individual is an active participant in the decision-making process and is supported and well informed in a way they understand, about the medicines being prescribed and possible alternatives (Department of Health and Aged Care 2023a).

### The pharmacist's role

Pharmaceutical companies make medications in their specific forms, which are ready for dispensing to community and hospital pharmacies. Prescribed medications are prepared and dispensed by the pharmacist for community and hospitalised individuals (Frotjold & Bloomfield 2021). Compounding pharmacists also make special orders for medications by mixing compounds and/or solutions. Hospital pharmacists may mix up intravenous (IV) additive solutions (e.g. total parental nutrition [TPN]) for individual medication requirements. When dispensing, the pharmacist needs to ensure that the medication is suitable for the individual, including looking for any contraindications or interactions. The correct labelling of the right dosage and number of tablets is also part of the pharmacist's role. In many acute settings, the hospital pharmacist also checks each individual's medication chart to ensure accuracy and the correct medication and dosage is prescribed. Amendments may be made by the pharmacist. Healthcare workers and individuals can access the pharmacist for a valuable resource to provide information relating to the prescribed medication including action, side effects, interactions and incompatibilities (Frotjold & Bloomfield 2021). See Case Study 20.1 regarding medication interactions.

### The nurse's role

Nurses have several roles in prescribing (NP only) and administering medications. Nurses require knowledge of the rationale, as well as the therapeutic and non-therapeutic effects of the prescribed medication, adverse drug reactions (ADRs) and contraindications (Frotjold & Bloomfield 2021). This enables nurses to ascertain the appropriateness of the medication they are about to deliver and be able to provide individual and/or family education about specific medications and their effects. Administering medications includes the responsibility of assessing individuals prior to administration, following the 11 rights, and evaluating the therapeutic effectiveness and outcomes after administration (Frotjold & Bloomfield 2021). The nurse must be aware of and work within the legal parameters of medication administration in accordance with the state, territory or country the nurse works in, as well as the employer policy and procedural guidelines of medication administration and management.

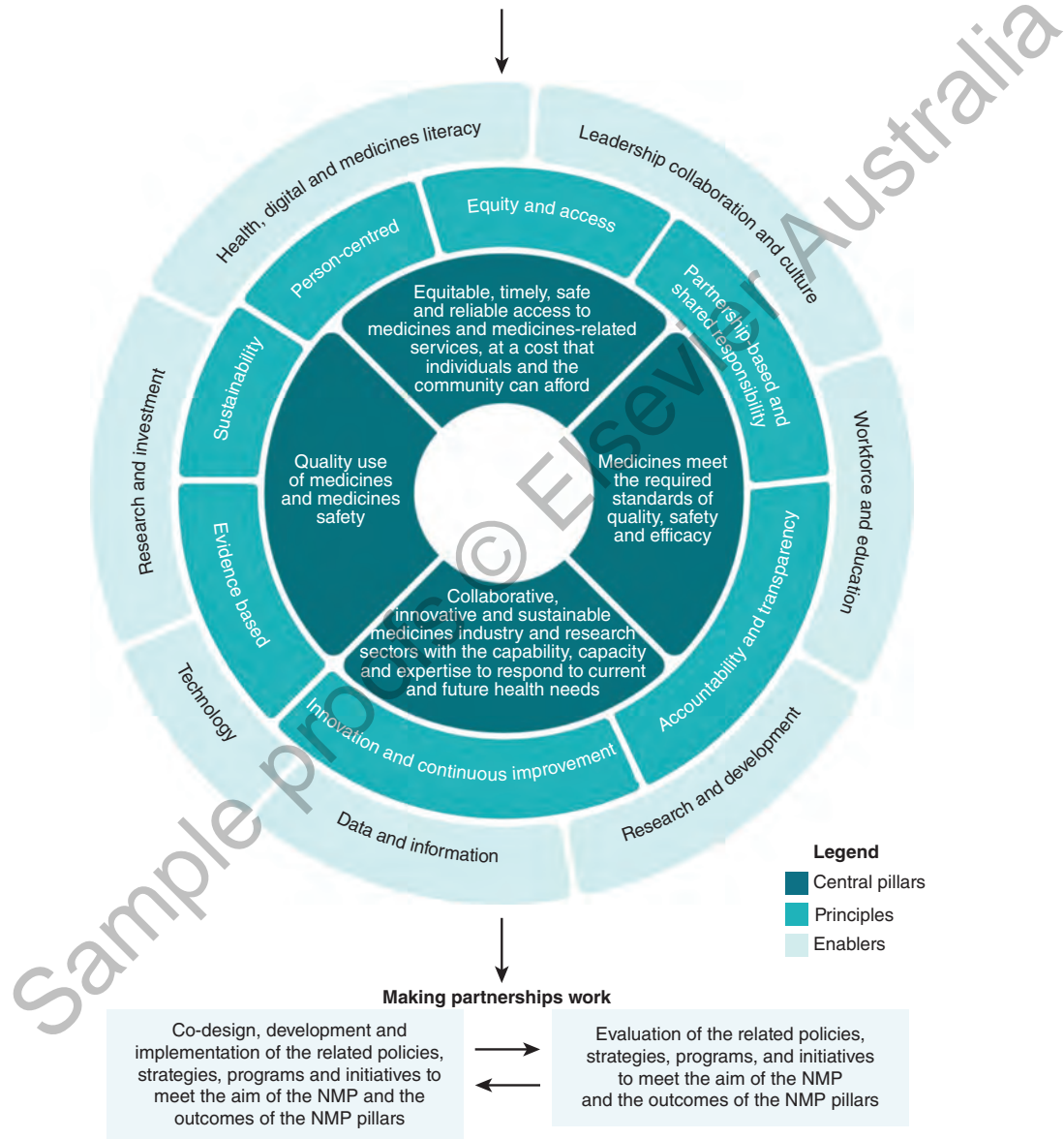
**Vision**

To achieve the world’s best health, social and economic outcomes for all Australians through a highly supportive medicines policy environment

**Aim**

To ensure:

- Equitable, timely, safe and affordable access to a high-quality and reliable supply of medicines and medicines-related services for all Australians.
- Medicines are used optimally and judiciously, with a focus on informed choice and well-coordinated person-centred care.
- Support for a positive and sustainable policy environment to drive world-class innovation and research, including transnational research, and the successful development of medicines and medicines-related services in Australia.



**Figure 20.1** Overview of National Medicines Policy (NMP)

(Department of Health and Aged Care 2023a)



### CASE STUDY 20.1

#### Medication interactions

David had recently been prescribed two new medications by his GP for hypertension and depression. David was diligent about taking his medications as prescribed. David started experiencing dizziness and feeling faint and generally unwell and, since the symptoms continued to worsen over the next few days, he decided to make an appointment to go back and see his GP. In the meantime, he researched using the internet since he was sure the medications were making him unwell. He found that the combination of the blood pressure medication and the antidepressant were interacting with each other as well as the grapefruit juice he was drinking. David noted he was not supposed to drink grapefruit juice with the prescribed antihypertensive. David considered that he ate healthily and drank grapefruit juice every morning because it was rich in antioxidants. On return to the GP, David's blood pressure was 95/45 mmHg and his heart rate was 110 beats per minute. The GP said that blood pressure medication had caused his blood pressure to drop, which was making him feel dizzy and faint.

David's doctor immediately adjusted his medication regimen, taking him off the antidepressant and switching him to a different blood pressure medication that wouldn't interact with the one he was already taking. It took a few days for the new medication to take effect.

1. What is the role of the doctor and the pharmacist in ensuring safe medication administration for David?
2. What questions could David have asked his GP about the newly prescribed medications?

## The consumer's role

The individual who has been prescribed the medication has a role in adhering to the prescribing regimen, having regular health reviews and discussions with the medical officer, and reporting any health concerns and side effects associated with the medication being taken. Information regarding any alternative therapies being used should also be discussed, such as naturopathy, homeopathy or over-the-counter (OTC) medications to ensure they do not interact with the prescribed medications being taken.

Medication management in residential aged-care (RAC) homes falls under the *Aged Care Act 1997* (under review at the time of this publication), Quality of Care Principles, Residential Care Standards and the Accreditation Standards. The approach in QUM in RAC homes for the use and management of medications is outlined in *The Guiding Principles for Medication Management in Residential Aged Care Facilities* (Department of Health and Aged Care 2022b). The guiding principles are intended to promote a

person-centred approach, safe and quality use of medicines and medication management within RAC homes (Department of Health and Aged Care 2022b). The QUM in RAC homes approach means that suitable medications are chosen that treat illness and maintain health, the necessity of the medication is considered and that medications are used safely and effectively.

Medications accessed OTC are non-prescription medications and are generally used for short-term, self-limiting illnesses such as headache, heartburn and constipation. They also include vitamins, minerals and herbal medications and remedies which, unfortunately, many people consider to be safe because they are natural. However, herbal medications and remedies do interact with prescription medications (e.g. St John's wort interacts with warfarin, increasing warfarin's metabolism and decreasing its therapeutic effect) and non-prescription medications (e.g. aspirin and ibuprofen) can cause gastrointestinal bleeding and must only be taken at recommended doses (Knights et al 2023).

### CRITICAL THINKING EXERCISE 20.1

#### Quality use of medications

Mary is a 62-year-old woman who is not on any current medications and has recently had an annual pathology test completed. Mary was asked to come and see the GP for her results. During the consultation, the GP mentioned that her cholesterol test was normal 12 months ago, but it was now 7.2 mmol/L, which he said he felt was a bit too high and he was going to prescribe her 20 mg of atorvastatin. Mary has been taking the medication for 2 months and has returned to her GP due to side effects she is experiencing. Mary reports that the medication has caused her several uncomfortable side effects, including joint pain, fatigue and heartburn. The medical officer mentioned these side effects can be quite normal and proceeded to prescribe an NSAID, diclofenac BD PRN for the joint pain and 20 mg esomeprazole D for the heartburn and told her to continue with the atorvastatin until her next blood test. Given the NMP view on judicious, safe and optimal use of medicines, is this quality use of medicines? What alternatives do you think Mary's GP could have discussed with her?

## Medication formulations and administration routes

Medications are given by three general methods: **enteral**, **parenteral** and **topical** administration. Enteral administration is when medication enters into the gastrointestinal tract. Parenteral medication administration involves injection into the body tissues. Topical administration includes medication applied to the skin, mucous membranes and intraocularly (Frotjold & Bloomfield 2021). A single medication may be available in a variety of forms (see Table 20.1, Figure 20.2) and administered via several different routes.



**TABLE 20.1 | Medication forms**

Medication form	Description
Capsule	Gelatine container enclosing a medication in liquid, powder or granule form.
Tablet	A medication mixed with a base compound and compressed into a variety of shapes. Tablets are sometimes coated, which delays release of the medication until the tablet reaches the intestine. Tablets are coated if the medication could cause gastric irritation or if it would be destroyed by gastric juice. Another form of tablet is 'slow release' (or sustained release), which contains a medication that is released over a prolonged period.
Granules	Small rounded pellets that are usually coated.
Lozenge	Small tablet containing a medicinal agent in a flavoured fruit or mucilage base, which dissolves in the mouth to release the medication.
Mixture	Aqueous vehicle in which medications are dissolved or suspended.
Suspension	Liquid in which insoluble particles of a medication are dispersed.
Elixir	Sweetened, flavoured alcoholic solution containing a medication.
Linctus	Sweetened syrup containing a medication.
Tincture	Alcoholic solution containing a medication.
Emulsion	Mixture of oil and water containing a medication.
Syrup	Concentrated sugar solution containing a medication.
Cachet	Envelope of rice paper that encloses a medication.
Injection	Sterile aqueous or oily solutions and suspensions containing a medication, which are administered parenterally.
Suppository	Solid preparation containing a medication, which melts when inserted into the rectum.
Pessary	Solid preparation containing a medication, which is administered vaginally.
Drops	Aqueous or oily solution containing a medication. Drops may be instilled into the eye, ear or nose.
Cream	Aqueous or oily emulsion for topical application.
Ointment	Semi-solid greasy preparation for topical application.
Paste	Similar to ointment but contains a high proportion of powders. Pastes have a very stiff consistency and will adhere to lesions at body temperature.
Liniment	Oily or alcoholic preparation for topical application.
Paint	Liquid preparation for application to the skin or mucous membranes.
Lotion	Aqueous, alcoholic or emulsified vehicle for topical application.
Powder (dusting)	Medicated substance for topical application.

(Adapted from Frotjold & Bloomfield 2021; Broyles et al 2019; Knights et al 2023)



**Figure 20.2** Forms of oral medications  
(Frotjold & Bloomfield 2021)

Enteral administration of medications include:

- Oral (PO)—the most convenient and least expensive way of administering medications since most are available in oral preparations (Knights et al 2023). Most medications are not absorbed until they reach the small intestine (Ritter et al 2023), and effects may not be seen for 30–45 minutes after administration. Disadvantages may include slow absorption, irritation to the gastric mucosa, possible unpleasant taste, and inability/decreased absorbency in the critically ill (since the gut may not be functioning). This route is not suitable in those who are vomiting or are not able to take oral medications (e.g. unconscious person, infant, person with dementia) (Broyles et al 2019). Oral liquid medications are administered via a specialised oral syringe. The oral/enteral syringe is purple in colour to differentiate between syringes used for parenteral medication delivery. The tip does not allow for a needle to be attached, therefore ensuring there is no risk of mistakenly administering oral liquid medications via the parenteral route. Enteral medications are not sterile, contain suspensions that are vesicant to veins, and are not equivalent to a dosage that is given intravenously (Health WA 2018).
- Orogastric/nasogastric/percutaneous endoscopic gastrostomy (OG/NG/PEG)—these routes are generally used for oral medications when the individual already has an enteral feeding tube in place for other health reasons. (See Chapter 30 for information about nasogastric and PEG tubes.) The enteral feeding tube ports are also coloured purple to match the liquid medications syringe delivered via the enteral route only.

Parenteral administration of medications include:

- Intravenous (IV)—the effect of medication delivered via the IV route is rapid since it is administered directly into the bloodstream (Ritter et al 2023). IV medication or fluid administration may be given as a bolus dose or delivered as an infusion over a period of time. The IV route may also be accessed for therapeutic or diagnostic purposes (e.g. serum blood

levels). Nurses may care for individuals receiving IV medication therapy as an inpatient or outpatient, or in the home (Broyles et al 2019). The individual must be observed and assessed closely to detect ADRs as these may occur more quickly with IV medication administration (Frotjold & Bloomfield 2021). In preparing and administering IV medication, infection control principles are followed, maintaining asepsis and utilising a non-touch technique to prevent infection from occurring (Frotjold & Bloomfield 2021). Advantages of IV administration include route of choice in an emergency situation, when other routes are not appropriate (e.g. the unconscious person), or when volume and dosages can be titrated more precisely with constant blood levels being maintained (Ritter et al 2023). Disadvantages include increased risk of ADRs, local reactions such as pain/discomfort, irritation, risk of infection, being more costly than other routes, and unsuitability for self-administration.

- Intramuscular (IM)—the medication is injected into the muscle tissue, from which it is absorbed through capillaries into the bloodstream. Medication absorption IM is generally fast because of the vascular nature of muscle. However, this can be slowed by the addition of oily substances (termed a depot preparation). IM injection is suitable for medications that are irritating or painful via the subcutaneous route, and minimises these effects when the medication is injected into a large muscle (Broyles et al 2019).
- Subcutaneous (subcut)—medications are injected or can be infused into subcutaneous adipose tissue underlying the dermis and overlying the muscle. Medication absorption subcutaneously is relatively slower than with IM injection as subcutaneous tissue have less capillaries than muscles (Frotjold & Bloomfield 2021). One advantage of the subcutaneous route is the suitability for medications requiring a slower absorption rate, such as insulin or morphine. Disadvantages include unpredictable absorption rates, bruising, scarring and only small volumes ( $\leq 1$  mL) can be administered (Frotjold & Bloomfield 2021).
- Intradermal (ID)—medications are administered into the dermis (under the epidermis). Medications are not commonly given via this route. Substances such as local anaesthetics are sometimes administered intradermally and this route is used for allergy testing (e.g. Mantoux tests).
- Intrathecal (IT)—injections are given directly into the central nervous system (CNS) via the cerebrospinal fluid, bypassing the blood–brain barrier. (See Chapter 35 for an explanation of the blood–brain barrier.) Epidural injections are given into the space between the arachnoid mater and the dura mater and are often used as regional anaesthetics during surgical procedures involving the pelvic region (Ritter et al 2023).
- Intra-articular—injections are given directly into articular joints. Examples include corticosteroids to reduce

joint inflammation and radio-opaque contrast to view structures. Disadvantages to this route are that it can be painful and is often required to be done under radiological imaging to ensure that it is administered into the joint cavity.

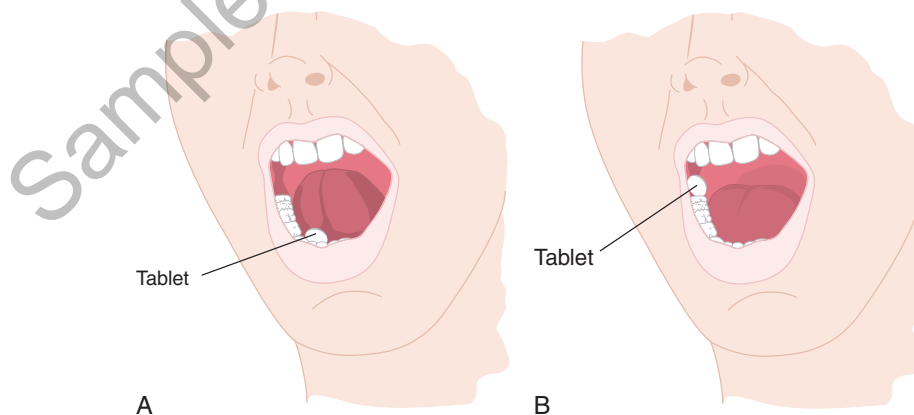
Topical administration of medications include:

- Cutaneous—application of medication to the skin where a local effect is desired. Preparations include antiseptics, creams and lotions. Some preparations have systemic as well as local effects, as small amounts may be absorbed systemically (Broyles et al 2019).
- Transdermal—medications given via this route require a steady rate of delivery of the medication over a longer period of time. Transdermal preparations are lipid soluble medications and include hormones, antiemetic agents, antianginal agents and nicotine patches (Ritter et al 2023).
- Mucous membranes—some medications administered via this route have both local and systemic effects. Medications designed to be absorbed through the mucous membranes can be administered:
  - > sublingually (subling) (Figure 20.3A)—even though medication is placed into the mouth and under the tongue (e.g. sprays, lozenges), the medication is absorbed directly into the systemic circulation and does not pass through the stomach. Any sublingual or buccal medication swallowed is usually metabolised quickly by gastric acid (Ritter et al 2023)
  - > buccally (Figure 20.3B) between the inner lining of the cheek and gum
  - > intranasally via aerosol or drops instilled into the nose, where the medication is rapidly absorbed through the vascular network in the nasal tissues
  - > rectally (PR), where it may have both local (evacuation suppositories) and systemic (antiemetic) effects (Frotjold & Bloomfield 2021). Advantages include its suitability in individuals who are

nauseous or vomiting, have swallowing difficulties, are unconscious or have severe inflammatory bowel disease. The slow absorption of anti-inflammatory preparations makes this route ideal for overnight analgesia administration, unlike oral preparations where the effects have often worn off by the following morning. Disadvantages include suppositories causing anal or rectal irritation, especially with prolonged use, self-administration may be difficult for some individuals and the presence of faecal matter in the rectum interferes with medication absorption, making it erratic and unpredictable

> vaginally (PV)—preparations include pessaries, creams, foams, gels or creams inserted into the vagina with a special plunger (Frotjold & Bloomfield 2021). One advantage of this route is that the individual is often able to self-administer. The onset is slow and effects are generally local.

- Conjunctivally is the ophthalmic administration of aqueous solutions and ointments into the eyes. The disadvantage of solutions is that corneal contact time is brief, and ointments cause blurred vision (Ritter et al 2023).
- Otic—medication is placed into the ear via drops or creams. These need to be at room temperature to prevent the possibility of vertigo.
- Inhalation—the large surface area and blood flow in the lungs facilitates rapid absorption (Ritter et al 2023). Agents given via this route include oxygen, anaesthetic agents, mucolytic agents, steroids and bronchodilators. A proportion of inhaled medications will reach the systemic circulation and may cause ADRs (e.g. salbutamol causing tremor) (Ritter et al 2023).
- Intraocular—a disc is inserted into the eye much like a contact lens and the medication is released over a period of time, or via injection to treat conditions such as macular degeneration or diabetic retinopathy.



**Figure 20.3 A:** Sublingual administration of a tablet, **B:** Buccal administration of a tablet (Potter et al 2023)

### CRITICAL THINKING EXERCISE 20.2

#### Medication routes

Arthur is a 75-year-old man who was recently discharged from the rehabilitation ward after a L-sided stroke. He was diagnosed with atrial fibrillation, which caused an embolic stroke. The initial effects of the L-sided stroke for Arthur included short-term memory loss, dysphagia, aphasia, right-sided hemiparesis and impaired vision in the right visual field of each eye. He spent 2 months in rehabilitation and was able to be discharged home with a community care package to support him and his wife. Arthur saw his GP a week ago and was commenced on Cefalexin 500 mg TDS, for a chest infection. His wife Barbara has brought him to the emergency department for review. During triage, Barbara states he has a fever of 38°C and reports that he keeps coughing when he drinks water or his tea, and she is worried he may have inhaled some food or fluid. Arthur's current prescriptions include Cefalexin 500 mg TDS, Panadol Osteo TDS for chronic back pain, Rivaroxaban 10 mg BD, and Digoxin 62.5 microg mane. What nursing actions need to be taken regarding John's wife reporting he may have aspirated food or fluid? What are other options for routes of administration for John's medications?

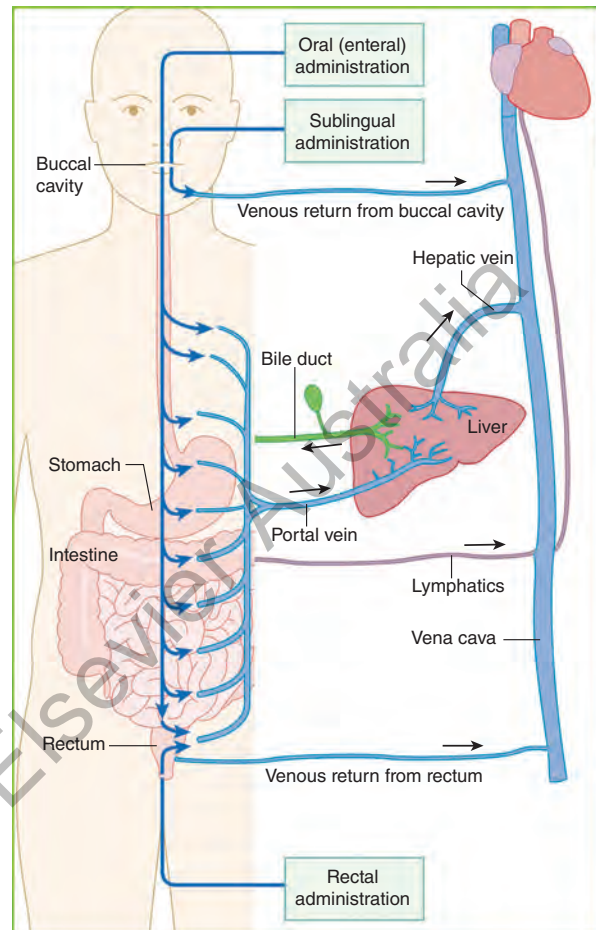
## PHARMACOKINETICS

Pharmacokinetics is the study of the way the body affects the medication over time and relates to the processes of absorption, distribution, metabolism and excretion. Figure 20.4 simplifies this process.

### Absorption

**Absorption** is the movement of a medication from the site of administration into the bloodstream where it is carried to the site of action (Broyles et al 2019). The rate and amount of medication absorbed depends on different factors, including:

- **Route of administration:** Affects the speed with which a medication takes effect. This is important for all medication routes since most medications must enter the bloodstream before they exert their action (Ritter et al 2023). An oral medication has to undergo absorption in the gastrointestinal tract before it reaches the bloodstream. It is therefore slower acting than if the same medication were administered by injection. A medication administered by injection bypasses the gastrointestinal tract. The fastest effect for medication occurs via the IV route, because the medication is injected directly into circulating blood.
- **Dissolvability of the medication:** How fast an oral medication dissolves depends on its form or preparation since a liquid form will be more readily absorbed than in a tablet or capsule form (Frotjold & Bloomfield 2021). If the tablet is enteric-coated, it will be prevented from breaking down in the stomach, therefore absorption of the medication is delayed until it reaches the intestine (Frotjold & Bloomfield 2021).
- **Food:** Can delay the passage and therefore absorption of some medications. These medications may need to be administered on an empty stomach or after meals (Broyles et al 2019). Some IM or subcutaneous medications are suspended in an oily substance or fluid that provides a sustained release of the medication from the site of injection (Broyles et al 2019).
- **Degree of blood flow to the area:** A medication will be absorbed more rapidly from a highly vascular area (as with IM injections) and less rapidly from poorly vascularised areas (such as adipose tissue in subcutaneous injections). In addition, heat or massage can increase the absorption rates of the medication in IM and subcutaneous injections (Broyles et al 2019).
- **Solubility of the medication:** To be effectively absorbed across the cell membrane, a medication should be lipophilic (lipid loving). Acidic medications are



**Figure 20.4** Pharmacokinetics simplified

(McCustion et al 2023)

readily absorbed in the stomach, while alkaline medications are better absorbed in the intestine. However, because most medications pass rapidly through the stomach, absorption mainly takes place in the small intestine (Broyles et al 2019).

- **Body surface area:** The larger the body surface area, the faster the medication will be absorbed. The villi in the small intestine creates a larger surface area than the stomach and therefore medications will be absorbed at a faster rate (Frotjold & Bloomfield 2021). Gastric motility plays a large role in the rate of medication absorption. For example, medications can affect motility by increasing (metoclopramide) or decreasing (codeine) the speed of motility and therefore affecting the absorption time of other medications (Ritter et al 2023).

### First-pass metabolism

Enteral medications are absorbed from the gastrointestinal tract, enter the hepatic portal system where they reach the liver and either pass through unchanged (in parent form) or are metabolised (Knights et al 2023). During this hepatic **first-pass metabolism**, biotransformation occurs where liver enzymes break down the medication, resulting in reduced amounts of the medication entering the systemic circulation (Ritter et al 2023). Biotransformation occurs primarily in the liver; however, the lungs, kidneys, blood and small intestine also play a role in metabolising some medications (Frotjold & Bloomfield 2021). Bioavailability is the percentage of the unchanged medication that reaches the systemic circulation for distribution (Ritter et al 2023). Medication delivered via the IV route has 100% bioavailability since it is delivered directly into the bloodstream because it bypasses first-pass metabolism. Some medications are not suited to being given via the oral route because they are almost entirely metabolised by the digestive system and are better given by the parenteral routes. An example of this is glyceryl trinitrate (Anginine), which is used to treat angina pectoris. If given orally, it is ineffective since it is destroyed by the hepatic first-pass metabolism. Given sublingually, the medication is absorbed through the oral mucous membranes into the bloodstream and is able to reach the target organs to exert its therapeutic effect (Ritter et al 2023). First-pass metabolism is also the reason why oral doses and parenteral doses are not equal—administering medications via the parenteral route means that smaller doses may need to be administered to achieve the same therapeutic effect.

### Distribution

After the medication has been absorbed into the systemic circulation, it will then be distributed to specific tissues for medication action to occur. The chemical and physical properties of the medication affect the **distribution** rate and delivery of the medication, as well as the physical makeup of the individual consuming the medication (Frotjold & Bloomfield 2021). The blood plasma contains a variety of plasma proteins (e.g. albumin, corticosteroid-binding

globulin [CBG] and glycoproteins), which medications are able to bind to in order to produce a medication–protein complex. Medication molecules are transported in blood either bound to these proteins or freely in the plasma. Molecules that become **protein bound** (i.e. bind loosely to blood proteins) cannot elicit a pharmacological effect; however, there is always some unbound (or free) medication that is available to bind with receptors to exert an effect (Broyles et al 2019). Equilibrium exists between the bound and unbound medication and when the unbound plasma levels of the medication diminish, the bound medication is able to be released from the plasma protein and become available to bind with target tissues (Broyles et al 2019).

If an individual has a condition that causes decreased levels of plasma proteins (e.g. liver disease, malnutrition or extensive burns) a greater portion of the medication remains unbound and is available to bind to the tissue, increasing the effects of the medication and therefore requiring a decrease in the dose. Conversely, if there is an increased level of plasma proteins (e.g. in an individual who has multiple myeloma), this will cause more of the medication to be bound, reducing the availability of the medication to bind with receptors. This will decrease the medication's effectiveness, and therefore requires an increase in dose to exert the required effect.

Medications may also compete for the same binding site on the plasma protein when more than one medication is administered concurrently. The medication with the higher affinity (or greater attraction) will be bound and displace the other(s) from the protein-binding site, resulting in an increase in the plasma concentration of the now unbound medication (Broyles et al 2019). For example, aspirin will displace warfarin (an anticoagulant) from the plasma protein, resulting in increased levels of unbound warfarin and potentially increasing the risk of haemorrhage (Broyles et al 2019). The effect is the same as giving an increased dose of the medication.

The blood–brain barrier of the CNS is generally very selective and allows only lipid-soluble medications to pass through it (Frotjold & Bloomfield 2021). However, some conditions alter the permeability of the blood–brain barrier (e.g. meningitis renders the blood–brain barrier permeable to penicillin, which it would otherwise be unable to pass through). The placental barrier is not as effective as the blood–brain barrier, and many lipid-soluble and non-lipid-soluble medications are able to cross the placenta to the foetus, potentially causing significant damage, including congenital malformations (Frotjold & Bloomfield 2021). Unless absolutely necessary, medications should not be taken during pregnancy and especially not during the first trimester, when organ development in the foetus occurs.

### Metabolism

**Medication metabolism** is the process of chemical modification of a medication and is usually carried out by enzymes. For most medications, metabolism results in the formation of a more hydrophilic (water-loving) compound

or metabolite so that it can be readily excreted from the body via the kidneys (Knights et al 2023). **Biotransformation** is the process of detoxification, degradation and removal of biologically active chemicals by enzymes (Frotjold & Bloomfield 2021). This is important in inactivating medication before it accumulates and produces a toxic effect (Broyles et al 2019). These enzymes are primarily produced by the liver; however, some are also found in plasma, lungs, kidneys and the intestines, though in smaller amounts than produced by the liver (Frotjold & Bloomfield 2021). In some circumstances, the number of enzymes produced can alter, thereby also altering the rate of metabolism. For example, alcohol stimulates production of hepatic enzymes in habitual drinkers, resulting in the alcohol being more rapidly metabolised than in a non-drinker (Broyles et al 2019). Alcohol can also cause the levels of other enzymes involved in medication metabolism to increase, leading to the rapid metabolism of the medication and therefore reducing the therapeutic effect (Broyles et al 2019). Some medications are known enzyme inhibitors and therefore cause a decrease in the synthesis of enzymes, resulting in decreased metabolism and increased therapeutic effect. Medications such as cimetidine, erythromycin, allopurinol and metronidazole and foods such as grapefruit juice are enzyme inhibitors (Ritter et al 2023).

## Excretion

After metabolism, medications and their metabolites are excreted from the body via the kidneys, lungs, exocrine glands (e.g. sweat, saliva, tears, breast milk), liver and/or intestine (Frotjold & Bloomfield 2021). The kidneys, however, are the main organs for medication **excretion**. Some medications are excreted in the urine unchanged, and others have undergone the process of biotransformation before being excreted (Frotjold & Bloomfield 2021). If an individual's renal function is impaired, the individual is at risk of medication toxicity due to the medication failing to be excreted as required; this may occur more slowly in the very young and in older people (Knights et al 2023).

The chemical composition of medications determines the organ(s) of excretion (e.g. 100% of furosemide, 80% of digoxin and 50% of salbutamol are excreted in the urine). Gaseous compounds such as general anaesthetic agents are expelled via the lungs (Frotjold & Bloomfield 2021). Alcohol is also partially excreted via the lungs and this is the basis of the police random breath test to detect drink-drivers. Some medications (e.g. penicillin) are excreted unchanged in the urine, while others must undergo biotransformation in the liver before being excreted by the kidneys. Many medications enter the hepatic circulation to be broken down by the liver, excreted in bile and then into the intestines to be excreted in faeces (Frotjold & Bloomfield 2021). The liver has a large metabolic capacity so, in people with liver disease, medication elimination is generally not affected until a large portion of the liver's functional capacity is lost. Many medications can enter the mammary glands and be excreted in breast milk, increasing

the risk of infants ingesting the excreted medication (Knights et al 2023).

## Importance of therapeutic medication monitoring

Monitoring for a medication's therapeutic effect can be done by observing or measuring the individual for clinical signs and symptoms, including expected therapeutic outcomes (antihypertensives lowering blood pressure) and ADRs, as well as taking plasma or blood samples to ascertain the medications levels in the body (Knights et al 2023), such as blood glucose levels (BGL) for insulins. For medications to be therapeutic, certain blood levels need to be reached and maintained. It is therefore a priority that medications are administered on time. To maintain therapeutic levels of a medication, the time interval between each medication dosing is important. The subsequent dose is determined by the medication **half-life**, which is the time taken for the medication concentration to be reduced by half from the time it was administered (Frotjold & Bloomfield 2021). If medications are administered late, the level of the medication in the blood may drop below a therapeutic level (e.g. if the level of an antibiotic is too low, it provides an opportunity for microorganisms to multiply and potentially develop resistance). If the blood levels are too high, toxicity and serious consequences might occur. This also provides the basis for adjusting medication dosages (Knights et al 2023).

The main aim of **therapeutic medication monitoring** is to optimise medication therapy by achieving adequate therapeutic levels while minimising toxicity. This is especially important in individuals at the extremes of age—infants and the older person. Clinical Interest Box 20.1 outlines some signs and symptoms of toxicity commonly seen in older individuals. Clinical Interest Box 20.2 identifies changes related to ageing that influence pharmacokinetics.

Medication serum blood levels are measured to:

- Titrate the dose for individuals to the medication specific target range (e.g. insulins and warfarin). Insulin, as a hypoglycaemic agent, lowers blood glucose levels and therefore the dose may vary depending on the individual's blood glucose levels at the time of administration. Warfarin is an anticoagulant used to manage or prevent the formation of a thrombus (blood clot) and is varied depending on the serum International Normalisation Ratio (INR) result in maintaining the warfarin levels within the therapeutic range of 2–3 (Tiziani 2022). With each of these medications, the optimal dose is highly individual, the effects need careful monitoring, and the dose may need to be adjusted periodically.
- Avoid toxicity (e.g. digoxin and vancomycin). Digoxin is a medication that slows the heart rate and strengthens the force of contraction of the heart, increasing cardiac output. **Therapeutic index** of digoxin is within a very narrow target range (0.5–0.9 nanogram/mL) and can easily reach toxic levels

### CLINICAL INTEREST BOX 20.1 Indicators of medication toxicity in older adults

#### Skin

- Rashes
- Pruritus
- Urticaria
- Photosensitivity (e.g. abnormal responses to sunlight)

#### Gastrointestinal tract (GIT)

- Discomfort and pain (e.g. pancreatitis)
- Nausea and vomiting
- Blood in stools or vomitus
- Diarrhoea

#### Cardiovascular system

- Abnormalities in cardiac rhythm (e.g. palpitations, tachycardia)
- Hypotension or hypertension
- Congestive cardiac failure
- Depression of bone marrow activity (causing anaemia, leucopenia or other abnormalities of the blood)

#### Central nervous system

- Increasing confusion and irritability
- Alterations in gait (e.g. stumbling)
- Tremors
- Unusual drowsiness or insomnia
- Blurred vision or other vision abnormalities
- Slurred speech
- Ototoxicity (changes in hearing and balance)
- Intolerance to heat or cold (changes in temperature regulation)
- Anticholinergic effects (ranging from dry mouth and hot dry skin to serious mental impairment and seizures)

#### Renal system

- Electrolyte imbalance
- Urine retention
- Polyuria
- Fluid retention

#### Respiratory system

- Dyspnoea
- Asthmatic responses

#### Biliary system

- Jaundice
- Impaired liver function
- Clotting changes

(Adapted from Touhy & Jett 2020)

(Knights et al 2023). Blood tests are performed to measure digoxin levels to identify sub-therapeutic or toxic levels. Symptoms that may indicate toxicity include slow or irregular heartbeat, anorexia, nausea, vomiting, diarrhoea, drowsiness and extreme tiredness, weakness, confusion, abdominal pain, blurred

### CLINICAL INTEREST BOX 20.2 Age-related changes that influence pharmacokinetics and pharmacodynamics

Many age-related changes to the body have an impact on the way that a medication may be absorbed, distributed, metabolised and excreted from the body. Because of these differences, all medication therapy should be given cautiously and monitored carefully in the older individual. Age-related changes that may affect the pharmacokinetics of a medication include:

- altered nutritional habits and ingestion of non-prescription medications that may alter medication absorption (e.g. ingestion of antacids and laxatives)
- dry mouth and decreased saliva leading to potential difficulty swallowing oral medications
- changes in the quantity and quality of digestive enzymes
- increase in gastric pH
- decrease in gastric motility
- decrease in intestinal blood flow
- delayed gastric emptying
- decreases in total body water and lean body mass and increase in body adipose tissue, which may all lead to an altered distribution of the medication, as well as potential decrease in absorption of transdermal or topical medications
- decreased levels of plasma proteins and therefore decreased protein binding of medications if malnutrition or acute illness is present
- changes in liver mass and blood flow leading to reduction in the phase I metabolism in the liver, involving the microsomal enzymes
- alteration in bioavailability of medications (e.g. some medications undergoing extensive first-pass metabolism may have significant increase in availability while others may be reduced or decreased, such as ACE inhibitors available as promedications)
- reduction of the liver's ability to recover from injury such as hepatitis
- hepatic function may also be affected by severe nutritional deficiencies
- decreased cardiac output and reserve
- decreased blood flow to liver and kidneys
- cognitive abilities, to understand and comply with medication therapy
- congestive cardiac failure reduces both the capacity of the liver to metabolise medications as well as the hepatic flow
- creatinine clearance decreases with age, resulting in a longer half-life of many medications and the subsequent risk of accumulation
- decreased renal excretion
- changes in response to medications related to changes in medication concentration (related to above factors)
- risk of medication interactions is increased
- decrease in ability to read label correctly.

(Broyles et al 2019; Knights et al 2023; Ritter et al 2023)

vision or visual disturbances (Tiziani 2022). Vancomycin is a powerful antibiotic reserved for the treatment of severe infections that are not responding to other antibiotics. This medication can produce severe adverse effects that include rash, itching, fever, tachycardia, nausea, vomiting, diarrhoea and, sometimes, hearing loss or kidney damage (Tiziani 2022). Blood levels are taken immediately before the third dose to ensure therapeutic levels are achieved and the dose is adjusted accordingly. If treatment is ongoing, serum trough levels need to be repeated as per the hospital protocol.

- Ensure therapeutic blood levels are maintained (e.g. prophylactic anticonvulsants [antiepileptics] such as phenytoin, sodium valproate and carbamazepine used to manage epileptic [convulsive] seizures).
- Check individual compliance/concordance/adherence.
- Ensure comorbidities have not altered medication metabolism and excretion as they may have an adverse effect on therapeutic blood levels (e.g. renal impairment, hepatic failure, shock, sepsis).
- Ensure that concurrent medication administration is not affecting therapeutic levels.
- Indicate a need for change of administration method (e.g. from IV or IM to oral administration) or change of dosage to increase, decrease or cease a medication.

## PHARMACODYNAMICS

Pharmacodynamics relates to how a medication acts on the body, including the strength and duration of its effects. Medication actions are similar in all individuals that take the same medication; however, factors such as tachyphylaxis, desensitisation and tolerance can affect the medication action responses (Knights et al 2023). *Tachyphylaxis* and *desensitisation* occur when there is a sudden decrease in the effect of the medication (e.g. from one dose to the next) (Ritter et al 2023). *Tolerance* differs as the individual develops a gradual reduction (over weeks and months) in the responsiveness to the medication, rendering the dose inadequate (Knights et al 2023).

### Medication action

The extent of the response to a medication depends on its concentration at the site of action, and the affinity the medication has with the receptors, which then exerts a response (Knights et al 2023). The response is linked to the medication dose and the pharmacokinetic processes of absorption, distribution, metabolism and excretion. Other factors that may influence a response to a medication include a person's age, weight, gender and disease state as well as route of administration. However, more than any other factor, the route of administration determines the onset of medication effect. Medications that are administered directly into the bloodstream (intravenously) provoke a rapid response, whereas medications administered via other routes must be first absorbed into the bloodstream

before they can take effect. Medications act by affecting or controlling changes in biochemical or physiological processes in the body.

Medications produce their actions in one of three ways: altering body fluids, altering cell membranes or interacting with receptor sites. Most medications act at specific cell receptor sites. When a medication binds with a receptor, the action is either agonistic (causing an action) or antagonistic (blocking an action) (Knights et al 2023). An agonist will increase or decrease an action on the receptor site similar to the endogenous ligand (the body's own neurotransmitter or hormone), which normally binds with those receptors. An antagonist takes up the receptor sites, blocking the endogenous ligand from binding to the receptor sites, therefore blocking or decreasing the cells' response (Knights et al 2023). A specific medication forms a complex with one type of receptor but may in turn produce multiple effects, because those receptor types may be found also in other cells in different tissues or organs.

An agonist (medication) binds with cells, receptor sites until they become saturated, producing a response. This is termed *maximal efficacy* and increasing the concentration of the medication dose does not increase the response; however, it may increase the risk of side effects (Ritter et al 2023). This is why medication potency (dose of medication required to bind to receptors, eliciting the therapeutic effect) needs to be determined, without causing unwanted side effects. When an antagonist binds with receptor sites, it blocks the binding of the endogenous agonist; therefore, there is no efficacy (Ritter et al 2023).

**Medication action** is either classified as selective or non-selective. Selective medications bind with their target sites producing the intended effects. A 'selective' medication has a preference for a particular receptor and will have little influence at similar receptor cell sites in other organs (Knights et al 2023). For example, if a selective beta-blocker was chosen, such as metoprolol tartrate, then the beta-1 cells in the myocardium would be targeted, resulting in a lesser effect on the beta-adrenergic receptors in the lungs, decreasing the likelihood of unwanted side effects compared to the non-selective medication.

Non-selective medication will affect tissues or organs for which the effect is unintended (Knights et al 2023). For example, both the heart and lungs have beta-1 and beta-2 adrenergic receptors. For example, sotalol is a non-selective beta-blocker medication (antagonist), which has the intended action of reducing heart rate by blocking the beta-1 cells in the myocardium. This medication will also affect the beta-2 adrenergic receptors in the lungs, causing bronchoconstriction, and the individual taking sotalol may develop an unwanted side effect (cough) due to the non-selective characteristics of the medication.

A medication may produce more than one effect:

- **Adverse effects** (also called adverse drug reactions [ADRs]) are undesirable secondary effects, which may be expected (constipation with codeine) or unexpected (cough with beta-blocker). These effects may also be



called *side effects* by consumers. ADRs will indicate to the medical officer that treatment may need to be modified or ceased (Frotjold & Bloomfield 2021). If a patient is having oxycodone for pain and is experiencing nausea, metoclopramide (antiemetic medication) may also need to be prescribed.

- Toxic effects develop after prolonged administration of high doses of medication, or when a medication accumulates in the blood because of impaired metabolism or excretion. Some medications, such as digoxin and lithium, have a very narrow target range and toxicity can occur at recommended or therapeutic doses (Frotjold & Bloomfield 2021).
- **Allergic reactions** are unpredictable responses to a medication that the body sees as foreign. This stimulates the body to produce antibodies or immunoglobulins that then bind to the antigen (medication) upon a second exposure, triggering an allergic response (Knights et al 2023). Allergic reactions may be mild, such as urticaria (hives) and pruritus (itching), or they may be severe (e.g. severe wheezing and respiratory distress, or a life-threatening anaphylactic reaction). Some reactions occur within minutes of the medication being given while other allergic reactions may be delayed for hours or days (Frotjold & Bloomfield 2021).
- Idiosyncratic reactions are those where the individual's body either overreacts or underreacts to a medication, or when the reaction is unusual and there is no known cause (e.g. the antihistamine promethazine [Phenergan] is sometimes used for sedation; however, in some individuals it can cause insomnia and agitation) (Frotjold & Bloomfield 2021).
- Pharmacogenetic reactions occur because an individual may have a genetic trait that leads to abnormal reactions to medications. For example, malignant hyperthermia is a genetic autosomal disorder, which is triggered when general anaesthetics and muscle relaxants are administered, causing a hypermetabolic state to develop that can quickly lead to death. As a result all individuals who undergo a general anaesthesia have their temperatures monitored (Knights et al 2023).
- Medication tolerance may also occur where an individual has a decreased response or resistance to a medication over time, necessitating an increase in dosage to achieve the required response (Broyles et al 2019) (e.g. tolerance to glyceryl trinitrate patches if nitrate-free periods are not adhered to).
- Medication-to-medication interactions occur when one medication changes the action of another medication, by either increasing or decreasing its action (Knights et al 2023). A medication interaction may be synergistic (enhances the effects of another medication), antagonistic (opposes the effects of another medication) or additive (where the two medication actions are added together enhancing the effect) (Frotjold & Bloomfield 2021).

## SAFETY AND LEGAL REQUIREMENTS IN MEDICATION ADMINISTRATION

The National Safety and Quality Health Service (NSQHS) Standards were developed by the Australian Commission on Safety and Quality in Health Care (ACSQHC) to ensure relevant systems are in place to improve the quality of healthcare practices and to protect the public from harm.

Medicines are the most common healthcare treatment that individuals receive and, as a consequence, there is a higher incidence of errors and ADRs than with any other health procedure (ACSQHC 2012; 2021a). The outcomes of these errors and ADRs add a huge cost to the healthcare system and are largely avoidable (ACSQHC 2021a). **Medication safety** is one of the NSQHS Standards (ACSQHC 2021a) and 'To ensure clinicians are competent and safely prescribe, dispense and administer appropriate medicines and to monitor medicine use. To ensure consumers are informed about medicines and understand their individual medicine needs and risks' (p. 1). The Medication Safety Standard outlines the standardised and systematic processes to be implemented to support and promote medication safety to prevent common errors occurring. This includes robust medication management systems, correct and accurate documentation of patient information, and review of patient medications ensuring continuity of medication management. These processes aim to improve communication between clinicians, the workforce and patients utilising technology for recording and transferring information, and improving accessibility of patient data and support for clinical decision-making at the point of care.

**High-risk medicines (HRMs)**, as identified by ACSQHC (2023a), are medicines that have an increased risk to cause harm to the person or death if not administered and monitored correctly. The ACSQHC identified that these medicines include medications that have a narrow therapeutic index (e.g. warfarin, digoxin) or are dangerous if delivered via the wrong route or in error.

There is no standardised national list of HRMs; however, each health service organisation must identify HRMs and provide proper systems to ensure correct storage, prescribing, dispensing and administration of HRMs safely (ACSQHC 2023a). APINCHS is a classification system used to identify HRMs (Table 20.2).

In Australia, a range of paper and electronic national medication charts were designed and introduced in 2006 for public and private hospitals as well as RAC homes. The National Inpatient Medication Charts (NIMC) (Figure 20.5A) include charts for adult and paediatric (acute and long stay), day surgery, GP e-version, insulin subcutaneous order and blood glucose record (adult) (Figure 20.5B), residential and clozapine titration (ACSQHC 2019a). Because these medication charts are mandatory and are used nationally, they provide familiarity for healthcare professionals, which in turn improves the safety and quality of

**TABLE 20.2 | APINCHS**

A	Antimicrobials	Aminoglycosides: gentamicin, tobramycin and amikacin Vancomycin Amphotericin—liposomal formulation
P	Potassium and other electrolytes	Injections of concentrated electrolytes: potassium, magnesium, calcium, hypertonic sodium chloride
I	Insulin	All insulins
N	Narcotics (opioids) and other sedatives	Hydromorphone, oxycodone, morphine, fentanyl, alfentanil, remifentanyl and analgesic patches Benzodiazepines: diazepam, midazolam thiopentone, propofol and other short-term anaesthetics
C	Chemotherapeutic agents	Vincristine, methotrexate, etoposide, azathioprine Oral chemotherapy
H	Heparin and other anticoagulants	Warfarin, enoxaparin, heparin Direct oral anticoagulants (DOACs): dabigatran, rivaroxaban, apixaban
S	Systems	Medication safety systems such as independent double-checks, safe administration of liquid medications, standardised order sets and medication charts etc.

(Reproduced with permission from APINCHS classification of high risk medicines, 'APINCHS safety improvement list', developed by the Australian Commission on Safety and Quality in Health Care [ACSQHC] 2024. ACSQHC, Sydney)

medication management in prescribing, dispensing and administration, reducing the risk of medication errors and adverse events (ACSQHC 2019a).

The ACSQHC has developed a guide for electronic medication management (EMM) systems to assist Australian healthcare organisations to ensure that their implementation is done safely. The EMM systems aim to ensure the safety of the management of individuals, medications, including prescribing, allergy and ADR checking, dispensing, ordering and supply, as well as electronic medication patient records. These records provide an up-to-date and accurate medication list for approved healthcare providers to review, including current prescriptions, OTC and complementary medicines and ADRs or allergies (ACSQHC 2019b). The individual's electronic medication records are held in the Australian Government's My Health Record system. Upon presentation to an acute healthcare facility, the individual's record can be accessed for accurate medication management, which can then be updated or continued through to discharge, allowing the community pharmacist and GP to be informed immediately of any changes (ACSQHC 2019b).

The EN's role in medication administration is a complex one and must take into consideration the NSQHS Standards, organisational policy and procedure guidelines and scope of practice in the state, territory or country that the EN works in. These practices promote safe and correct medication administration. Accountability and responsibility are paramount in administering medications and the nurse requires knowledge about all medications being administered, including:

- generic names and classifications
- indications for use

- rationale for prescribed medication
- medication action
- desired therapeutic effects and possible ADRs
- normal dosage range
- correct routes of administration
- 11 rights of medication administration
- APINCHS classification system for HRMs
- safe handling and storage
- legislation and healthcare facility policies and procedure guidelines.

The nurse also requires certain skills to:

- Administer medications by the various routes.
- Calculate the correct amount of medication to administer.
- Assess and evaluate the response and effects of medications.
- Educate individuals about medication therapy.
- Teach self-administration.
- Record the medications administered and the individual's response.
- Communicate and advocate for individuals in quality use of medicines.

Scope of practice should also be considered because in some organisations, states, territories or countries, the EN's role in medication administration may vary.

## Legal aspects of medication administration

Registered and Enrolled Nurses are authorised to administer medications under the *Health Practitioner Regulation National Law Act 2009* as well as relevant regulations and legislation in each state and territory. ENs must work under the direction

Cut off section

Attach ADR sticker

See front page for details

As required PRN medicines

Year: 20

URN: Family name: Given names: Address: Date of birth: Sex: M F

First prescriber to print patient name and check label correct:

Table with columns for Date, Time, Dose, Route, Sign, and Discontinued? for multiple medicines.

Facility/service: Ward/unit: Medication chart number of Additional charts: BCU/relief, Palliative care, Acute pain, IV heparin, Other

NIMC (acute)

Telephone orders (to be signed within 24 hours of order) table with columns for Date, Time, Medicine, Dose, Frequency, Route, Prescriber name, Date, Time, Dose, Frequency, Route, Pharmacy.

Medicines taken prior to presentation to hospital (Prescribed, over the counter, complementary). Own medicines brought in? Y N Administration aid (specify) Medication aid (specify) Duration

Ai

Figure 20.5A National Inpatient Medication Chart (NIMC Acute) (ACSOHC 2019c)

**Attach ADR sticker**

**Allergies and adverse drug reactions (ADR)**  
 Nil known     Unknown (risk acceptable to be comparable details below)  
 Medicines (for other):    Reaction / type / date    Initials

Family name: \_\_\_\_\_ Not a valid prescription unless identifiers present  
 Given names: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Date of birth: \_\_\_\_\_ Sex: M  F   
 First prescriber to print patient name and check label correct: \_\_\_\_\_ Weight (kg): \_\_\_\_\_ Height (cm): \_\_\_\_\_  
 Sign: \_\_\_\_\_ Print: \_\_\_\_\_ Date: \_\_\_\_\_



Regular medicines		Regular medicines	
Year 20	Date and month	Year 20	Date and month
<b>Variable dose medicine</b> Date: _____ Route: _____ Indication: _____ Prescriber signature: _____ Prescriber name: _____ Date: _____		<b>PRESCRIBER MUST ENTER administration times</b> Date: _____ Route: _____ Indication: _____ Prescriber signature: _____ Prescriber name: _____ Date: _____	
<b>VTE risk assessed: Yes <input type="checkbox"/> Prophylaxis not required <input type="checkbox"/> Contraindicated <input type="checkbox"/></b> Date: _____ Route: _____ Indication: _____ Prescriber signature: _____ Prescriber name: _____ Date: _____		<b>Warfarin</b> Date: _____ Route: _____ Indication: _____ Prescriber signature: _____ Prescriber name: _____ Date: _____	
<b>Mechanical prophylaxis</b> Date: _____ Route: _____ Indication: _____ Prescriber signature: _____ Prescriber name: _____ Date: _____		<b>1600</b> Date: _____ Route: _____ Indication: _____ Prescriber signature: _____ Prescriber name: _____ Date: _____	
<b>Reason for not administering</b> Code MUST be entered A Absent F Fasting R Refused - notify prescriber V Vomiting L On leave N Not available - obtain supply or contact prescriber W Withheld - enter reason in clinical record S Self administered		<b>Reason for not administering</b> Code MUST be entered A Absent F Fasting R Refused - notify prescriber V Vomiting L On leave N Not available - obtain supply or contact prescriber W Withheld - enter reason in clinical record S Self administered	
<b>Pharmaceutical review:</b> Prescriber signature: _____ Prescriber name: _____ Date: _____		<b>Pharmaceutical review:</b> Prescriber signature: _____ Prescriber name: _____ Date: _____	

Figure 20.5A, cont'd

Year: 20 \_\_\_\_\_

Ward / Unit: \_\_\_\_\_ Facility: \_\_\_\_\_

### Insulin Subcutaneous Order and Blood Glucose Record - Adult

URN: \_\_\_\_\_

Family name: \_\_\_\_\_

Given name(s): \_\_\_\_\_

Address: \_\_\_\_\_

Date of birth: \_\_\_\_\_

Sex:  M  F  X

**First prescriber to complete this box:**

Patient name: \_\_\_\_\_

ID label has been checked  NMC  EIM

(Affix identification label here)

NOT A VALID PRESCRIPTION UNLESS IDENTIFIERS ARE PRESENT

**Once only/Phone Orders (also complete Administration Record)**

Date prescribed	Name of insulin	Units	When to administer	Replaces or additional to existing order?	Order type	Phone order 12 initials	Signature	Prescriber
DD / MM / YY			Time (24 hr)	<input type="checkbox"/> Replaces <input type="checkbox"/> Additional	<input type="checkbox"/> Once only <input type="checkbox"/> Phone			

**Supplemental Insulin Orders** (valid until changed or ceased)

Supplemental insulins should **NOT** be prescribed for all patients. Sliding scale insulins alone is **NOT** recommended. Consider basal insulin needs.

Remember: Adjust routine insulin doses when supplemental insulin requirements change.

If unsure, seek advice.

**At the following intervals...**

With meals only (unless NBM)	Other
<input type="checkbox"/>	<input type="checkbox"/>

...administer additional insulin as specified below (dose depends on current BGL range row).

Start date and time	Greater than 20	16.1-20	12.1-16	8.1-12	4-8	Initial
Start Date	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY
Time (24 hr)	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY

Name of insulin (should match the routine short-acting insulin): \_\_\_\_\_

Prescriber signature: \_\_\_\_\_

Print your name: \_\_\_\_\_

If supplemental short-acting insulin is ordered for the same time as routine short-acting insulin, they may be given together but must be recorded separately.

**Diabetes Treatment Prior to Admission**

Pharmacist review

DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY

**Monitoring Record**

Date: DD / MM / YY

BGL frequency:  21:00hrs  02:00hrs (✓ to select; see-out words to cancel)

Diet:  Full  NI by mouth  TPN  Clear fluids  Other: \_\_\_\_\_

(✓ to select; see-out words to cancel)

**ALERTS** (24 hr)

Test ketones then notify doctor immediately if greater than 20

Test ketones then notify doctor if positive

Notify if 3 consecutive BGLs greater than 12

BGL (mmol/L)

Write number in corresponding range row

Treat hypoglycaemia (see Page 4) and notify doctor (✓)

Hypoglycaemia intervention (✓)

Ketones

Doctor notified (✓)

**Special Instructions**

Dr: \_\_\_\_\_

or Ward doctor

**Administration Record (mealtime insulin is given at start of meal unless otherwise specified in Special Instructions)**

Name of routine insulin:	Units	Time given and initials:	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY

Name of routine insulin: \_\_\_\_\_

Name of routine insulin: \_\_\_\_\_

Name of supplemental insulin: \_\_\_\_\_

Time given (24 hr): \_\_\_\_\_

Nurse 12 initials: \_\_\_\_\_

Comments: \_\_\_\_\_

**Routine Insulin Orders (should not be ordered more than 4 meals in advance - nurse must consult doctor if expected dose is not ordered)**

Prescriber signature	Print your name	Date	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY

**Diabetes Treatment Prior to Admission**

Pharmacist review

DD / MM / YY	DD / MM / YY	DD / MM / YY	DD / MM / YY

Bi

Figure 20.5B Insulin subcutaneous order and blood glucose record (ACSOHC 2022b)



and supervision of the Registered Nurse (RN). In some states and territories, unregulated healthcare workers in RAC homes may administer medications as guided by their training; however, they must administer medications as set down in the legislation and standards (Department of Health and Aged Care 2022b). Before a medication can be administered safely, the nurse needs to be aware of the legal aspects of medication administration. This includes knowledge of the laws governing the possession, use and dispensation of medications and the guidelines set down by the Nursing and Midwifery Board of Australia (NMBA) and the Australian Nursing and Midwifery Accreditation Council (ANMAC), which provide guidelines for healthcare professionals, including ENs, in administering medications to individuals. In addition, nurses need to observe the employing healthcare facility's work health and safety (WHS) regulations, which are designed to promote safe storage, handling and use of medications.

### Nursing competency

The NMBA is one of the 15 national boards of the Australian Health Practitioner Regulation Agency (Ahpra). In 2009, Ahpra made changes to the registration of nurses, and the EN study programs now have a core medication administration unit—HLTENN040 Administer and monitor medicines and intravenous therapy. This means that any EN that has the competency in this medication unit no longer has a medication endorsement added to their registration. In order to protect the public, the NMBA has stipulated that ENs must hold a board-approved unit of study (accredited by ANMAC) to be able to safely administer medication. Those ENs who have not completed the required unit of study to deliver medications will have a notation—'Does not hold Board-approved qualifications in administration of medicines' against the individual nurse's name on the register (NMBA 2022). Jurisdictional legislation and policy specifies the routes and schedules of medicines that the EN is able to administer and it is therefore of paramount importance that the nurse and employer understand and comply with the medications and poisons legislation and policy.

Legal Acts concerning medications and poisons and the subsequent regulatory bodies in each state and territory in Australia deal with the control of all medications, from prescription medications through to agricultural poisons and research medications. The laws and regulations apply to sale, supply, storage, dispensing and labelling. The medications and **poisons schedules** divide medications into groups according to their mode of action, therapeutic use, potency, potential for abuse and addiction and safety. The Poisons Standard classifies medicines and chemicals into Schedules, which are published in the Poisons Standard, and is also referred to as the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP). (See Table 20.3.) The Poisons Standard applies to all medicines and poisons in Australia, and is incorporated into the legislation and regulations of each state and territory in Australia (Department of Health and Aged Care 2023c). Aims of this document

include promoting uniform scheduling, labelling and controls on availability and use of medicines throughout Australia (Department of Health and Aged Care 2023c).

### Safe administration of medications

In the process of administering medications in any form or by any route, the nurse must ensure that the safety and legal requirements of medication administration are followed, including the principles of infection control (see Chapter 18).

To ensure that medications are administered correctly and safely, the nurse must observe the 11 rights of medication administration below.

1. The right prescription
2. The right medication
3. The right dose
4. The right expiration date
5. The right route
6. The right time
7. The right form
8. The right person
9. The right documentation
10. The right to refuse
11. The right response

Before any medication is administered, the individual medication prescription on the NIMC or EMM system must be checked thoroughly and systematically to determine the accuracy of the prescription, identity of the individual receiving the medication, the name of the medication, the dosage, the route, form and expiration date as well as the date and time for administration of the medication prescribed. These 11 rights are further described here.

1. *The right prescription:* All medications prescribed must be on the approved medication NIMC or EMM systems consistent with state or territory health regulations. The medication order must be completed accurately by the prescriber. From February 2021, **active ingredient prescribing** has been mandated, where the prescriber must use each medication's active ingredient (generic name) in writing the prescription, unless there is a valid reason to choose a specific brand (ACSQHC 2022a). The prescription must include the individual's three identifiers; be written legibly, preferably in black ink and only accepted abbreviations and symbols as outlined in the national ACSQHC 2016 Recommendations for Terminology, Abbreviations and Symbols used in Medicines Documentation may be used; the date the medicine order was written, the route of medication administration; the dosage including using metric and numbers, placing a zero before any decimal point, and writing the strength and dose in milligrams (mg) or micrograms (microg) of liquid medications; the frequency (e.g. BD, TDS, QID) and the times using the universal 24-hour clock; the indication of why the medication is being prescribed since this is critical information for anyone managing an individual's medications to ensure correlation and accuracy of what has been prescribed;

**TABLE 20.3 | Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)**

Schedule	Label	Description	Examples
Schedule 1	Blank	This schedule is intentionally blank.	
Schedule 2	Pharmacy medicines	Poisons for therapeutic use (medicines), available to the public only from pharmacies or, where a pharmacy service is unavailable, from persons licensed to sell Schedule 2 poisons. A pharmacist's advice is available if required.	Most cough and cold preparations, some antihistamines, mild analgesics, worm tablets, antianginal sprays, anti-inflammatory agents, topical antifungals, histamine H <sub>2</sub> -receptor antagonists for gastro-oesophageal reflux (small packets) and decongestant eye drops.
Schedule 3	Pharmacist only medicines	Poisons for therapeutic use (medicines), only available to the public from a pharmacist or from medical, dental or veterinary practitioners, without need for a prescription. However, the safe use of these substances requires professional advice.	Metered-dose bronchodilator asthma aerosols, topical corticosteroids (low-strength preparations, small packs), adrenaline (epinephrine) injections (high strength, for anaphylaxis).
Schedule 4	Prescription only medicines and prescription animal remedies	Poisons for therapeutic use (medicines), which may be used or supplied only by or on the order of persons permitted by state or territory legislation to prescribe and should be available from a pharmacist on prescription.	Many medications: all new medications, antibiotics, insulins, antidepressants, hormones (including contraceptives), most cardiovascular and central nervous system (CNS) medications, antineoplastic agents, vaccines, anti-glaucoma eye drops and most injections.
Schedule 5	Caution	Some medicines and agricultural, domestic and industrial poisons with a low potential for causing harm, which can be minimised by the use of appropriate packaging with simple warnings and safety directions on the label.	Household poisons, ether, naphthalene, petrol, some head lice preparations and borax.
Schedule 6	Poisons (depending whether for internal or external use)	Some medicines and agricultural, domestic and industrial poisons with a moderate potential for causing harm. Distinctive packaging and warning labels and safety directions on the label are required.	Household and garden pesticides and solvents, some iodine preparations.
Schedule 7	Dangerous poisons	Some medicines and agricultural and industrial substances, having a high potential for causing harm even with low exposure. These poisons require special precautions during the process of manufacturing, handling or use. Should only be available to specialised or authorised users who have the skills necessary to handle them safely. There may be special regulations restricting availability, possession, storage or use.	Arsenic, strychnine, cyanide and commercial pesticides.
Schedule 8	Controlled drugs	Substances for therapeutic use (medicines) but restriction of manufacture, supply, distribution, possession and use required. The tightest controls are used to reduce abuse, misuse and physical or psychological dependence.	Opioids (e.g. morphine, methadone, high-dose codeine) and CNS stimulants (e.g. dexamfetamine).

Continued



**TABLE 20.3 | Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)—cont'd**

Schedule	Label	Description	Examples
Schedule 9	Prohibited substances	Substances that may be abused or misused, for which the manufacture, possession, supply or use is prohibited by law except in special circumstances, where approval has been given by Commonwealth and/or state and territory health authorities for medical and scientific research.	Heroin and most recreational medications (except alcohol and tobacco).
Schedule 10	Substances of such danger to health as to warrant prohibition of sale, supply and use	A list of substances or preparations, the sale, supply or use of which should be prohibited because of their known dangerous properties.	Coal tar, formaldehyde, hydrogen peroxide, lead compounds.

(Based on content from Department of Health and Aged Care, TGA 2023c)

the signature and legible name of the prescriber. It is the nurse's responsibility to check the NIMC or EMM system for accuracy and report to the prescriber any errors prior to administering the medication (Figure 20.5A).

2. *The right medication:* The nurse must understand the rationale for the prescribed medication and what the expected outcomes should be (Broyles et al 2016). The nurse also needs to consider if this is the right medication for the individual, given their health situation at the time of administration, as well as the indication written by the medical officer on the medication chart. The principles of the QUM and whether the individual requires the prescribed medication must also be taken into consideration. For example, if an individual who has been admitted for dizziness and hypotension normally takes an antihypertensive, the need for the medication at this point in time must be reviewed.

To ensure the right medication is being administered, the nurse compares the label of the medication with the individual medication chart three times:

1. before removing the container from the trolley or cupboard
2. before removing the medication from the container
3. before returning the container to the trolley or cupboard.

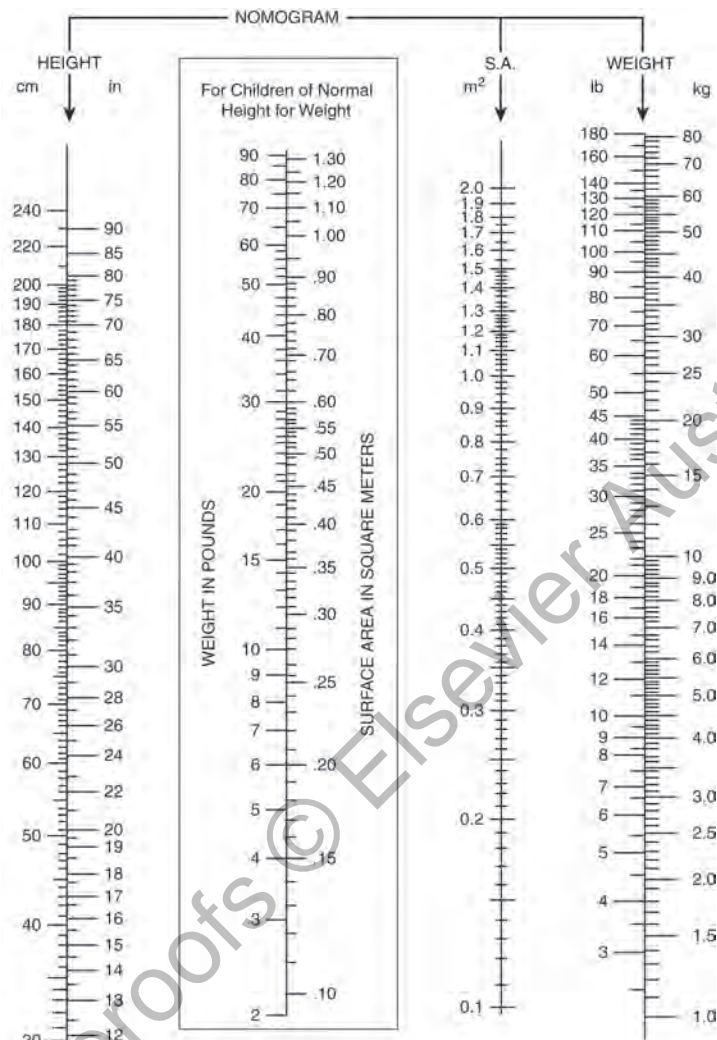
(Frotjold & Bloomfield 2021)

Medication sleeves contained in a prescribed medication box must be removed from the packaging and medication sleeve checked for the right medication, as potentially wrong sleeves may have been placed in the medication box.

3. *The right dose:* There are many factors that affect the dosage of medication being prescribed including age, weight, liver and renal function, as well as the health of the individual (Tiziani 2022). Some children's dosages need to be calculated using the nomogram and corresponding formula to calculate the adult dose to a suitable child's

dose (see Figure 20.6). Medications are written in SI unit form. Medication calculations and conversions need to be calculated accurately to ensure the individual obtains the correct dose (Frotjold & Bloomfield 2021). The correct measuring devices such as medicine cups, spoons, enteral and parenteral syringes, or droppers assist in giving the precise prescribed dosage (Broyles et al 2019).

4. *The right expiration date:* Expiry dates indicate that a pharmaceutical product is no longer stable and should not be used. The expiry date can be determined by date of manufacture, or time of dispensing, opening or reconstitution. The nurse whilst checking the right medication should also check the expiry date on the container, sleeve, ampoule, vial, IV fluid or blood bag, to ensure it is within date. Some medications may need the date of opening written on the container to ensure it is discarded within the recommended expiry date timeframes (e.g. eye drops will need to be discarded 30 days after opening). When preparing parenteral medications or fluids the *Australian Injectables Drug Handbook* must be reviewed and will indicate expiry timeframes once the medicine is reconstituted.
5. *The right route:* The route is indicated by the prescriber on the medication chart. The nurse administering the medication must assess if this route is suitable for the individual receiving the medication, and if not should consult with the prescriber (Frotjold & Bloomfield 2021).
6. *The right time:* Medications have different administration time periods. Medications may be administered BD (twice a day), TDS (three times a day), QID (four times a day), mane (morning), midday, nocte (night), before food, after food, with food, stat (immediately and once only), PRN (when required) or on an hourly or day basis (e.g. 6-hourly; every second day). When administering medications at any of the times ordered the nurse must be aware of normal medication intervals and any medication-to-medication interactions so



**Figure 20.6** Nomogram  
(McCusiston et al 2023)

these can be rescheduled and avoided. The nurse must prioritise her daily workload to ensure medications are given at the correct time.

7. *The right form:* Medications are available in many forms (see Table 20.1) including the same medication being available in different forms (e.g. paracetamol is available in tablet, capsule, suppository, liquid and IV form). The nurse needs to ensure the medication prescribed is in the right form for administration, taking into consideration the route prescribed, the individual's ability to swallow and cognitive and conscious state. The Pharmacy Board of Australia have published an essential guide to administering oral medications *Don't Rush to Crush* (SPHA 2022), which needs to be reviewed before crushing any medications, as medications that are enteric coated (EC)

or sustained release (SR), the absorption and effects may be altered if crushed. If a medication cannot be administered for any reason in the form it is prescribed, the prescriber will need to be notified to change the form of the medication suitable for the individual.

8. *The right person:* The nurse must use three identifiers to identify an individual correctly, before a medication is administered. The nurse asks the individual to state their full name and date of birth and the nurse then confirms this with the medication chart and against the identity (ID) band. The individual's unit record (UR) number is then checked on the medication chart and confirmed on the ID band. If an individual's identification is required to be double-checked for particular medicines such as S8s then each nurse must

complete their own checking of the three identifiers and then this is confirmed to ensure the right person is being administered the prescribed medication.

Special care should be taken when ID bands are not worn (e.g. in residential aged-care settings) or where the individual is unable to state their own name, because of dementia or mental disturbance, for example. One safety measure that has been implemented in some residential aged-care settings is to have a current photograph of each resident that can help with identification.

9. *The right documentation:* The nurse must document accurately and in a timely manner the date and time of medication administration, and this should be recorded after the individual has been observed consuming the medication or after administration by the nurse, via the prescribed route. If the administration of any medication is not documented, it may be determined the individual has not been given their dosage and there is a risk of a medication error with a second dose being given. If for any reason the medication is not given, this needs to be recorded on the NIMC and in the EMM system, according to the 'Reason for not administering' code indicated on the NIMC and in the EMM system. The code must be circled to prevent it being mistaken for a signature. The medical officer will also need to be informed to complete a review and then record the reason in the individual's progress notes.
10. *The right to refuse:* If for any reason the individual refuses to take the prescribed medication, the nurse records the refusal on the medication chart, documents in the progress notes and notifies the prescriber or medical officer for review (ACSQHC 2019a). Refusal of the individual to take the prescribed medication may be related to a knowledge deficit, unwanted side effects, poor cognition or illness or cultural or language barriers. Clarifying why an individual is refusing to take medications will assist the nurse to provide relevant interventions or education (Gray et al 2019). Medication education is an essential component of nursing care and may involve a multidisciplinary approach (Tiziani 2022). This will assist the individual to understand the rationale and importance of medication management and the individual may then be more willing to take the prescribed medication (Gray et al 2019). The nurse administering the medication is able to refuse or question the order, if any part of the prescription is incorrect (Gray et al 2019) or if they feel that there is a contraindication for administering the medication. This must be discussed with a medical officer or the prescriber.
11. *The right response:* Any medication administered has an expected physiological response. The nurse administering the medication requires knowledge regarding the medication actions and side effects in order to assess the individual for therapeutic outcomes and ADRs. For example, when giving the medication furosemide in peripheral oedema, has the desired

therapeutic effect occurred (i.e. urine output increased or peripheral oedema decreased or resolved)? Review Progress Note 20.1.

## Errors in administration

Medications are one of the most common treatments in hospitalised individuals. Medication errors have been found to occur at any point during prescribing, documenting, dispensing, administering and monitoring of medicines (Rayhan et al 2022), and are one of the most common clinical incidents reported in acute health settings (ACSQHC 2016). A medication error is '... any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer' (NCCMERP 2023). It is reported that in Australia over 50% of medication errors are considered largely preventable (Pharmaceutical Society of Australia 2019). Information to prevent errors in administration is provided throughout this chapter and focuses on the NSQHS Standards and safe medication management guidelines discussed previously and also listed in Clinical Interest Box 20.3. Each healthcare facility has its own protocol for monitoring and recording medication errors, and the nurse must understand and adhere to that protocol. (See Case Study 20.2.)

If the nurse makes a medication error (e.g. administering the wrong medication or dose, or via the wrong route, or to the wrong individual) or identifies an error made by another nurse, the correct reporting processes must be followed, from reporting to the nurse in charge to documenting the incident. In medication administration, the nurse accepts responsibility to ensure the individual's safety is maintained and that the individual is not harmed by the nurse's actions (Frotjold & Bloomfield 2021). The nurse has a professional and ethical responsibility for reporting any error, no matter how minor or trivial it may seem at the time (Frotjold & Bloomfield 2021). Measures to counteract the effects of the error may be necessary, such as administering an antidote (with a medical officer's order) or monitoring the medication's effects over time. The reporting process provides an objective analysis of why the medication error occurred and is a means for the facility's quality assurance personnel to monitor such events and to implement measures to prevent recurrence. The medication error, measures taken, and outcomes should also be recorded in the individual's medical notes. (See Chapter 2 for information on open disclosure and Chapter 8 for information on nursing documentation.)

To prevent medication administration errors the nurse must:

- Be proficient with the 11 rights.
- Ensure the accuracy of the prescribed medication order.
- Check the date and time to be given.
- Read medication labels carefully.
- Be aware that many medications have similar names.
- Check the expiry date on the medication label.
- Check the decimal point on prescriptions and medication container labels.

### CLINICAL INTEREST BOX 20.3 Safe medication management guidelines

- All medications must be kept in a locked cupboard or medication trolley. The key must be kept with the RN at all times. Some preparations (e.g. suppositories, vaccines, levothyroxine sodium and insulin) require refrigeration and are stored in a lockable refrigerator. Nothing else should be stored in the refrigerator along with the medications. Medications or preparations for external use are stored apart from those intended for internal use.
- Medications of addiction (e.g. Schedule 8 or other medications of addiction such as benzodiazepines or Panadeine Forte) are kept in a separate locked cupboard that is firmly fixed to a wall or floor, within a locked room. The key is kept in the possession of an RN at all times.
- A register must be maintained of all medications of addiction, and the records must contain full details of all receipt of medications and all disposal of medications, whether by administration to an individual, return to the pharmacy department or discarded by any other means. The nurse who administers the medication and the nurse who checks the medication both sign their names in the register.
- Healthcare facilities implement a protocol that conforms to the relevant state or territory Regulations whereby certain medications (usually medications of addiction such as morphine) are checked at the change of shift (e.g. every 8 hours). Two nurses, one of whom should be an RN who has worked the current shift and one RN from the following shift, count the medications together and document their findings in a register. The number of medications in the containers is compared with the number of medications already recorded in the register. Both nurses sign the register to indicate that the count is correct. If the count is not correct, the healthcare facility protocol should be followed.
- Medications of addiction and restricted substances can only be supplied by the pharmacist with a written order by a medical officer or dentist.
- A qualified pharmacist has complete responsibility for all containers dispensed from the pharmacy department. No-one else is permitted to supply a medication, label a container, alter the wording on a label or transfer the contents of one container to another.
- There should be a written medical officer's order for all medications administered to individuals. Verbal orders, including telephone orders, are open to misinterpretation. A written prescription must contain the date of prescribing, the individual's full name, the name and dosage of the medication, the route of administration, the frequency of administration and the signature of the medical officer who is writing the prescription. If the nurse has any doubt about the meaning of an order, the medical officer must be contacted immediately for clarification (before the medication is administered).
- The nurse administering the medication must check the accuracy of the medication order prior to administration and if there are any discrepancies then the order needs to be reviewed by the original prescriber.
- An RN must check every dose of medication to be administered by an undergraduate student nurse. Nursing regulations dictate that an RN must accompany student nurses during administration of a medication. Any medication that requires the process of double-checking with another RN must also be done when a student nurse is administering the medication.
- A nurse should administer only a medication that has been prepared personally (e.g. the nurse should not administer any medication that has been prepared by someone else and not witnessed personally).
- The nurse who administers a medication to be taken orally must remain with the individual until the medication has been swallowed.
- If the nurse is checking a medication that is to be administered by another nurse (e.g. a medication of addiction or intravenous antibiotic), in addition to the safety measures already stated, the checker must observe the dose being measured, reconstituted and drawn up, and then witness the medication being administered via any route.
- After administering any medication, the nurse records it immediately on the appropriate NIMC or EMS or fluid order chart. Prompt recording prevents errors. Details recorded on the individual's medication chart include the name of the medication, dosage, route and exact time of administration. The nurse who administers the medication must sign the record sheet.

(Frotjold & Bloomfield 2021; Broyles et al 2019)

- Not administer a medication if the prescription or medication label is illegible (or if the nurse has any doubt at all about the order).
- Be proficient in calculating medication dosages using correct formulae.
- Use administration equipment (e.g. a medicine cup or syringe) with distinct markings.
- Not administer any medication prepared by another person; the nurse preparing the medication must be the nurse administering the medication.
- Not prepare medications in advance of the prescribed time for administration.
- Not prepare more than one individual's medication at the same time (e.g. drugs of addiction/dependence).
- Not leave prepared medications (e.g. in a syringe, a transdermal patch, or an oral medication in a medicine cup) unattended in the medication room, on the medication trolley or at the person's bedside.
- Most importantly, give full attention to the task and prepare for medication administration in a dedicated



## CASE STUDY 20.2

### NIMC charting errors

You have commenced an enrolled nursing graduate program in the medical ward at the local acute hospital. You attended the organisation's nursing orientation program the week before, which included completing a medication calculation competency and completion of the online NIMC medication safety training. You have commenced your graduate program with a 3-month rotation on the medical ward. It is an extremely busy shift, and the medical officer has just completed admitting three new patients. He has written up their prescriptions on the NIMC. You have just finished completing John Johnston's admission and discharge when the medical officer lets you know that he has quickly finished the NIMC ready for medication administration. John has a history of unstable angina, hypertension and has type 2 diabetes mellitus requiring insulin. He has been admitted to the ward post AMI. Review John's NIMC (Figure 20.7) to determine if all the prescribed medication orders are legal.

medication room, via a medication trolley, or in other designated areas free from distraction and interruptions.

### CRITICAL THINKING EXERCISE 20.3

#### Medication administration safety

You are working on the medical ward, and it is an extremely busy shift. You complete your medication round prior to breakfast, and notice your colleague is looking flustered. She tells you that she must attend to one of her patients that has been incontinent, and she has just drawn up Mr Park's insulin in the medication room. She asks for you to get the insulin, check this with another nurse and give it to Mr Park for her. She mentions the medication chart is in the medication room. What are the safety issues in giving a medication that you have not drawn up, or seen drawn up yourself? What is your response?

#### Medicine abbreviations

When writing prescriptions, the medical officer frequently uses abbreviations that are derived from Latin. ACSQHC (2016) identify that one of the major causes of ongoing medication errors is the misuse of dangerous abbreviations. The ACSQHC have introduced standard prescribing terminology, abbreviations and symbols used in medicine documentation in an attempt to reduce the number of associated errors. Abbreviations are also used when referring to strength of medications such as grams (g) and milligrams (mg). For example, the abbreviation for micrograms using the Greek letter  $\mu$  ( $\mu\text{g}$ ) is not recommended, nor is  $\text{mcg}$ , since these may lead to errors; *microg* is the preferred and recommended abbreviation, or the whole word (microgram) should be written. Other error-prone abbreviations and symbols that should be avoided include IU (international units—can be mistaken for IV), IVI (intravenous injection—mistaken for IV 1). A 24-hour clock must be used for administration time (e.g. for 8:00 pm this should be written as 20:00, so it is clear the medication is to be given at 8 pm not 8 am). Some frequency abbreviations can be misinterpreted, for example, qd (every day—mistaken as QID [four times daily]). 6/24 can be interpreted as every 6 hours or six times in 24 hours; therefore 6-hourly should be written so there is no confusion (ACSQHC 2016).

## SYSTEMS OF MEASUREMENT

To promote accurate and safe administration of medications, the nurse must understand the system of weights and measures used in prescriptions and correctly calculate dosages (Frotjold & Bloomfield 2021). The metric system is the standard system used for measurement in all medication administrations. The metric system is based on the International System of Units (SI units) where decimals are used to write measurement for length, mass, time, temperature and amount of substance (Knights et al 2023).

### SI units

Commonly used SI units in medication administration are mass (kilograms [kg]), volume (litres [L]), time (min) and amount molecules of a substance (mole [mol]). These basic units can be multiplied or divided by 1000 to form secondary units (Knights et al 2023).

Measures of mass commonly used are:

- grams (g):  $1000\text{ g} = 1\text{ kg}$
- milligrams (mg):  $1000\text{ mg} = 1\text{ g}$
- micrograms (microg):  $1000\text{ microg} = 1\text{ mg}$ .

Measures of volume commonly used are:

- millilitres (mL):  $1000\text{ mL} = 1\text{ L}$
- microlitres (microL)  $1000\text{ microL} = 1\text{ mL}$ .

Measures of amount of substance are:

- millimoles per litre:  $1000\text{ mmol/L} = 1\text{ mol}$ .

The mole is the molecular weight of a substance expressed in grams (Knights et al 2023). The strength of a pharmaceutical preparation used in electrolyte replacement therapy is normally expressed in millimoles per given volume of solution (e.g. mmol/L). Millimoles are also used to express the concentration of substances other than electrolytes and are used widely in laboratories (e.g. in haematology reports [cholesterol 5.2 mmol/L]).

It is important to note that units are not capitalised (e.g. kilogram, not Kilogram) except for litres (L); full stops should not be used in unit abbreviations (e.g. mL, not m.L or m.L.); quantities less than 1 should have a zero to the left of the decimal point to avoid potential errors (e.g. 0.35 mg, not .35 mg); and abbreviations should not be plural (e.g. 100 mL, not 100 mLs). A trailing zero should not be added





**Attach ADR sticker**  
 Allergies and adverse drug reactions (ADR)  
 Medication history  
 Reaction / type / date  
 Initials

URN: 1234560  
 Family name: Johnston  
 Given names: John Bradley  
 Address:  
 Date of birth: 10/01/19XX  
 Sex: M  F   
 Height (cm): 175  
 Weight (kg): 85

Not a valid prescription unless identifiers present

First prescriber to print patient name and check label correct: 06/06/XX



**Regular medicines**

Year 20 XX Date and month →

**Variable dose medicine**  
 DATE (Medicine (print generic name))  
 Route Frequency  
 Prescriber to enter dose time and individual dose  
 Prescriber signature Print your name Contact  
 Time to be given: Time given

**VTE risk assessed. Yes**  **Propylaxis not required**  **Contraindicated**

Date (Medicine (print generic name))  
 Subcut 85mg BD Frequency and NOW enter times  
 Indication  
 Prescriber signature Print your name Contact  
 Mechanical prophylaxis NA  
 Prescriber/NI signature Print your name Contact

Date (Medicine (print generic name))  
 Warfarin Marevan / Coumadin  
 Target INR Range  
 Route Prescriber to enter individual dose  
 Prescriber signature Print your name Contact

Date (Medicine (print generic name))  
 PO 10mg Mane Frequency and NOW enter times  
 Indication  
 Prescriber signature Print your name Contact

**PRESCRIBER MUST ENTER administration times**  
 DATE (Medicine (print generic name))  
 PO 25mg BB Frequency and NOW enter times  
 Indication  
 Prescriber signature Print your name Contact

Date (Medicine (print generic name))  
 PO 20mg D hyperlipidemia Frequency and NOW enter times  
 Indication  
 Prescriber signature Print your name Contact

**Regular medicines**

Year 20 XX Date and month →

**PRESCRIBER MUST ENTER administration times**  
 DATE (Medicine (print generic name))  
 Route 30mg mane Frequency and NOW enter times  
 Indication T2DM  
 Prescriber signature Print your name Contact  
 Date (Medicine (print generic name))  
 Route Frequency and NOW enter times  
 Indication  
 Prescriber signature Print your name Contact

**Recommended administration times**  
 Morning (0600-0800)  
 Night (1800-2000)  
 Once daily (0800-2000)  
 Twice daily (0800-1800) (2000-0800)  
 Three times daily (0800-1400) (1400-2000)  
 Four times daily (0800-1400) (1400-2000)  
 PRN (0800-1800) (1800-2000)  
 As required

SR = Sustained modified or controlled release  
 If SR, check for SR on label. If SR, then half dose can be given.  
 Dose must be swallowed without crushing.

**Anticoagulant education receipt**  
 Medication: Warfarin  
 Product:  Doctored  
 Patient:  Educated  
 Pharmacist: Helen Brown  
 Designation: EN  
 Date: 06/06/XX

**Reason for not administering**  
 A Absent  
 F Fasting  
 R Refused - notify prescriber  
 V Vomiting  
 L On leave  
 N Not available - obtain supply or contact prescriber  
 W Withheld - enter reason in clinical record  
 S Self administered

Medicine (print generic name)	Route	Dose	Frequency and NOW enter times	Indication	Prescriber signature	Print your name	Contact	Date	Duration days	Dispensed? Yes/No	Continued on discharge? Yes/No
Warfarin	PO	10mg	Mane								
Marevan / Coumadin	PO	25mg	BB								
Metoprolol	PO	20mg	D	hyperlipidemia		Joe Bloggs					
Subcut 85mg BD							040				
30mg mane				T2DM		Joe Bloggs	040				

Pharmaceutical review: \_\_\_\_\_

Figure 20.7, cont'd

after the decimal point (e.g. 1.0 mg) since it may be mistaken as 10 mg if the decimal point is not seen (Knights et al 2023).

## Medication calculations

Competence in calculating the required dose of prescribed medications is an important factor in preventing an administration error. The nurse must understand basic mathematical skills in order to be able to accurately calculate dosages, using the correct formulae based on the form of medication and route of administration, as well as mixing medications (Knights et al 2023).

## Conversions

Medications are not always supplied in the order of measure in which they are prescribed. Nurses are required to convert the available units of volume and weight to the ordered dosages. The recommendation is to convert the prescribed unit of measure to the medication stock unit of measure, to prevent over- or under-dosing. The conversion of an SI unit of mass is a systematic process where the dose is divided or multiplied by 1000 to change to the next SI mass unit (see Figure 20.8). For example, to change milligrams to grams, divide the dose by 1000, which involves moving the decimal point three places to the left:

The medication ceftriaxone is available in 1.2 g vials and the order written is for 800 mg

To convert litres to millilitres, multiply by 1000, or move the decimal point three places to the right:  $1.2 \text{ g} \times 1000 = 1200 \text{ mg}$ .

The same converted SI can then be used to calculate the required medication dosage.

$$\frac{1200 \text{ mg}}{800 \text{ mg}} \times \frac{10 \text{ mL}}{1} = 6.7 \text{ mL}$$

## Calculating dosages

Although the introduction of standard unit doses and prepared solutions has meant that the need for nurses to undertake calculations has decreased, there are certain situations where the nurse will need to perform basic calculations for administration of medications, fluids and other pharmaceutical products. The calculation of dosages must be performed with total accuracy and therefore the nurse must be competent in dealing with decimals, fractions, percentages, ratios and proportions. If any

÷ 1000	↑	kg	↓	× 1000
	↑	g	↓	
	↑	mg	↓	
	↑	microg	↓	

**Figure 20.8** Medication calculation conversion table for mass

doubt exists, it is important that the nurse double-check all calculations with another health professional, such as another nurse, medical officer or pharmacist.

Formulae for calculating medication doses include:

## Liquid medications

$$\frac{\text{Stock required}}{\text{Stock strength}} \times \frac{\text{Volume}}{1} = \text{Volume to be administered}$$

**Example:** A medical officer prescribes fentanyl 100 microg intramuscularly (IM). The medication in stock is available in ampoules containing 500 microg per 10 mL.

$$\frac{\text{Stock required} = 100 \text{ microg}}{\text{Stock strength} = 500 \text{ microg}} \times \frac{\text{Volume} = 10 \text{ mL}}{1}$$

$$\frac{100 \text{ microg}}{500 \text{ microg}} \times \frac{10 \text{ mL}}{1} = 2 \text{ mL}$$

= Volume to be administered

## Solid medications

$$\frac{\text{Stock required}}{\text{Stock strength}} = \text{Amount to be administered}$$

**Example:** A medical officer prescribes metoprolol tartrate 12.5 mg orally. The medication in stock is available as tablets containing 50 mg.

$$\frac{\text{Stock required} = 12.5 \text{ mg}}{\text{Stock strength} = 50 \text{ mg}} = \frac{1}{4} \text{ tablet}$$

= Amount to be administered

## Medications measured in units

$$\frac{\text{Stock required}}{\text{Stock strength}} \times \frac{\text{Volume}}{1} = \text{Volume to be administered}$$

**Example:** A medical officer prescribes morphine sulphate 4 mg subcutaneous (subcut). The medication in stock is available in 10 mg/mL

$$\frac{\text{Stock required} = 4 \text{ mg}}{\text{Stock strength} = 10 \text{ mg}} \times \frac{\text{Volume} = 1 \text{ mL}}{1} = 0.4 \text{ mL}$$

= Volume to be administered

## Calculation of paediatric dosages

Children do not always metabolise medications in the same way as adults, due to a greater body water content and immaturity



of their liver and kidneys. In addition, children's recommended dosages are not always standard (Broyles et al 2019). In most cases, the prescriber will calculate the dose based on weight or weight and height (body surface area [BSA]) before ordering the medication. Clinical Interest Box 20.4 provides interventions to assist the nurse with administering medications to infants and children.

Dosages based on weight use kilograms of body weight per kilogram recommendations to arrive at the approximate and safe dose.

### Solid medications

$$\frac{\text{Stock required} = \text{mg/kg}}{\text{Stock strength}} = \text{Amount to be administered}$$

### Liquid medications

$$\frac{\text{Stock required} = \text{mg/kg}}{\text{Stock strength}} \times \frac{\text{Volume}}{1} = \text{Volume to be administered}$$

**Example:** A medical officer prescribes paracetamol to be given orally 6-hourly for a 10-year-old child who weighs 32 kg. The recommended dose of paracetamol is 15 mg/kg/dose every 6 hours.

$$\frac{\text{Stock required} = \text{mg/kg}}{\text{Stock strength}} \times \frac{\text{Volume}}{1} = \text{Volume to be administered}$$

The medication available in stock is 120 mg/5 mL.

$$\frac{15 \text{ mg} \times 32 \text{ kg}}{120 \text{ mg}} \times \frac{5 \text{ mL}}{1} = 20 \text{ mL}$$

= Volume to be administered

The most accurate way of calculating paediatric dosages is based on BSA. The BSA is calculated using the child's height and weight and a nomogram (see Figure 20.8) and is an indicator of metabolic mass. It is used to calculate correct dosages for paediatric cytotoxic and other medications. A nomogram is used to make the calculation easier. There are three columns to the nomogram: height, weight and the SA (surface area).

## CLINICAL INTEREST BOX 20.4 Interventions to assist the nurse with medication delivery for infants and children

For oral medications, these interventions may assist the child in taking the oral medication:

- Where possible, use liquid rather than tablet form since children find it difficult to swallow tablets.
- Offer a pleasant-tasting drink or treat after medication is swallowed as this will remove the unpleasant after-taste and makes compliance/concordance/adherence more likely with next dose.
- Mix medication with a tiny amount of pleasant-tasting substance, such as honey (unless contraindicated by pharmacist) to help persuade a reluctant child to take medication.
- Avoid mixing the medication with food. If the child does not eat the food the whole dose will not be delivered. This will also prevent food aversion.
- Use an oral medication syringe to draw up and deliver liquid medications inside the mouth between the cheek and the gums.

For intramuscular (IM) or subcut injections:

- Ensure that a large well-developed muscle is chosen for the IM injection to avoid pain and bruising.
- Ask a parent or guardian to be present to assist in decreasing the child's anxiety.
- The parent or guardian may need to assist in holding the child.
- Use distraction techniques such as a toy or talking reassuringly to the child.

For IV infusion:

- Every child must be weighed before intravenous therapy (IVT) commences and then daily.
- Serum electrolytes and glucose must be checked before IVT commences and again within 24 hours if IVT continues.
- IVT is delivered through a volumetric pump or syringe driver. It is recommended that a paediatric infusion set with an inline burette must be used for all children requiring intravenous therapy. All IVT prescribed for children should be infused through a volumetric pump.
- The IV cannula site is observed every hour when IV therapy is in progress to monitor for extravasation or infiltration.
- An accurate fluid balance chart is maintained, documenting input, ongoing losses and urine output.
- Ensure that the labelling standards are adhered to when preparing any injectable medicines, fluids and lines for IV administration.

(Frotjold & Bloomfield 2021; Department of Health and Wellbeing, Government of South Australia 2023; Kliegman 2019)

The individual's height is marked on the chart (first column) and then weight (third column), and a line is drawn between these two crossing over the SA (middle) column and the point at which it crosses the SA column is the BSA, which will be used in the calculation (Broyles et al 2019).

Once the BSA has been calculated it is applied to a formula to calculate the correct paediatric dose. There are two calculation methods that can be utilised:

**Formula 1:** Dosage is based on average adult BSA (1.73 m<sup>2</sup>)

$$\frac{\text{Child's BSA in m}^2}{\text{Average adult BSA 1.73m}^2} \times \text{Average adult dosage} \\ = \text{Child's dosage in mg}$$

**Example formula 1:** The child is prescribed cefaclor monohydrate TDS. The child's height is 95 cm and weight is 14 kg; therefore, according to the nomogram, the BSA is 0.6 m<sup>2</sup>. The cefaclor adult dosage is 250 mg TDS.

$$\frac{0.6 \text{ m}^2}{1.73 \text{ m}^2} \times 250 \text{ mg} = 86.7 \text{ mg QID}$$

**Formula 2:** Dosage is based on multiplying paediatric dosage × mg/m<sup>2</sup>/day

$$\frac{\text{Paediatric dose in mg}}{\text{m}^2/\text{day}} \times \text{child's BSA in m}^2 \\ = \text{Child's dosage in mg}$$

**Example formula 2:** The child is prescribed cefaclor monohydrate TDS. The child's height is 0.75 m and weight is 10 kg; therefore, according to the nomogram, the BSA is 0.43 m<sup>2</sup>. The normal daily paediatric dosage of cefaclor is 40 mg/kg/day (400 mg) divided into 3 doses (TDS).

$$\frac{400 \text{ mg}}{1 \text{ m}^2/\text{day}} \times 0.43 \text{ m}^2 = 172 \text{ mg divided into 3 doses}$$

It should be noted that preparing medications for infants and children requires additional skills. Nurses caring for children are recommended to consult paediatric textbooks for more information. These provide general guidelines concerning administering medications to infants and children. When administering medication to paediatrics, ENs must observe the 11 rights and double-check procedures with the RN, in accordance with the organisation's policy and procedural guidelines.

## Intravenous administration calculations

There are several methods used to infuse IV fluids and medications directly into the bloodstream, including gravity feed line, volumetric pump, syringe driver and a syringe. With

the gravity feed line, the IV fluid passes from an IV infusion bag into a drip chamber. The drip chamber is designed to allow a fixed number of drops per mL to be delivered, which is controlled by a roller clamp allowing the nurse to adjust the flow rate. A volumetric infusion pump is able to be programmed to maintain an accurate flow rate; however, it should still be checked at regular intervals. Some volumetric pumps have modules that are attached which are programmed separately so more than one IV medication or fluid can be delivered at the same time. (See Figure 20.18.) Volumetric pumps have specific medication rates programmed into them to prevent medication delivery errors from occurring. The nurse is able to accurately program the rate of medication or fluid being delivered through the volumetric pump's library. A syringe driver allows for medications to be administered in smaller amounts of fluid through an IV cannula or a subcutaneous butterfly, which is delivered in minute doses (e.g. insulin or morphine). A single syringe can be attached to the IV cannula directly and a volume of fluid or medication is delivered as a push, either quickly or slowly over a period of time (e.g. sodium chloride 0.9% flush). The calculation of the volume to be infused and delivery rate may vary depending on the device used. The *Australian Injectable Drugs Handbook* by the Society of Hospital Pharmacists of Australia (SHPA 2023) gives the recommended mixing volumes, type of fluid and rates that certain medications should be administered over and *must be checked prior to every parenteral medication calculation and administration*. Hospital procedure guidelines also guide the nurse regarding the delivery method and also must be reviewed prior to delivery.

### Calculation of intravenous infusion rate

Volumetric pump rates are calculated in mL/hour or mL/min. mL/hour is calculated by dividing the total infusion volume by the total infusion time in hours.

$$\frac{\text{Volume to be infused}}{\text{Time (hours)}} = \text{Rate mL/hr}$$

**Example:** A medical officer orders sodium chloride 0.9% (normal saline) 1 L to be delivered over 8 hours via an infusion pump.

$$\frac{\text{Volume to be delivered} = 1000 \text{ mL}}{\text{Time (hours)} = 8} = 125 \text{ mL/hr}$$

The rate on the volumetric pump is set at 125 mL/hour and the volume to be infused is set at 1000 mL.

Calculating mL/min is done by dividing the volume to be infused by the minutes then multiplying by 60, which converts the volume to be infused from minutes to hours.

$$\frac{\text{Volume to be infused}}{\text{Time (minutes)}} \times \frac{60}{1} = \text{Rate mL/hr}$$

**Example:** A medical officer has ordered 10 mmol/L of potassium chloride to be delivered over 90 minutes. The

stock is potassium chloride 10 mmol/L in 100 mL premade IV bags.

$$\frac{\text{Volume to be infused} = 100 \text{ mL}}{\text{Time (minutes)} = 90 \text{ min}} \times \frac{60}{1} = 67 \text{ mL/hr}$$

= Rate mL/hr

### Gravity feed IV delivery

The number of drops delivered per millilitre of solution varies with different brands and types of infusion sets. This rate is called the drip or drop factor and is usually printed on the back of the package. In Australia, the macrodrops IV infusion sets most commonly used are those with a 20 drops/mL drip chamber. The drip chamber for microdrip is 60 drops/mL.

The nurse will be required to closely regulate the drops per minute to ensure that the total prescribed volume will be delivered in the required time. Drops per minute are calculated using the following formula:

$$\frac{\text{Volume to be infused}}{\text{Time (hours)}} \times \frac{\text{Drops/mL}}{60} = \text{Rate drops/min}$$

**Example:** A medical officer orders sodium chloride 0.9% 1 L to be delivered over 8 hours. The IV infusion drip chamber delivers 20 drops/mL.

$$\frac{1000 \text{ mL} = \text{Volume to be infused}}{8 = \text{Time (hours)}} \times \frac{20 \text{ drops per mL}}{60}$$

= 42 drops/min

When delivering a fluid or medication via a gravity feed line over less than an hour, the time in hours is not factored into the equation since only the minutes are used in the calculation.

$$\frac{\text{Volume to be infused}}{\text{Time (minutes)}} \times \frac{\text{Drops/mL}}{1} = \text{Rate drops/min}$$

**Example:** An individual is to receive 1 g of IV ceftriaxone added to 60 mL of sodium chloride 0.9% and delivered over 30 minutes. The IV giving set delivers 20 drops/mL.

$$\frac{60 \text{ mL} = \text{Volume to be infused}}{30 \text{ minutes}} \times \frac{20 \text{ drops/mL}}{1}$$

= 40 drops/min

## ADMINISTERING MEDICATIONS

The medication administration route will depend on the rationale for prescription, type and form of medication, medication properties and the desired therapeutic effect (Frotjold & Bloomfield 2021). It is the nurse's role to assess the individual prior to administering any medications and report to the nurse in charge any contraindications as well as inform the medical officer if the prescribed route is not suitable.

## Administering enteral medications

### Oral route

The oral route is the most common route by which medications are administered. Oral medications may be presented in solid (tablets, capsules or powder) or liquid (solution, elixir or suspension) form (Knights et al 2023). Oral medications may be contraindicated in individuals who are unconscious, unable to swallow or unable to retain the medication in the stomach (vomiting, gastric drainage, fasting) (Frotjold & Bloomfield 2021). Before administering any oral medication, the nurse must ascertain if any individuals have a nil by mouth status, such as individuals who are to have certain tests or surgery. The nurse must know whether solid medications are to be swallowed whole, chewed or sucked, and whether the medication can be crushed for administration. The nurse will need to consult the SHPA *Don't Rush to Crush*, to ascertain if certain medications may or may not be crushed prior to administration. Most medications in tablet and capsule form should be swallowed with at least 100 mL of water (Frotjold & Bloomfield 2021). Powdered medications and some medications in granule form are mixed with a liquid before administration. Enteric-coated or sustained-release preparations must never be crushed, chewed or opened and must be swallowed whole. Enteric coatings are used to:

- Protect the medication from being metabolised by gastric acids.
  - Protect the stomach from medication that may cause gastric irritation and side effects such as nausea and vomiting.
  - Cause a delayed release of the medication allowing it to reach the small intestines where it will be absorbed.
- (Knights et al 2023)

Suggested guidelines for safely administering oral medications are provided in Clinical Skill 20.1. Effervescent powders and tablets should be taken immediately after dissolving. All liquid preparations should be shaken before they are poured. Any mixture that stains the teeth should be taken through a straw, and the individual should rinse out the mouth after each dose.

In certain circumstances, oral medications may be administered through a nasogastric or PEG tube. Clinical Skill 20.2 provides guidelines to ensure safe administration of medications via a nasogastric or PEG tube. More information about nasogastric and PEG tubes can be found in Chapter 30. Administering medication via a nasogastric or PEG tube is the main reason that tubes become blocked, and this can be caused by poorly crushed medications, crushing medications that cannot be crushed or inadequate flushing (Williams 2023). Medications must be administered through the enteral feeding tube one at a time and then flushed with 5–10 mL of water between each medication (Williams 2023). The pharmacist, or *Don't Rush to Crush* book, should be consulted before crushing any tablets and administering them orally or via a nasogastric or PEG tube. It is often the case that the medication is manufactured and

## CLINICAL SKILL 20.1 Administering oral medications

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

NIMC/EMM system medication order  
 Prescribed medication  
 Disposable medication cups  
 Glass of water, juice or preferred liquid  
 Straw (if required)  
 Medication cutting device (if required)  
 Clean pill crusher (if required)  
 Liquid measure or oral/enteral syringe  
 Resource material (e.g. MIMS, *Don't Rush to Crush*)



### PREPARE FOR THE SKILL

(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Mentally review the steps of the skill.  
 Discuss the skill with your instructor/supervisor/team leader, if required.  
 Confirm correct facility/organisation policy/safe operating procedures.  
 Validate the order in the individual's record.  
 Identify indication and rationale for performing the activity.  
 Assess for any contraindications.  
 Locate and gather equipment.  
 Perform hand hygiene.  
 Ensure therapeutic interaction.  
 Identify the individual using three individual identifiers.  
 Gain the individual's consent.  
 Assess for pain relief.  
 Prepare the environment.  
 Provide and maintain privacy.  
 Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration. Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions. Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes. Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring. Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring. Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.
Assess individual's ability to receive the medication in the prescribed form via the prescribed route.	If the individual is nauseous, and is not able to tolerate medication given via the oral route, a review will need to occur to reassess the ordered route.

Continued

**CLINICAL SKILL 20.1 Administering oral medications—cont'd**

Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.
Perform any necessary assessments related to the medication such as blood pressure (BP), pulse, respiratory rate (RR).	Apical pulse should be performed before administering digoxin; RR checked before opioid (narcotic) analgesics; BP checked before antihypertensives. If any abnormalities are found, the nurse should not administer medication and should contact nurse in charge and medical officer.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

<b>Skill activity</b>	<b>Rationale</b>
Prepare medications as per administration guidelines and calculate the correct dose. Review <i>Don't Rush to Crush</i> handbook if medication needs to be crushed. Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times: <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Some individuals may require their medication to be crushed. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.
<b>Solid dose forms</b>	
Tip the required number of tablets or capsules into the lid of the container and transfer into the medicine cup. Do not touch the medication with your bare hands.	Maintains cleanliness of medications and prevents cross-infection.
Some individuals may require their medication to be crushed. Crush medication/s using a clean pill crusher if required after reviewing the <i>Don't Rush to Crush</i> resource.	Some medications cannot be crushed. Crushing these medications can alter their effectiveness. Clean pill crusher ensures that medications are not being mixed from previous individual's medications.
<b>Liquid dose forms</b>	
Follow manufacturer's instructions—shake bottle thoroughly unless contraindicated.	Promotes mixing of the contents and a uniform distribution of the medication in the liquid.
Hold the bottle with the label against the palm of the hand and remove bottle cap and place it upside down.	Mixture will be poured away from the label, to avoid smearing of the label. Prevents contamination of the inside of the cap.
Place the medicine cup on a flat surface and at eye level, pour the liquid medication to the correct level on the medicine cup, ensuring the prescribed dose is poured or withdraw the required dose from the container using an approved oral/enteral syringe.	Ensures accuracy of measurement. Note that parenteral syringes should not be used for preparation or administration of doses.

**CLINICAL SKILL 20.1 Administering oral medications—cont'd****Administration**

Assist the individual into a sitting (preferred) or side-lying position when possible.	Prevents aspiration during swallowing.
Administer the oral medication. Individual may self-administer or assist as required. Offer a glass of water, unless contraindicated. Advise individual to take a few sips of water before placing medication in the mouth.	Solid forms of medication are swallowed more easily in a moistened mouth and by swallowing with liquids.
Remain with the individual until the medication is swallowed. Never leave medication unattended at the bedside or on the medication trolley.	The nurse assumes responsibility for ensuring that the individual receives the prescribed medication. Other individuals may access the medications if left at the bedside.

**AFTER THE SKILL****(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.  
 Restore the environment.  
 Report, record and document assessment findings, details of the skill performed and the individual's response.  
 Report, record and document any abnormalities and/or inability to perform the skill.  
 Reassess the individual to ensure there are no adverse effects/events from the skill.

<b>Skill activity</b>	<b>Rationale</b>
As indicated, advise to remain sitting upright for 30 minutes after ingestion.	Prevents side effects such as oesophageal ulceration.
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSQHC 2012; 2019a; Frotjold &amp; Bloomfeild 2021; JBI 2022c; Rebeiro et al 2021; The Society of Hospital Pharmacists of Australia [SHPA] 2022; Tollefson et al 2022)</i>	

**CLINICAL SKILL 20.2 Administering medications via enteral routes (nasogastric tube, percutaneous endoscopic gastrostomy tube, percutaneous endoscopic gastrojejunostomy tube)**

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

<p><b>NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):</b></p> <ol style="list-style-type: none"> <li>1. Am I educated?</li> <li>2. Am I authorised?</li> <li>3. Am I competent?</li> </ol> <p>If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.</p>	<p><b>Equipment:</b></p> <ul style="list-style-type: none"> <li>NIMC/EMM system medication order</li> <li>Prescribed medication</li> <li>Disposable medication cups</li> <li>Oral/enteral syringe for measuring and administering liquid medication forms</li> <li>Clean pill crusher (if required)</li> <li>Water</li> <li>50 mL enteral tip syringe</li> <li>Disposable gloves</li> <li>pH indicator paper/strips (if nasogastric tube in use)</li> <li>Resource material (e.g. MIMS, <i>Don't Rush to Crush</i>)</li> </ul>
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Continued

## CLINICAL SKILL 20.2 Administering medications via enteral routes (nasogastric tube, percutaneous endoscopic gastrostomy tube, percutaneous endoscopic gastrojejunostomy tube)—cont'd



### PREPARE FOR THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

- Mentally review the steps of the skill.
- Discuss the skill with your instructor/supervisor/team leader, if required.
- Confirm correct facility/organisation policy/safe operating procedures.
- Validate the order in the individual's record.
- Identify indication and rationale for performing the activity.
- Assess for any contraindications.
- Locate and gather equipment.
- Perform hand hygiene.
- Ensure therapeutic interaction.
- Identify the individual using three individual identifiers.
- Gain the individual's consent.
- Assess for pain relief.
- Prepare the environment.
- Provide and maintain privacy.
- Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration. Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions. Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes. Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring. Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring. Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.
Assess individual's ability to receive the medication in the prescribed form via the prescribed route.	If medication needs to be administered on an empty stomach, the nurse will need to ensure the tube feed is modified around the medication delivery times (e.g. ceasing the enteral tube feed for a certain time so medications can be administered).
Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.
Perform any necessary assessments related to the specific medication such as blood pressure (BP), pulse rate and respiratory rate (RR).	Apical pulse should be performed before administering digoxin; RR checked before opioid (narcotic) analgesics; BP checked before antihypertensives. If any abnormalities are found, the nurse should not administer medication and report to the nurse in charge and medical officer.

## CLINICAL SKILL 20.2 Administering medications via enteral routes (nasogastric tube, percutaneous endoscopic gastrostomy tube, percutaneous endoscopic gastrojejunostomy tube)—cont'd



### PERFORM THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.

Apply PPE: gloves, eyewear, mask and gown as appropriate.

Ensure the individual's safety and comfort throughout skill.

Promote independence and involvement of the individual if possible and/or appropriate.

Assess the individual's tolerance to the skill throughout.

Dispose of used supplies, equipment, waste and sharps appropriately.

Remove PPE and discard or store appropriately.

Perform hand hygiene.

Skill activity	Rationale
<p>Prepare medications as per administration guidelines and calculate the correct dose</p> <p>Review <i>Don't Rush to Crush</i> handbook if medication needs to be crushed.</p> <p>Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times:</p> <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard.</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	<p>Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered.</p> <p>Medications should be given in liquid form if available. Other medications may require crushing as per the <i>Don't Rush to Crush</i> handbook.</p> <p>Ensures medication order is the same as the medication supplied.</p> <p>Ensures the correct medication is being administered.</p> <p>Prevents preparation and administration errors.</p>
<p>Follow steps for preparation of solid dose forms or liquid dose forms in Clinical Skill 20.1. Mix each individual crushed medication with a small amount of water.</p> <p>Check the fluid balance status of the individual for any fluid restrictions.</p>	<p>Following administration guidelines ensures medications are administered correctly.</p> <p>Checking to see if there is a fluid restriction may determine the amount of fluid used to flush the line before and after medication administration.</p>
<p>Position in semi-Fowler's position unless contraindicated.</p>	<p>Reduces the risk of regurgitation and aspiration.</p>
<p>Stop the flow of any feed solutions in progress prior to administering medications through the feeding tube.</p>	<p>Recommendation is not to administer feed solutions with medications.</p> <p>Some medications may also require the feed solution to be stopped for a set length of time to allow for effective absorption. Again, check with the pharmacist or dietitian if you are unsure.</p>
<p>Prior to administration of medications into tube check for position and patency.</p> <p>Determine placement of nasogastric tube (NGT) (if this route used) by aspirating stomach contents and testing the pH indicator strips. The pH should be &lt;6.</p> <p>Connect the appropriate type of syringe to the tube (no less than a 30 mL syringe).</p> <p>Flush the tube with 30 mL of water with the plunger or remove the plunger of the oral/enteral syringe, and pour the water into the barrel and hold the barrel of the syringe above the stomach.</p>	<p>Ensures NGT tubing is in the stomach and prevents inadvertent delivery of medication into the lungs.</p> <p>The smaller the syringe, the greater the pressure, which could rupture the tubing.</p> <p>Flushing ensures patency of the tube.</p> <p>Holding the barrel of the syringe above the level of the stomach assists with gravity delivery of the medication directly into the stomach via the tube.</p>
<p>If more than one medication is to be given, they must be given separately. Draw up each medication separately into the oral/enteral syringe and administer into the tube. Flush with 10 mL of water between each medication.</p>	<p>Flushing prevents occlusion of the tube.</p> <p>Administering medications separately prevents clogging of the tube.</p>

Continued



## CLINICAL SKILL 20.2 Administering medications via enteral routes (nasogastric tube, percutaneous endoscopic gastrostomy tube, percutaneous endoscopic gastrojejunostomy tube)—cont'd

When the last medication is administered, flush the tube with at least 30 mL of water.  
Remove the syringe barrel and replace tube cap if enteral feed is not being administered. If the individual is receiving continuous feeding, check the facility/organisation policy on when to recommence.

Ensures patency of tube. Reduces incidence of occlusion.



### AFTER THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Advise to remain in semi-Fowler's position for 30 minutes.	Reduces risk of regurgitation and aspiration. Keeps individual informed and creates an opportunity to initiate medication education. Monitors for adverse effects and ensures that complications can be prevented or addressed early.
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	

*(ACSQHC 2012; 2019a; JBI 2022b; Williams 2022; The Agency for Clinical Innovation and the Gastroenterological Nurses College of Australia 2015; The SPHA 2022; Tollefson et al 2022)*

available in a suitable formulation for administration into enteral tubes (e.g. in a liquid instead of a solid form).

### Oral mucosal absorption

Some medications are administered by buccal or sublingual application, for the purpose of being absorbed directly into the systemic circulation through the oral mucosa (Broyles et al 2019). These routes are indicated for medications that tend to be destroyed by gastric juice, or those that are rapidly detoxified by the liver. Buccal tablets or wafers are placed in the space between the upper molar teeth and gums. Individuals should be advised to alternate cheeks with each administration to prevent mucosal irritation occurring. Sublingual tablets are placed under the tongue. Both forms remain in place while they dissolve. The individual should be advised not to chew or swallow such tablets or drink fluids until the medication has fully dissolved (Frotjold & Bloomfield 2021).

### Rectal instillation

Medication may be given rectally in the form of suppositories or retention enemas. The rectal route (per rectal [PR]) may

be used for a local effect such as evacuation suppositories, or a systemic effect such as analgesia or antiemetic. If individuals are vomiting or unconscious, the rectal route may be an option for medication delivery. Some individuals may be able to insert suppositories without assistance of a nurse, avoiding embarrassment, and others will require the nurse to administer the suppository. To administer the PR medication, the individual is placed in the left lateral position and the suppository or enema is lubricated and inserted past the internal anal sphincter, approximately 2.5 cm (Frotjold & Bloomfield 2021). This prevents the medication being expelled. Suppositories have a rounded end to prevent trauma to the rectum upon insertion (Frotjold & Bloomfield 2021). The nurse should be aware of the different types of suppositories and enemas available. Evacuant suppositories prescribed to promote a bowel action are composed of various substances, such as glycerine, and act by softening and lubricating the faeces to facilitate easier passage and excretion, or by increasing peristalsis through the irritation of intestinal sensory nerve endings. Suggested guidelines for administering rectal suppositories are presented in Clinical Skill 20.3.

**CLINICAL SKILL 20.3 Inserting a rectal suppository or disposable enema**

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

**NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):**

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

**Equipment:**

NIMC/EMM system medication order  
Enema/suppository  
Lubricant  
Waterproof sheet  
Disposable gloves  
Resource material (e.g. MIMS)



**PREPARE FOR THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.

Discuss the skill with your instructor/supervisor/team leader, if required.

Confirm correct facility/organisation policy/safe operating procedures.

Validate the order in the individual's record.

Identify indication and rationale for performing the activity.

Assess for any contraindications.

Locate and gather equipment.

Perform hand hygiene.

Ensure therapeutic interaction.

Identify the individual using three individual identifiers.

Gain the individual's consent.

Assess for pain relief.

Prepare the environment.

Provide and maintain privacy.

Assist the individual to assume an appropriate position of comfort.

**Skill activity**

**Rationale**

Ensure correct medication is given by following the '11 rights' throughout preparation and administration.

Identifies issues, which can be addressed prior to administration.  
Prevents medication errors from occurring and promotes correct and safe administration of medication/s.

Ensure medication orders are correctly prescribed and written.  
Verify indication for the medication on the NIMC/EMM system.  
Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration.  
Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions.  
Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.

Ensures correct medication administration is about to take place.  
Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes.  
Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring.  
Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.  
Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.

*Continued*

**CLINICAL SKILL 20.3 Inserting a rectal suppository or disposable enema—cont'd**

Assess individual's ability to receive the medication in the prescribed form via the prescribed route.	If the individual is not able to receive the medication given via the rectal route (e.g. haemorrhoids, rectal bleeding or diarrhoea), a review will need to occur to reassess the ordered route.
Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.
Perform any necessary assessments related to the medication such as pain assessment or bowel chart.	If any abnormalities are found, the nurse should not administer medication and should contact nurse in charge and medical officer.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.

Apply PPE: gloves, eyewear, mask and gown as appropriate.

Ensure the individual's safety and comfort throughout skill.

Promote independence and involvement of the individual if possible and/or appropriate.

Assess the individual's tolerance to the skill throughout.

Dispose of used supplies, equipment, waste and sharps appropriately.

Remove PPE and discard or store appropriately.

Perform hand hygiene.

<b>Skill activity</b>	<b>Rationale</b>
Prepare medication as per administration guidelines and calculate the correct dose. Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times: <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.
Place individual in a left lateral position with the right leg flexed.	Anatomical site of the lower colon means that this position is the most effective for the introduction and retention of suppositories.
Ensure individual is adequately covered, with only the buttocks exposed. Place protective sheet under buttocks.	Promotes warmth and comfort. Provides absorption pad for any leakages and respects dignity.
Lubricate finger of glove and end of suppository/enema nozzle.	Facilitates smooth insertion of suppository/enema.
Gently insert the suppository by directing it with the finger, through the anus, about 2.5 cm into the rectum. Insert enema tip approximately 10 cm into the rectum and squeeze contents into the rectum.	Suppository/enema must pass the internal anal sphincter and come in contact with rectal mucosa. Ensures that the medication is delivered into the rectum.

**CLINICAL SKILL 20.3 Inserting a rectal suppository or disposable enema—cont'd**

During insertion, encourage the individual to take deep breaths through the mouth.

Helps to relax the anal sphincters.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Advise individual to remain on their side or supine for at least 5 minutes and to retain the suppository/enema for the correct length of time for medication administered.	Individual must be aware whether the suppository/enema is to be retained to allow any medication to be dissipated, or whether to expect a bowel action. Suppositories/enemas to promote a bowel action should be retained for at least 20 minutes. An enema should be held for the time stated on the manufacturer's instructions. Keeps individual informed and creates an opportunity to initiate medication education.
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Ensure individual has easy access to toilet facilities and a nurse call bell within reach.	Reduces anxiety related to accidental expulsion of the suppository or faeces. Can communicate with the nurse in a timely manner.
Observe faeces for odour, colour, texture and amount. Document results.	Assists to assess the effectiveness of the treatment and detects any abnormalities.
Attend to individual's personal hygiene and reposition.	Helps promote dignity and comfort.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSQHC 2012; 2019a; JBI 2022a; Rebeiro et al 2021; Tollefson et al 2022)</i>	

## Administering parenteral medications

### Injections

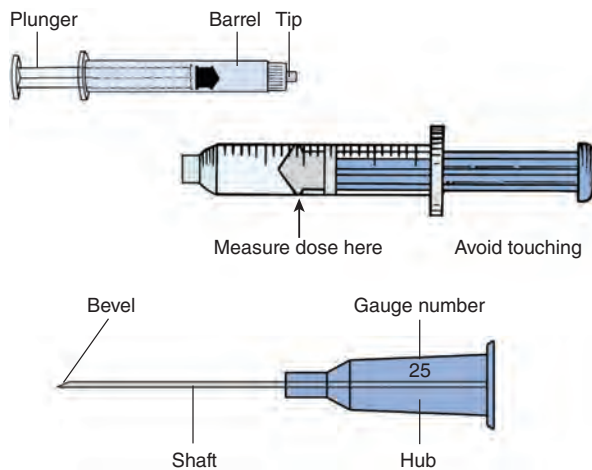
Nurses commonly administer medications by parenteral injection through the subcutaneous, IM or IV routes. Medications are given by injection for a variety of reasons, including:

- Inability to be absorbed when given orally (e.g. aminoglycoside antibacterial agents)
- Destroyed by digestive juices (e.g. insulin)
- Rapid onset of action may be required
- Very precise control over dosage may be needed
- Inability of the individual to take medications orally.

The administration of an injection is an invasive procedure that must be performed using aseptic non-touch technique (ANTT) since there is a risk of infection when a needle pierces the skin, or a syringe is attached to a peripherally

inserted venous catheter (PIVC) device. Infection is prevented by hand hygiene, ANTT when preparing the solution, in administration of the injection, and by preparing the skin or PIVC device prior to the injection (Broyles et al 2019). Principles of ANTT (see Chapter 18) are used when preparing for and administering parenteral medications.

A variety of syringes and needle sizes are available and are single use and disposable. Syringes vary in capacity from 0.5 mL to 60 mL. A syringe consists of a cylindrical barrel with a tip designed to fit the hub of a needle, and a close-fitting plunger (Figure 20.8). The syringe tip is either straight, where the needle slides firmly over, or a Luer lock, where the needle is screwed securely into place. The barrel of the syringe is calibrated into millilitres and tenths of a millilitre or, in the case of an insulin syringe, into units. Selecting an appropriate syringe size depends mainly on the prescribed route and volume of medication to be administered. Generally, a 2–3 mL



**Figure 20.9** Components of a needle and syringe  
(Potter et al 2023)

sized syringe is adequate for subcutaneous, IM and some IV injections.

Needles are available in various lengths and gauges, with different sized bevels. A needle has three parts (Figure 20.9): the hub, which fits onto the tip of a syringe, the shaft and the bevel tip. Needle gauge is determined by the lumen of the needle: as the diameter of the lumen increases, the gauge number decreases. For example, a 16-gauge needle is substantially larger in diameter than a 22-gauge needle.

Selecting an appropriate needle depends mainly on the prescribed route, viscosity of the medication and the individual's body size and amount of adipose tissue. Subcutaneous injections are generally given through a small-diameter needle (e.g. 25-gauge) while IM injections usually require a 21–23-gauge needle. There are specially designed needles that contain a sheath that slides down and covers the needle and tip, to prevent needlestick injury, after the injection has been given.

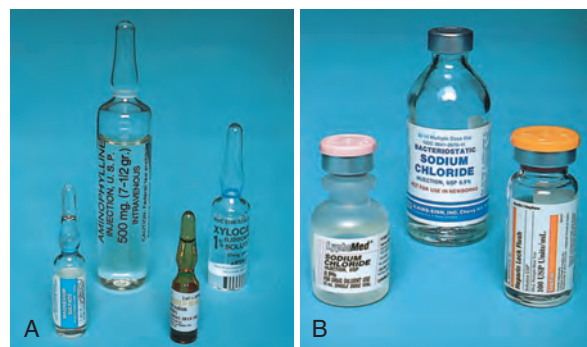
A **needleless intravenous system** administers medications or fluids through an IV access device without using a needle. Blunt filter needles may be used for drawing up sterile solutions from ampoules and the needleless ports are then accessed with the hub of the syringe only. Needleless systems are routinely used in acute healthcare settings, and are important in preventing the risk of needlestick injuries in the workplace since injuries occur with attempts to recap needles, mishandling of needles and syringes, and when needles are left at bedsides (Broyles et al 2019).

There are several different venous access devices (VAD), including PIVC, central venous catheter (CVC), peripherally inserted central catheter (PICC); however, organisational policy and procedure guidelines will outline who is able to administer medications via these devices. The VAD will have a needleless connector port

attached for connection of a syringe or IV infusion line and will be covered with a sterile transparent film to secure the device and allow for monitoring of the site.

To administer IV fluids, blood products or medications, administration lines will need to be pre-primed before they are attached to the VAD, which has been checked for patency with a 0.9% normal saline flush. The type of administration line chosen will vary depending on the infusion method: gravity feed lines are controlled by a roller clamp; volumetric pump infusion sets are controlled by a roller clamp; dual infusion lines contain a filter and are recommended for blood transfusions; an add-a-line is used for secondary infusions; and extension sets for patient-controlled analgesia (PCA) or syringe driver delivery. Some IV lines have integrated systems such as filters, back flow valves and needleless ports to ensure a continuous system and to prevent the risk of contamination (Gorski et al 2021).

Medication for injections may be presented in sterile ampoules, vials, IV medication bags or bottles (Figure 20.10). Prepared IV medications are premixed in bags in a compatible IV fluid and will need an IV line connected to it for administration. An ampoule is made of clear glass or plastic, with a constricted neck that must be snapped off to allow access to the medication. When snapping the neck of the ampoule, glass shards spill onto the medication. A sterile blunt filtered drawing-up needle should be used to draw up the medication into the syringe, from the ampoule. Ampoules contain volumes from 0.2 mL to 20 mL or more. A vial is a single-dose glass container with a rubber seal at the top, which is protected by a metal and plastic cap until it is ready for use. Vials contain medications in either liquid or powder form, requiring reconstitution or further dilution prior to administration. Sterile 'water for injection' and 'sodium chloride 0.9%' are commonly used diluents to dissolve medications in powder form. The SPHA *Australian Injectable Drugs Handbook* specifies type and volume of diluent to use, as well as any



**Figure 20.10 A:** Medication in ampoules, **B:** Medication in vials

(Potter et al 2023)

other recommendations for administration (e.g. compatibilities, speed of administration). These instructions must be consulted before the preparation and administration of any parenteral medication. Table 20.4 illustrates the procedure for the preparation of medications from ampoules and vials.

Some medications are available in disposable, single-dose pre-filled syringes and may not need calculations to prepare dose of the medication (e.g. enoxaparin). It may

be necessary to advance the plunger a small way to expel some medication if the dose ordered is less than that in the syringe or to prime the needle (e.g. insulin pen). The nurse must still follow correct checking procedure, including name, strength, expiry date and volume of the medication. Particular care is needed because many pre-filled syringes look the same but contain very different medications. Some emergency medications (e.g. adrenaline [epinephrine]) are available in an injection system

**TABLE 20.4 | Preparation of medications from ampoules and vials**

Ampoules	Vials
Rotate the ampoule or tap the top lightly with a finger to dislodge any fluid above the neck of the ampoule.	Remove the metal cap to expose the rubber seal.
Face the dot on the tip of the ampoule away from the body. Gently tilt the tip towards the body and snap away from the body. The tip should easily snap off. If resistance is felt, use an ampoule snap device or place a gauze square around the neck of the ampoule to protect the fingers as the glass is snapped.	Wipe the surface of the seal with an alcohol swab, to remove any dust or grease.
Snap the neck in a direction away from the hands, to prevent shattering the glass towards the fingers or face.	To prepare a powdered medication, assemble needle and syringe and draw up the amount of diluent recommended on the label of the vial or in the manufacturer's information, and gently inject into the vial. Gently shake or roll the vial between the hands to dissolve the powder.
Assemble needle and syringe. Remove needle cover. Use a blunt filter needle (if available) to draw up medication from a glass ampoule. Filter drawing-up needles prevent micro glass particles from entering the syringe and thus avoids injection of these particles into the individual.	Before drawing up the solution, assemble the needle and syringe and remove the needle cover. Draw back on the plunger to draw air into the syringe, equivalent to the volume of medication to be aspirated.
Insert the needle (attached to the syringe) into the centre of the ampoule opening, being careful not to touch the needle on the rim of the ampoule, to prevent needle contamination.	With bevel pointing up, insert the tip of the needle through the centre of the rubber seal.
Aspirate the medication by pulling back on the syringe. Keep the needle tip below the surface of the medication to prevent aspiration of air bubbles.	Inject the air from the syringe into the vial. Hold the plunger since it may be forced backwards by air pressure within the vial.
To expel air bubbles from the syringe, remove the needle from the ampoule and hold syringe with the needle pointing up. Draw back slightly on the plunger and then push the plunger up to eject the air (but avoid dispersing medication into the environment). Holding the syringe and needle upright, tap the syringe barrel to dislodge remaining air bubbles. It is important to expel air bubbles because if air is injected it may gain entry to the bloodstream and block a blood vessel.	Holding the syringe and plunger, invert the vial. Hold the vial in the non-dominant hand. Allow air pressure to gradually fill the syringe with medication. Ensure to keep the tip of the needle below fluid level. Pull back slightly on the plunger to keep the needle tip below the water level. Remove the needle from the vial by pulling back on the barrel of the syringe. Tap the syringe barrel to remove any air bubbles.
Remove the drawing-up needle from the syringe before administering the medication via the IV needleless system.	Remove the drawing-up needle from the syringe before administering the medication via the IV needleless system.

(Adapted from Frotjold & Bloomfield 2021)

that requires the plunger in a standard syringe to be screwed into the end of a pre-filled vial with an inbuilt needle. After use, the whole injection unit is discarded into the appropriate sharps container. This device is designed to minimise the risk of needlestick injury (Frotjold & Bloomfield 2021).

### Parenteral fluids

Parenteral fluids correct imbalances in individuals and the IV fluid or blood product ordered will be determined by the illness and its effect on the fluid balance status of the individual. IV fluids are divided into isotonic, hypotonic and hypertonic fluids (Willets & Schmidt 2021). The osmolarity of a fluid is determined by the concentration of solutes (primarily sodium) in a litre of fluid (mOsm/L). Body fluids have an osmolarity of 280–296 mOsm/L. Isotonic fluids have a similar osmolarity as blood and are primarily used to increase the volume of the intravascular space, in the presence of dehydration (from ongoing fluid losses such as vomiting and diarrhoea), hypovolaemia (blood loss) and hypernatraemia (high sodium) (Gorski 2023). Isotonic fluids will not cause fluid shifts between the intracellular and extracellular compartments and any isotonic fluids administered IV will remain in the intravascular compartment (Gorski 2023). Therefore, the nurse will need to monitor the individual for signs and symptoms of fluid overload (pulmonary and peripheral oedema), especially if they have other comorbidities such as congestive heart failure or hypertension (Willets & Schmidt 2021). Daily weights are a good measure of acute body fluid gain and should be measured in individuals where there is risk of fluid volume overload.

Hypotonic fluids have an osmolarity less than blood (<250 mOsm/L) and will cause a fluid shift from the intravascular compartments into the intracellular compartment, restoring fluid levels to cells (Gorski 2023). Hypotonic fluids are used to treat conditions such as hypertonic dehydration and diabetic ketoacidosis. The individual receiving hypertonic fluids will need to be monitored closely because the fluid shift from the intravascular compartment may cause insufficient fluid in the blood vessels and lead to circulatory collapse.

The osmolarity of hypertonic fluids (>375 mOsm/L) is greater than that of body fluids and will cause a fluid shift from the intracellular space to the extracellular compartment and is mainly used to treat conditions such as shock (Gorski 2023). Individuals will need to be monitored for fluid overload (Willets & Schmidt 2021).

Potassium chloride is a common premixed additive with another IV fluid. Any IV solution containing potassium chloride has the fluid type written in red, as an alert that the fluid contains potassium. Fluid boluses must not be given from IV fluids containing potassium chloride as it can be fatal (Willets & Schmidt 2021). Many hospital facilities now have protocols that individuals going to

**TABLE 20.5 | Common intravenous fluid types**

Crystalloids solutions	Therapeutic use
5% glucose	Provides calories and free water, diluent for IV medications, treatment for hyperkalaemia and dehydration
10% glucose	Provides calories and free water, used with parenteral nutrition
0.9% sodium chloride	Replaces electrolytes, hyponatraemia, DKA, flush pre- and post-IV medication delivery and access devices, extracellular fluid replacement, irrigation of wounds
Hartmann's	Dehydration, hypovolaemia, extracellular fluid replacement, shock
20% albumin	Extremely low albumin in the critically ill, burns, ascites in liver cirrhosis, haemodialysis
Dextran	Plasma expander, fluid replacement, perioperative shock, haemorrhage, trauma
Gelofusine	Plasma expander due to hypovolaemia from fluid or blood loss, perioperative shock, haemorrhage, trauma

(Adapted from Broyles et al 2019; Gorski 2023)

theatre must not have IV fluid running that contains the additive potassium chloride in case the individual needs to have a rapid fluid bolus during surgery.

Parenteral fluid replacement includes crystalloid fluids (IV fluid and electrolyte replacement) and colloid fluids (blood and blood products) (see Table 20.5). Crystalloids are used to correct and prevent fluid loss as well as correcting electrolyte balances (Willets & Schmidt 2021). Crystalloids, once mixed with the blood, are able to disperse through the intracellular and extracellular compartments through osmosis without changing the osmolarity of the body's fluids in these compartments (Gorski 2023).

Colloids are essentially a hypertonic fluid that contains proteins and starches and once infused, normally remain in the intravascular space. These proteins cause an increase in the osmolarity of blood and draw fluid into the blood vessels expanding the volume of the plasma. Colloids are also called volume expanders and include products such as albumin, dextran and mannitol (Gorski 2023). (See also Chapter 26.)

**CRITICAL THINKING EXERCISE 20.4**

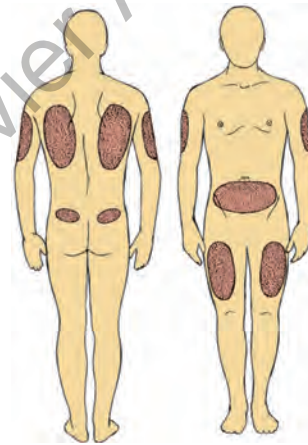
Mr Thompson has had Crohn's disease for 10 years and went to theatre for an ileocecal resection and formation of a temporary ileostomy due to scarring and ongoing inflammation. Postoperatively, his serum potassium levels were 3 mmol/L and he was given 10 mmol/L of potassium chloride in 100 mL IV. After the potassium was administered, the medical officer ordered for Mr Thompson a 1000 mL of 0.9% normal saline with 30 mmol/L of potassium chloride to be given over 8 hours IV. You complete a set of vital signs and Mr Thompson's BP is 90/58 mmHg, HR 110 beats/minute, RR 20 breaths/minute and SpO<sub>2</sub> 96%. You inform the RN and the medical officer who instructs you to give Mr Thompson a 250 mL IV fluid bolus. What is your responsibility in giving the fluid bolus given Mr Thompson's current IV therapy?

subcutaneous tissue should have the needle inserted on a 45-degree angle. Figure 20.13 illustrates the most common site for administration of subcutaneous injections.

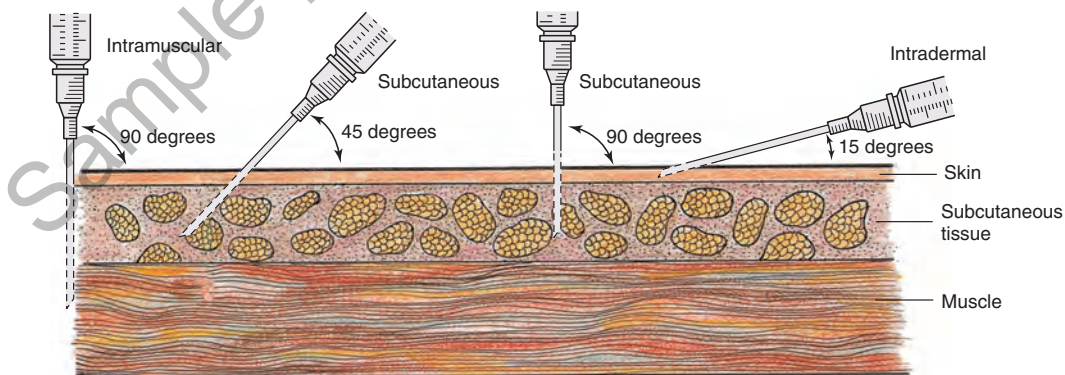
**Intramuscular (IM) injections** involve injecting medication into deep muscle tissue. Muscle is less sensitive to irritating or viscous medications, and specific volumes for each IM muscle site can be injected into muscle without causing severe discomfort. IM injections are administered with the needle inserted at an angle of 90 degrees (see Figure 20.12). Any medication given IM or IV must be mixed and administered as per the guidelines outlined in the *Australian Injectable Drugs Handbook* and/or hospital procedural guidelines. These must be checked prior to IM or IV medication calculation and administration. The recommended volumes for injecting into specific muscle sites are a maximum of 4 mL for ventrogluteal and 5 mL for vastus lateralis, and up to a maximum of 2 mL for the

**Injection sites**

**Subcutaneous injection** involves injecting medication into the loose connective tissue under the dermis (Frotjold & Bloomfield 2021). Small volumes of medication that will not damage subcutaneous tissue are administered by this route and must be water soluble (Frotjold & Bloomfield 2021). Subcutaneous sites that are commonly used include the upper lateral aspect (middle third) of the upper arm, the upper anterior thighs, the abdomen below the costal margins to the iliac crests, avoiding 2.5 cm around the umbilicus, and in the upper ventro- or dorsogluteal region (Figure 20.11) (Broyles et al 2019). These injection sites are generally free from bony prominences and large underlying muscles or nerves; the nurse must also assess the skin to avoid skin lesions (Frotjold & Bloomfield 2021). Subcutaneous injections are administered with the needle inserted at an angle of 45 degrees or 90 degrees (Figure 20.12), depending on the size of the needle used and the amount of adipose tissue on the individual (Broyles et al 2019). An older person with minimal



**Figure 20.11** Common sites for subcutaneous injections (Potter et al 2023)



**Figure 20.12** Comparison of angles of insertion

Subcutaneous injections (45 and 90 degrees), intramuscular injections (90 degrees), intradermal injections (15 degrees). (Potter et al 2023)





**Figure 20.13** Administering a subcutaneous injection in the abdomen  
(Potter et al 2023)

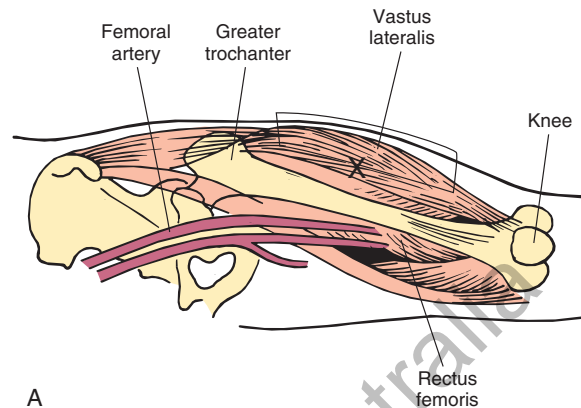
deltoid muscle (Frotjold & Bloomfield 2021). Smaller volumes are recommended for older adults or frail individuals, or those with less developed muscle mass or children. The sites chosen are areas where there is minimal risk of the needle penetrating a large blood vessel, nerve or bone.

An IM injection is generally always aspirated (syringe is drawn back 0.5 mL) after the needle is inserted into the muscle, and prior to injection of the medication. This is to ascertain that the needle has not entered a blood vessel. The nurse will need to follow the health organisation's policy and procedure guidelines for aspirating with an IM injection. According to the Australian Immunisation Handbook (2023) when giving an IM vaccination it is not necessary to aspirate unless blood appears in the needle hub. The needle will then need to be withdrawn and a new site selected.

Intramuscular sites and their anatomical locations commonly used are the **vastus lateralis muscle** (Figure 20.14), located at the middle third of the anterior lateral aspect of the thigh; **ventrogluteal region** (Figure 20.15) where the injection occurs into the gluteus medius muscle located between the greater trochanter and the iliac spine; and **deltoid muscle** (Figure 20.16) located at the upper outer aspect (middle third) of the upper arm (Frotjold & Bloomfield 2021).

The vastus lateralis is a common IM injection site for children (Frotjold & Bloomfield 2021). To locate the injection site for the vastus lateralis muscle place the width of one hand below the greater trochanter and the width of the other hand above the knee to divide the length of the thigh into equal thirds. The injection is given in the anterolateral aspect of the middle third of the thigh (Frotjold & Bloomfield 2021).

The ventrogluteal site is the preferred site for intramuscular injections because it does not contain large blood vessels or nerves, is sealed off by bone, contains less adipose tissue than the buttock area and has the greatest thickness of



A



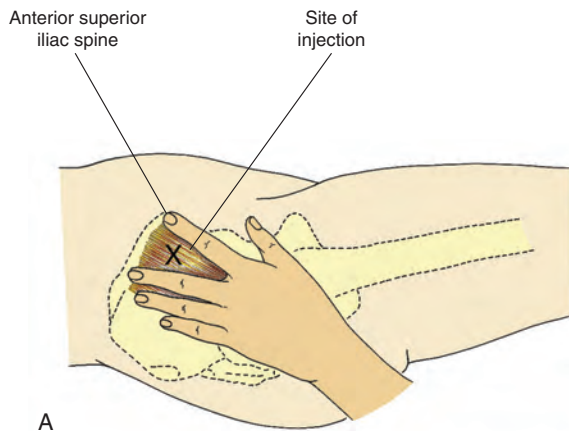
B

**Figure 20.14 A:** Landmark for IM injection vastus lateralis region, **B:** Injection location vastus lateralis muscle  
(Potter et al 2023)

gluteal muscle (Berman et al 2020; Frotjold & Bloomfield 2021). The ventrogluteal site for intramuscular injections is located midway between the greater trochanter and the hip. The heel of the hand is placed over the individual's greater trochanter, and then the anterior superior iliac spine is palpated with the index finger. The middle finger is widened from the index finger, making a space pointing towards the iliac crest. The injection site is located in the space between the index finger and middle finger (see Figure 20.15).

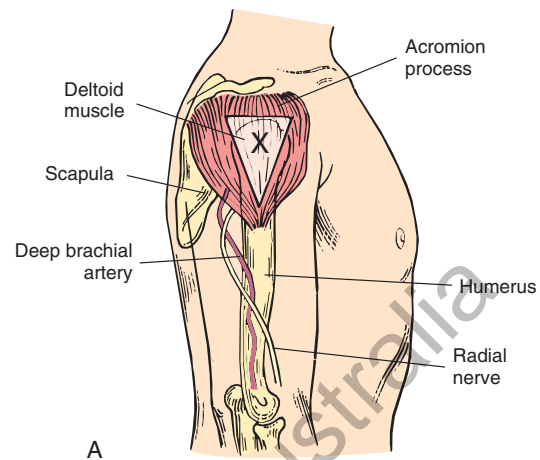
The deltoid muscle is a common site for immunisations and small volume injections. To locate the injection site for the deltoid muscle, feel for the bony acromion process found on the outer aspect of the shoulder. The injection is given 2.5 cm directly below the acromion process (Broyles et al 2019).

The Z-track method of injection (Figure 20.17) is a technique used when irritating preparations, such as iron, are given IM. A new needle is attached to the syringe after preparing the medication so that no solution remains on the outside of the needle. The skin and subcutaneous tissue are drawn to one side with the non-dominant hand, the



**Figure 20.15 A & B:** Landmark for IM injection ventrogluteal region, **C:** Injection location ventrogluteal muscle (Potter et al 2023)

needle is then inserted and the skin is released. The medication is then injected. After removal of the needle the skin closes the injection track, preventing the viscous medication seeping out of the muscle into the subcutaneous tissue (Broyles et al 2019). The Z-track method of injection



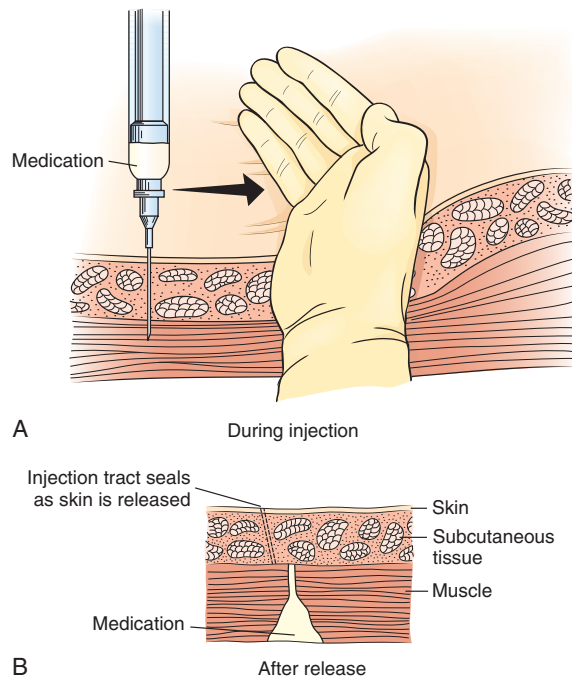
**Figure 20.16 A:** Landmark for IM injection deltoid region, **B:** Injection location deltoid muscle (Potter et al 2023)

deposits medication into the muscle without the tracking of residual medication through sensitive tissues. This promotes absorption of the medication contained in the muscle, reducing pain and preventing skin staining.

### Promoting safety and comfort

To ensure correct subcutaneous or intramuscular administration of an injectable medication and to minimise the individual's discomfort, the nurse should consider the following:

- Position the individual comfortably to reduce muscular tension.
- Use a sharp needle in the smallest suitable length and gauge.
- Select the correct injection site, using anatomical landmarks.



**Figure 20.17** Z-track injection

**A:** Pulling overlying skin down before IM injection, **B:** Releasing after injection to prevent tracking of medication into sensitive tissue

(Potter et al 2023)

- Sites should be rotated to minimise discomfort and tissue damage and aid absorption. This may be achieved by asking the individual the site of the last injection and/or documenting the site in the individual's clinical notes or care plan or on the medication chart.
- Insert the needle smoothly and quickly.
- Securely hold the syringe steady while the needle remains in the tissues.
- Aspirate the syringe in IM injections only before injecting the medication, to check that the needle has not entered an artery or vein.
- Remove the needle and press on, or gently massage, the area for several seconds after administration, unless contraindicated.
- Dispose of the needle directly into a sharps container to prevent needlestick injuries.
- Assess the injection sites ensuring they are free of any bruising, hardness, signs of inflammation or other abnormality.

Suggested guidelines for administering subcutaneous and intramuscular injections are outlined in Clinical Skill 20.4.

Nurses must be aware of their responsibilities and limitations to their scope of practice in relation to the law and Acts as stipulated by government bodies in each of the states and territories in Australia. They must also practise according to organisational policy and procedural guidelines of the employing hospital or other agency regarding the administration of IV medications.

## CLINICAL SKILL 20.4 Administering subcutaneous and intramuscular injections

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

NIMC/EMM system medication order  
 Prescribed medication  
 Diluent (if required)  
 Syringe  
 23G needle (for IM injections)  
 25G needle (for subcut injections)  
 18G needle or 18G blunt needle  
 Antiseptic swab (if required)  
 Sterile gauze  
 Injection tray  
 Sharps container  
 Disposable gloves (if required)  
 Resource material (e.g. MIMS, Australian Injectable Drugs Handbook, APINCHS list)



### PREPARE FOR THE SKILL

(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Mentally review the steps of the skill.

Discuss the skill with your instructor/supervisor/team leader, if required.

Confirm correct facility/organisation policy/safe operating procedures.

**CLINICAL SKILL 20.4 Administering subcutaneous and intramuscular injections—cont'd**

Validate the order in the individual's record.  
 Identify indication and rationale for performing the activity.  
 Assess for any contraindications.  
 Locate and gather equipment.  
 Perform hand hygiene.  
 Ensure therapeutic interaction.  
 Identify the individual using three individual identifiers.  
 Gain the individual's consent.  
 Assess for pain relief.  
 Prepare the environment.  
 Provide and maintain privacy.  
 Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration. Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions. Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information. Review high-risk medicines on facility/organisation APINCHS list.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes. Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring. Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring. Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication. Review of APINCHS list alerts the nurse to checking procedures before, during and after high-risk medication delivery, decreasing the risk of toxic or adverse events from occurring.
Assess individual's ability to receive the medication in the prescribed form via the prescribed route.	Ensures the correct anatomical location is chosen and any abnormalities such as areas of infection, cellulitis, dermatitis, and scarring or bruising from previous injection sites are avoided.
Gain assistance of another nurse if the individual is a child, or an adult who is restless or irrational or may need assistance with positioning.	Promotes safety during administration.
Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.
Perform any necessary assessments related to the specific medication being administered (e.g. vital signs, blood glucose level, pain levels).	Ensures safety of the individual during the administration of the medication.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.

*Continued*

### CLINICAL SKILL 20.4 Administering subcutaneous and intramuscular injections—cont'd

Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

Skill activity	Rationale
<p>Calculate correct dose and prepare medication according to Table 20.4 Preparation of medications from ampoules and vials and as per the <i>Australian Injectable Drugs Handbook</i>.            Check label and expiry date. Have two nurses check (one must be an RN) according to safe administration guidelines and the facility/organisation policy.            Ensure the right medication is being administered by comparing the label of the medication vial/ampoule and expiry date with the name on the NIMC/EMM system three times:</p> <ul style="list-style-type: none"> <li>• first check: before removing from the impress/DD cupboard</li> <li>• second check: before removing from the vial/ampoule</li> <li>• third check: before discarding the vial/ampoule.</li> </ul>	<p>Promotes safety during administration.            Ensures medications are being prepared as per the recommended process.            Ensures medication order is the same as the medication supplied.            Ensures the correct medication is being administered.            Prevents preparation and administration errors.</p>
<p>Select an appropriate injection site for correct volume to be administered and assist the individual into a comfortable position. Select an injection site that has not been used frequently. If possible, ask the individual the site of the last injection.</p>	<p>Appropriate site selection aids absorption and reduces likelihood of injury and discomfort. Rotating sites minimises tissue damage.            Sites should be rotated for long-term therapy such as insulin, as repeatedly using the same site leads to thickening of skin and tissue atrophy.            Comfort promotes relaxation and helps to reduce anxiety.</p>
<p>Locate the injection site using anatomical landmarks. Check site for any masses, lumps, signs of infection, scars or skin lesions.</p>	<p>Insertion of medication into the correct site avoids injury to underlying structures. Masses, scars etc., will interfere with medication absorption.</p>
<p>If required, cleanse the site with an antiseptic swab and allow area to dry for 30 seconds.</p>	<p>Removes microorganisms from the skin.</p>
<p>Remove the needle cap and hold the syringe in the dominant hand. Hold the individual's skin between the thumb and forefinger and either pull the skin taut (IM injection) or pinch up skin (IM or subcutaneous injection).</p>	<p>In an IM injection, a needle penetrates tight skin more easily than loose skin. Pinching the skin up may be necessary when a subcutaneous injection is given to an obese individual, or when an IM injection is given to an individual with small muscle mass.</p>
<p>Insert the needle quickly and firmly, at a 45-degree or 90-degree angle for subcutaneous injection, and at a 90-degree angle for IM injection.</p>	<p>Quick, firm insertion technique minimises anxiety and discomfort.            45-degree angle may need to be used in a subcutaneous injection where there is minimal subcutaneous tissue, to prevent insertion into a muscle.</p>
<p>For an IM injection, slowly pull back on the plunger to aspirate as per policy and procedure guidelines. If blood appears in the syringe, the needle is withdrawn, and the injection repeated at another site, using a fresh dose, syringe and needle.  <b>(Note:</b> Needle aspiration does not need to be performed for a subcut injection.)</p>	<p>Muscles are more vascular than subcutaneous tissue.            Checks whether needle has penetrated a blood vessel as insertion will be intravenous and not intramuscular.</p>

**CLINICAL SKILL 20.4 Administering subcutaneous and intramuscular injections—cont'd**

Inject the medication slowly depressing the syringe plunger 1 mL every 10 seconds. Once injected pause for at least 5 seconds before withdrawing the needle.	Slow injection reduces tissue trauma and pain. Pausing permits dispersal of the medication.
Withdraw needle at same angle of insertion while applying gauze gently over the injection site. Apply pressure with sterile gauze if bleeding occurs. Do not massage.	Support of tissues minimises discomfort as the needle is withdrawn. Use of alcohol swab may cause discomfort. Massage may cause bleeding/bruising, increase the absorption rate, damage underlying tissue.
Activate the needle safety guard (if used) or dispose of syringe without recapping into proper receptacle (kidney dish) or straight into an appropriately labelled rigid-walled sharps container.	Recapping used needles increases the risk of a needlestick injury. Proper disposal prevents sharps injury to personnel or visitors.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSGHC 2012; 2019a; 2023a; JBI 2021d; 2022f; Rebeiro et al 2021; The SPHA 2023; Tollefson et al 2022)</i>	

## Administering fluids and medications via the intravenous route

IV therapy is frequently prescribed for individuals requiring restorative, replacement, maintenance and medication treatment (Broyles et al 2019). **Intravenous (IV) injection** involves delivering medication or fluid directly into a vein. The nurse requires knowledge regarding the IV fluids, blood products and medications to be administered, rationale for IV therapy, and of the fluid and electrolyte balance of the individual receiving the treatment (Broyles et al 2019). In addition, the nurse requires the skills to assist with the establishment of the IV therapy, prepare the equipment required, manage the IV therapy once established, and routine care of the PIVC. (Review Clinical Skill 20.5 and Clinical Skill 20.6.) Most organisations require all IV fluid, blood products and medications diluted in fluids to be administered through a volumetric pump (Figure 20.18).

IV fluids, blood products and medications need to be administered over a certain time period since giving IV fluids, blood products or medications over an incorrect time period can cause serious adverse reactions. The *Australian Injectable Drugs Handbook* gives the recommended times over which individual medications should be administered.

IV fluids, blood products and medications may be administered in a number of different ways (review Clinical Skill 20.7), including:

- Large or small volume infusions—IV fluids are available in a variety of fluid types and volumes in 50, 100, 250, 500 and 1000 mL bags. Medications can be added to a compatible fluid and in specific volumes for administration. IV fluids may be administered at a slow (e.g. 10 mL/hr) rate to keep vein open (TKVO) in instances where IV access is not stable and to preserve the patency of the cannula. Large volume infusions are where fluids or medications are diluted in 500–1000 mL bags of compatible IV fluids. Since the medication is not in a concentrated form, the risk of ADRs is reduced when infused over the prescribed timeframe (Frotjold & Bloomfield 2021). Small volume infusions that are mixed in 50–100 mL bags are usually given intermittently over a shorter period of time.
- IV bolus—a volume of fluid or medication that may be given quickly through a volumetric pump over a short time period or as an IV push, through a PIVC. An IV bolus is a prescribed volume delivered from an already existing IV infusion (e.g. 250 mL over 15 minutes) programmed through the volumetric pump or

## CLINICAL SKILL 20.5 Establishing intravenous (IV) therapy (assisting)

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

Intravenous fluid order chart/EMM system fluid order  
Fluid balance chart (FBC)  
IV fluid  
IV infusion set  
Burette (if applicable)  
10 mL syringe  
10 mL normal saline 0.9%  
IV cannula  
IV cap/bung  
Dressing pack  
Antiseptic skin prep (chlorhexidine 70% solution)  
Disposable gloves  
Tourniquet  
Tape  
Occlusive dressing  
IV pump stand  
IV volumetric pump  
IV line label  
IV cannula care plan



### PREPARE FOR THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.  
Discuss the skill with your instructor/supervisor/team leader, if required.  
Confirm correct facility/organisation policy/safe operating procedures.  
Validate the order in the individual's record.  
Identify indication and rationale for performing the activity.  
Assess for any contraindications.  
Locate and gather equipment.  
Perform hand hygiene.  
Ensure therapeutic interaction.  
Identify the individual using three individual identifiers.  
Gain the individual's consent.  
Assess for pain relief.  
Prepare the environment.  
Provide and maintain privacy.  
Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct IV fluid is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure IV fluid orders are correctly prescribed and written. Verify indication for the IV fluid on the IV fluid order chart/EMM system fluid order. Review name of fluid on the IV fluid order chart/EMM system fluid order, dose, route, time of last administration and frequency of administration. Assess for any contraindications: Check allergy status on the medication/fluid order chart and with the individual; compare with the intravenous fluid ordered. Review all necessary information about the IV fluid, including action, purpose, normal dose, side effects, any special administration information.	Ensures correct IV fluid administration is about to take place. Ensures the nurse understands why the individual is receiving the IV fluid and is able to ask for a review by the medical officer if the individual's health status changes. Ensures correct IV fluid is administered. Promotes correct and safe administration of the IV fluid and prevents medication errors from occurring. Ensures all medication allergies are recorded. Promotes correct and safe administration of the IV fluid and enables the nurse to monitor the therapeutic effects of IV fluid.

**CLINICAL SKILL 20.5 Establishing intravenous (IV) therapy (assisting)—cont'd**

Assess individual's ability to receive the IV fluid. Review FBC for fluid volume status. Perform any necessary assessments related to the medication such as blood pressure (BP), pulse, respiratory rate (RR), SpO <sub>2</sub> .	Identifies if individual has contraindications such as heart failure or kidney failure. Prevents circulatory overload. If any abnormalities are found, the nurse should not administer medication and should contact nurse in charge and medical officer.
Check IV fluid order chart/EMM system fluid order for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and (IV) fluid order chart/EMM system fluid order.	Confirms the individual's identity.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
Apply PPE: gloves, eyewear, mask and gown as appropriate.  
Ensure the individual's safety and comfort throughout skill.  
Promote independence and involvement of the individual if possible and/or appropriate.  
Assess the individual's tolerance to the skill throughout.  
Dispose of used supplies, equipment, waste and sharps appropriately.  
Remove PPE and discard or store appropriately.  
Perform hand hygiene.

<b>Skill activity</b>	<b>Rationale</b>
Prepare IV fluid as per administration guidelines and calculate the correct rate. Ensure the right IV fluid is being administered by comparing the label and expiry date with the name of the IV fluid on the intravenous fluid order chart/EMM system fluid order three times: <ul style="list-style-type: none"> <li>• first check: before removing from the storage room</li> <li>• second check: before removing IV fluid flask from the packaging</li> <li>• third check: before spiking the IV fluid flask with the IV line spike and programming the volumetric pump.</li> </ul>	Following administration guidelines ensures the IV fluid's effectiveness and rate. Ensures IV fluid ordered is the same as the IV fluid supplied. Ensures the correct IV fluid is being administered. Abides by the legal and ethical frameworks regarding safe administration and checking procedures. Prevents preparation and administration errors.
Prepare giving set by closing the roller clamp, spiking the IV fluid bag using ANTT. Squeeze the drip chamber to allow fluid to enter and then open the roll clamp and prime the line. Continue priming with IV fluid until all of the air in the giving set has been expelled.	Ensures safe administration and ensures the tubing is filled with solution and free of air to prevent air embolus.
Assist medical officer or RN with cannulating the individual in order to establish IV access. Support the individual and help to anchor the proposed site for cannulation.	Relieves anxiety and allows for easier cannulation and securement of the IV without complications.
Vigorously rub injection port with alcohol swab for 30 seconds and allow to dry for 30 seconds.	Prevents contamination.
Connect primed line onto needleless port and secure Luer lock. Program ordered volumetric pump flow rate according to the IV fluid order chart/EMM system fluid order.	Ensures the safe administration of IV fluid.

*Continued*



## CLINICAL SKILL 20.5 Establishing intravenous (IV) therapy (assisting)—cont'd



### AFTER THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Ask individual to report pain/discomfort around the cannula site or any swelling.	Monitors for adverse effects such as phlebitis and ensures that complications can be prevented or addressed early.
<p>Ensure that the person who inserted the cannula documents the insertion and gauge of the IV cannula on appropriate form.</p> <ul style="list-style-type: none"> <li>The commencement of the IV fluid on the IV fluid order chart/EMM system fluid order</li> <li>Complete/commence a FBC as per facility/organisation policy</li> <li>Date and attach a change of line label to IV tubing</li> </ul> <p>Handover to nursing staff on next shift: type of fluid, flow rate, condition of PIVC infusion site, any adverse drug reactions.</p>	<p>Alerts staff of IV cannula presence and fluid administration (if in progress).</p> <p>Any adverse effects can be managed promptly.</p> <p>Identifies potential for a fluid balance overload or deficit.</p> <p>Prevents fluid imbalance.</p> <p>Identifies when IV line is required to be changed.</p> <p>Provides individual's healthcare data to the healthcare team.</p> <p>Allows for the planning and implementation of care.</p>

Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.

*(ACSQHC 2012; 2015; Gorski 2023; Queensland Health 2018; Rebeiro et al 2021; Tollefson et al 2022)*

## CLINICAL SKILL 20.6 Intravenous management

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

**NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):**

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

**Equipment:**

Intravenous (IV) fluid order chart/EMM system fluid order  
 IV fluid  
 IV volumetric pump  
 Fluid balance chart (FBC)  
 IV line label  
 IV cannula care plan



### PREPARE FOR THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.

Discuss the skill with your instructor/supervisor/team leader, if required.

Confirm correct facility/organisation policy/safe operating procedures.

Validate the order in the individual's record.

Identify indication and rationale for performing the activity.

Assess for any contraindications.

Locate and gather equipment.

Perform hand hygiene.

Ensure therapeutic interaction.

Identify the individual using three individual identifiers.

Gain the individual's consent.

Assess for pain relief.

Prepare the environment.

Provide and maintain privacy.

Assist the individual to assume an appropriate position of comfort.

**CLINICAL SKILL 20.6 Intravenous management—cont'd**

Skill activity	Rationale
Check the IV fluid order chart/EMM system fluid order for the individual's identifiers when changing an IV fluid flask or re-programming the rate, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and (IV) fluid order chart/EMM system fluid order.	Confirms the individual's identity prior to any changes in IV fluid administration or management.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

Skill activity	Rationale
<p>Assess individual's ability to continue to receive the IV fluid.            Perform any necessary assessments related to identifying local and systemic complications:            Local signs: Assess IV insertion site using the VIPS for any signs of redness/pallor, temperature (hot or cold), pain/discomfort, swelling (infiltration or extravasation) or bleeding.            Systemic signs: Assess vital signs such as blood pressure (BP), pulse, respiratory rate (RR), SpO<sub>2</sub>.            Review FBC for fluid volume status and assess for signs of circulatory overload or fluid volume deficit; assess for signs of infection/septicaemia or pulmonary air embolism.            Check the patency of the IV cannula and IV line and IV line label.</p>	<p>Identifies if individual has contraindications such as heart failure or kidney failure. Prevents circulatory overload.            If any abnormalities are found, the nurse should not administer medication and should contact nurse in charge and medical officer.            Assessing early for local or systemic complications will mitigate the risk of developing more severe issues.            Local signs and symptoms may be an early sign of phlebitis.            Prevents circulatory overload.            Ensures the PIVC is patent and prevents PIVC from occluding.            Identifies key sites are secure along the IV line.            Identifies when the IV line needs changing.</p>
<p>Assist individual with IV therapy with changing clothing, ambulating and personal hygiene, ensure the IV line remains intact and is not disconnected from the PIVC during these activities.            Explain rationale for care to the individual when performing any of the above in order to maintain IV access.</p>	<p>Educates individual about importance of maintaining IV access and the risks associated with poor management.            Ensures safety with IV management.            Prevents a break in the continuity of the IV line and therefore preventing contamination.            Prevents complications.</p>
<p>Change IV fluid as ordered ensuring that correct checking procedures are followed as per Clinical Skill 20.5.            Program the new flow rate as per the IV fluid order.            Check the IV fluid bag for expiry date, colour and leakage.</p>	<p>Ensures safe administration of IV fluid.            Ensure IV fluid order is the same as the IV fluid supplied.            Ensures the correct IV fluid is being administered.            Prevents preparation and administration errors.</p>
<p>Monitor IV infusion every hour as per facility/organisation policy. Assess PIVC patency using VIPS, and rate of flow.            Assess individual's response to treatment.</p>	<p>Prevents complications related to delivery of IV fluid and early detection of inflammation or tissue damage.</p>

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.  
 Restore the environment.  
 Report, record and document assessment findings, details of the skill performed and the individual's response.  
 Report, record and document any abnormalities and/or inability to perform the skill.  
 Reassess the individual to ensure there are no adverse effects/events from the skill.

*Continued*

## CLINICAL SKILL 20.6 Intravenous management—cont'd

Skill activity	Rationale
Ask individual to report: <ul style="list-style-type: none"> <li>• Pain or discomfort</li> <li>• Coolness over PIVC site</li> <li>• Swelling of feet and hands</li> <li>• Shortness of breath.</li> </ul>	Assists in identifying early signs of local or systemic complications.
Sign IV fluid order chart/EMM system fluid order, record date and time infusion commenced: <ul style="list-style-type: none"> <li>• Complete and attach change of IV line label to IV tubing.</li> <li>• Document review of PIVC each shift and note any complications such as infection, injury or loss of patency.</li> <li>• Complete FBC as per facility/organisation policy.</li> </ul> Handover to nursing staff on next shift: type of fluid, flow rate, condition of PIVC infusion site, any adverse drug reactions.	Maintains IV access and maintenance. Ensures individual is receiving recommended therapy as ordered. Prevents complications and monitors status. Provides individual's healthcare data to the healthcare team. Allows for the planning and implementation of care.
Discontinue IV therapy and remove IV cannula when: <ul style="list-style-type: none"> <li>• There is a medical order (verbal or written)</li> <li>• PIVC has been in situ for 3 days or has not been used for more than 24 hours</li> <li>• Complications have arisen (as mentioned above) and these have been discussed with an RN or medical officer (see Clinical Skill 20.8).</li> </ul> Document date and time of removal, condition of site at time of removal and whether cannula and tip is complete and intact (see Clinical Skill 20.8).	IV cannulas are inserted to administer medications and/or fluids. The goal is to remove the PIVC if it is no longer required, reducing the risk of infection. Loss of patency or complications will mean that a PIVC will need to be removed and re-sited.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<small>(ACSQHC 2012; 2015; Gorski 2023; Queensland Health, 2018; Rebeiro et al 2021; Tollefson et al 2022; SESLHD 2019)</small>	



**Figure 20.18** Alaris® pump and modules

**A:** Syringe driver, **B:** Base, **C:** Patient-controlled analgesia pump modules

(© BD)

by syringe into a PIVC or the access port on the IV line. Some medications that may be given as a push include steroids, opioids, antiemetics or antibiotics. Prior to administration of a bolus via the PIVC the patency of the IV cannula must be ascertained to ensure medication enters the vein and not surrounding tissue (Frotjold & Bloomfield 2021).

- Intermittent IV infusions—medications as a mixture in a small volume (e.g. 50–100 mL) of compatible fluid in a secondary fluid container or line separate from the primary infusion.

The most commonly used additive or secondary setups are through a:

- piggyback or add-a-line infusion set (Figure 20.19)
- secondary volumetric infusion pump module
- secondary volumetric syringe driver pump module
- secondary volumetric patient-controlled analgesia module
- burette (volume-control administration set, not commonly used) (Figure 20.20).

These are acceptable procedures for intermittent medications to be administered.

## CLINICAL SKILL 20.7 Administration of intravenous (IV) medications: Infusion and bolus

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

(IV) fluid order chart  
 NIMC/EMM system IV/medication orders  
 IV fluid flask/medication vial/ampoule  
 Diluent  
 IV infusion set  
 Burette  
 Secondary bag  
 Syringes and needleless device for administration and medication vial access (if applicable)  
 IV additive label  
 IV line label  
 Alcohol or antiseptic swabs  
 Disposable gloves  
 IV volumetric pump  
 Fluid balance chart (FBC)  
 Injection tray  
 Resource material (e.g. MIMS, *Australian Injectable Drugs Handbook*, APINCHS list)



### PREPARE FOR THE SKILL

(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Mentally review the steps of the skill.  
 Discuss the skill with your instructor/supervisor/team leader, if required.  
 Confirm correct facility/organisation policy/safe operating procedures.  
 Validate the order in the individual's record.  
 Identify indication and rationale for performing the activity.  
 Assess for any contraindications.  
 Locate and gather equipment.  
 Perform hand hygiene.  
 Ensure therapeutic interaction.  
 Identify the individual using three individual identifiers.  
 Gain the individual's consent.  
 Assess for pain relief.  
 Prepare the environment.  
 Provide and maintain privacy.  
 Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
<b>General procedures for administration of all IV medications</b>	
Ensure correct IV fluid/medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure IV fluid/medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes.

Continued

## CLINICAL SKILL 20.7 Administration of intravenous (IV) medications: Infusion and bolus—cont'd

<p>Assess for any contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions with concurrent IV therapy.</p> <p>Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.</p> <p>Review high-risk medicines on facility/organisation APINCHS list.</p>	<p>Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring.</p> <p>Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.</p> <p>Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.</p> <p>Review of APINCHS list alerts the nurse to checking procedures before, during and after high-risk medication delivery, decreasing the risk of toxic or adverse events from occurring.</p>
<p>Assess individual's ability to receive the IV fluid/ medication bolus.</p>	<p>Allows nurse to monitor individual's response to IV medication given that onset of action is quicker than any other route.</p>
<p>Check IV fluid order chart, NIMC/EMM system orders for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and (IV) fluid order chart or NIMC/EMM system order.</p>	<p>Confirms the individual's identity.</p>
<p>Perform any necessary assessments related to the medication being administered (e.g. vital signs, chest auscultation, potassium levels, pain levels before, during and after infusion of medication as recommended and/or as per facility/organisation policy).</p>	<p>Ensures safety of the individual during the administration of the medication.</p>



### PERFORM THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.

Apply PPE: gloves, eyewear, mask and gown as appropriate.

Ensure the individual's safety and comfort throughout skill.

Promote independence and involvement of the individual if possible and/or appropriate.

Assess the individual's tolerance to the skill throughout.

Dispose of used supplies, equipment, waste and sharps appropriately.

Remove PPE and discard or store appropriately.

Perform hand hygiene.

Skill activity	Rationale
<p>Prepare medications as per administration guidelines and calculate the correct dose.</p> <p>Ensure the right IV medication is being administered by comparing the label and expiry date with the name on the NIMC/EMM system three times:</p> <ul style="list-style-type: none"> <li>• first check: before removing from the storage room</li> <li>• second check: before preparing iv medication</li> <li>• third check: before adding to IV fluid or administering as a bolus through the PIVC.</li> </ul>	<p>Ensures medication order is the same as the medication supplied.</p> <p>Ensures the correct medication is being administered.</p> <p>Prevents preparation and administration errors.</p>
<p>Review <i>Australian Injectable Drugs Handbook</i> for compatibility with concurrent IV therapy.</p> <p>Calculate the correct IV medication dose and prepare the medication according to Table 20.4 Preparation of medications from ampoules and vials as per the <i>Australian Injectable Drugs Handbook</i>.</p>	<p>Promotes correct and safe administration of the IV fluid/ medication.</p> <p>Prevents preparation errors.</p>

## CLINICAL SKILL 20.7 Administration of intravenous (IV) medications: Infusion and bolus—cont'd

Ensure administration is according to manufacturer's instructions and organisation policy and procedure guidelines. Review high-risk medicines on facility/organisation APINCHS list.	Review of the <i>Australian Injectable Drugs Handbook</i> prevents incompatibilities and ensures correct mixing of IV fluid/medication. Review of APINCHS list alerts the nurse to checking procedures before, during and after high-risk medication delivery, decreasing the risk of toxic or adverse events from occurring.
Complete and attach additive label as per facility/organisation policy and the ACSQHC 2015 National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines.	Communicates to nurses the contents of the medication delivery systems.
Assess PIVC insertion site using VIPS for any signs of redness, warmth, swelling, pain or tenderness on palpation. Assess the patency of the cannula as per facility/organisation policy.	Assesses early signs of phlebitis to ascertain if PIVC needs replacing. Ensures safe administration of medication into venous system rather than into surrounding tissues.
Vigorously rub injection port with alcohol swab for 30 seconds and allow to dry for 30 seconds.	Prevents contamination.
Administer IV medication as per facility/organisation policy and the <i>Australian Injectable Drugs Handbook</i> .	Ensures the IV medication is administered correctly.
<b>Large volume infusion—fluid bolus</b>	
Check indication and IV fluid order for large volume IV bolus and calculate rate. Review FBC for fluid balance status. Check current IV fluid running to ensure it does not contain any additives such as potassium chloride.	Ensures large volume IV fluid bolus is being administered over the correct timeframe. Identifies a fluid volume deficit indicating the need for a fluid bolus. Ensures that individual is not given a bolus of IV potassium that could be fatal.
Pause current flow rate and set a secondary program using the medication library and set the bolus rate.	A secondary program once completed will revert to the original flow rate. Using the medication library in the volumetric pump reduces the risk of incorrect medication administration rates being programmed.
Check volumetric pump after completion of the large volume bolus timeframe and reduce VTBI by the fluid bolus amount. Records bolus on the FBC and IV fluid order chart.	Ensures large volume bolus has been delivered and has reverted back to original rate. Reducing VTBI reduces the risk of air in line. Allows review of fluid balance status.
Complete post bolus reviews—vital signs (BP) and FBC.	Large volume bolus should increase intravascular volume and improve blood pressure if individual was hypotensive. Large volume bolus can also cause fluid overload.
<b>Intravenous medication bolus via IV cannula/IV line</b>	
Check compatibility of current IV fluid administration and medication in the <i>Australian Injectable Drugs Handbook</i> .	Prevents incompatibility reaction.
Prepare medication and two syringes with 5–10 mL of normal saline 0.9% each, for flushing the cannula/line before and after medication administration.	Prevents blockage of line and ensures medication has been injected completely, and prevents chemical irritation to the vein.
Take equipment to the individual in injection tray ensuring all sharps are contained/capped correctly. Select injection port closest to individual.	Ensures correct transporting of equipment and abides by infection control/ANTT procedures. Allows for easier aspiration for blood return to check placement.

Continued

## CLINICAL SKILL 20.7 Administration of intravenous (IV) medications: Infusion and bolus—cont'd

Vigorously rub the injection port for 30 seconds with alcohol swab and allow to dry for 30 seconds.	Prevents introduction of microorganisms.
Pause pump program and occlude infusion line above port by pinching tubing or closing the roller clamp. Connect syringe containing normal saline 0.9% to needleless valve/injection port on IV line or PIVC. Gently pull back on syringe plunger to aspirate blood. Slowly inject 5–10 mL of normal saline 0.9% and remove syringe.	Prevents back flow of medication into IV line and ensures medication to be administered is into intravenous system. Checks position of cannula in vein. Clears reservoir of blood and checks patency of access port. Allows for access.
Attach IV medication syringe and inject medication as per the <i>Australian Injectable Drugs Handbook</i> guidelines or facility/organisation policy.	Ensures medication is given at the correct rate. Rapid administration may cause pain, phlebitis, adverse medication reactions, or could be fatal.
Attach second flush syringe and flush PIVC or line with 5–10 mL of normal saline 0.9%.	Flushes medication properly into the venous system preventing chemical irritation. Allows for medication clearance in the IV line and PIVC.
Release tubing and/or roller clamp and restart the pump infusion rate or gravity feed drip rate if required.	Re-establishes IV fluid delivery.
Vigorously rub the injection port for 30 seconds with alcohol swab and allow to dry for 30 seconds. If the port was capped, replace cap.	Prevents introduction of microorganisms.
<b>Piggyback/tandem infusion</b>	
Check compatibility of current IV fluid administration and medication in the <i>Australian Injectable Drugs Handbook</i> .	Prevents incompatibility reaction.
Prepare medication by injecting medication into small volume IV fluid bag (e.g. 50–100 mL) through medication injection port. After withdrawing syringe, gently mix contents of infusion.	Ensures even distribution of medication throughout the infusion fluid and prevents medication pooling in the bottom of the IV bag, inadvertently giving the individual a concentrated dose.
Complete and attach an IV medication additive label, with details of medication added, fluid, date, time and two nurses' signatures (second nurse must be an RN).	Informs all staff of the contents of the infusion.
Close roller clamp on secondary giving set and correctly insert spike into medication IV bag using ANTT. Half fill the IV giving set chamber and then slowly prime the line by releasing the roller clamp, without introducing any air.	Prevents the introduction of microorganisms and cross-infection. Allows IV tubing to fill slowly preventing entry of air into the IV line. Prevents air embolus entering the individual.
Vigorously rub the injection port for 30 seconds with alcohol swab and allow to dry for 30 seconds.	Prevents introduction of microorganisms.
Hang IV medication bag on IV pole, insert into volumetric pump (if using) and connect IV giving set to infusion port on the primary infusion line.	Prepares IV medication for administration. IV fluid bag needs to be higher than the individual or the volumetric pump to prevent back flow into primary IV bag and aids drip rate via gravity feed.
Program the IV pump secondary line using the medication library with correct rate and VTBI or gravity feed with correct drip rate. Infuse medication as per manufacturer's recommendations and/or <i>Australian Injectable Drugs Handbook</i> .	Ensures medication is administered at the correct rate to maintain therapeutic levels and prevent toxicity or adverse reactions. Using the medication library in the volumetric pump reduces the risk of incorrect medication administration rates being programmed.

## CLINICAL SKILL 20.7 Administration of intravenous (IV) medications: Infusion and bolus—cont'd

Remove and discard secondary infusion bag after completion of infusion, in a safe and appropriate manner. Connect a compatible IV fluid if required, to flush the giving set with 25 mL of normal saline 0.9%, then remove secondary line from the primary line. Return to primary infusion rate/drip rate.	Ensures complete infusion of medication Ensures the return to the original infusion rate as ordered. IV giving set requires approx. 25 mL for priming, which ensures medication infuses correctly and totally in order to allow for therapeutic levels. Ensures no crystallisation of fluid occurs with any other medication or IV fluid delivery in the same line.
Ensure primary infusion is running at the correct pump/drip rate.	Secondary infusion may have interfered with the flow rate of the primary infusion. Prevents circulatory overload.
<b>Burette</b>	
Check compatibility of current IV fluid administration and medication in the <i>Australian Injectable Drugs Handbook</i> .	Prevents incompatibility reaction.
Fill burette with required amount of fluid from infusion bag as per the recommendations listed in the manufacturer's guidelines and/or <i>Australian Injectable Drugs Handbook</i> .	Ensures correct amount of diluent for the safe administration of the medication. Prevents the risk of circulatory overload. Prevents incompatibility reactions or toxicity.
Vigorously clean injection port on top of burette for 30 seconds with alcohol swab and allow to dry for 30 seconds.	Prevents introduction of microorganisms.
Attach syringe and inject medication into burette port and gently mix with fluid in burette.	Ensures even distribution of medication throughout fluid.
Label burette with medication administration label containing name of medication, total volume, time of starting administration, individual's details and two checking staff signature/initials.	Ensures all staff are aware of medication infusion occurring; prevents other medication being added to burette at same time. Abides by policy and procedure.
Calculate rate and program volumetric pump using the medication library with the correct rate as per the recommendations listed in the manufacturer's guidelines and/or <i>Australian Injectable Drugs Handbook</i> .	Ensures medication is administered at the correct rate to maintain therapeutic levels and prevent toxicity or adverse reactions. Using the medication library in the volumetric pump reduces the risk of incorrect medication administration rates being programmed.
On completion of infusion, fill burette to a minimum of 25 mL of normal saline 0.9% or fluid in primary bag and infuse over the same rate medication administered (ensure flush is enough to completely infuse total medication through the IV giving set). Once complete, remove label from burette and return infusion to previous rate.	IV giving set requires approx. 25 mL for priming, which ensures medication infuses correctly and totally in order to allow for therapeutic levels. Ensures no crystallisation of fluid occurs with any other medication or IV fluid delivery in the same line. Alerts staff that medication infusion is complete.
If more than one medication is to be administered, ensure that burette and line are 'flushed' with a minimum of 25 mL in-between the medications, and wait the recommended time between the administration of medication as per the recommendations listed in the manufacturer's guidelines and/or <i>Australian Injectable Drugs Handbook</i> .	Prevents incompatible medications coming into contact with each other. Ensures that medication actions are adhered to and therapeutic outcomes are optimal.
<b>Volumetric pump syringe driver</b>	
Perform hand hygiene. Prepare 30–50 mL syringe with medication and diluent as per the recommendations listed in the manufacturer's guidelines and/or <i>Australian Injectable Drugs Handbook</i> .	Prevents cross-infection. Ensures correct amount of diluent for the safe administration of the medication. Prevents incompatibility reactions or toxicity.

Continued



## CLINICAL SKILL 20.7 Administration of intravenous (IV) medications: Infusion and bolus—cont'd

Label syringe with medication additive label containing name of medication, diluent total volume, time of starting administration, individual's details and two checking staff signature/initials. Places label away from markings on syringe.	Ensures all staff are aware of medication being administered via the volumetric pump syringe driver. Abides by policy and procedure. Ensures syringe level can be easily visualised for assessment of delivery and documentation.
Open syringe driver module on the volumetric pump, lift plunger lock and insert syringe with volume numbers facing out, locking it in place.	Ensures syringe is correctly fitted. Ensures syringe level can be easily visualised for assessment of delivery and documentation.
Vigorously rub the cannula valve/injection port for 30 seconds with an alcohol swab and allow to dry for 30 seconds and attach syringe driver line using ANTT.	Prevents cross-contamination.
Calculate rate and program syringe module on volumetric pump using the medication library with the correct rate as per the recommendations and/or <i>Australian Injectable Drugs Handbook</i> .	Ensures medication is administered at the correct rate to maintain therapeutic levels and prevent toxicity or adverse reactions. Using the medication library in the volumetric pump reduces the risk of incorrect medication administration rates being programmed.



### AFTER THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

#### Skill activity

Record and sign for each medication administered on the NIMC/EMM system.  
Record volume of fluid in medication bag (used for piggyback/tandem administration) or burette on FBC.

#### Rationale

Prompt documentation prevents medication errors. Sites should be rotated for long-term therapy such as insulin, as repeatedly using same site leads to thickening of skin and tissue atrophy.  
Prevents circulatory overload.

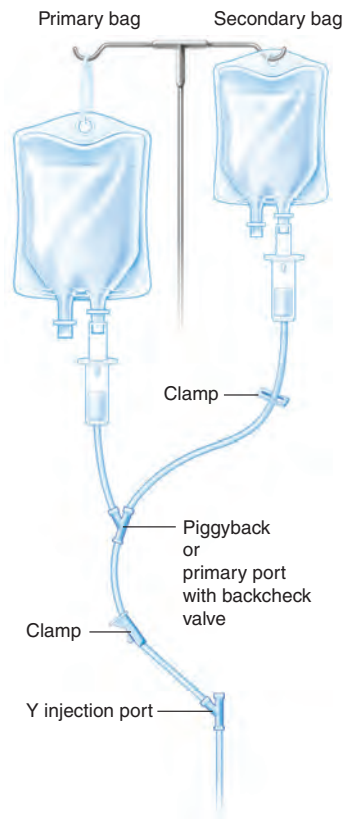
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.

(ACSQHC 2012; 2015; 2023a; Gorski 2023; Queensland Health 2018; Rebeiro et al 2021; The SPHA 2023; Tollefson et al 2022; SESLHD 2019)

The individual will already have an existing infusion line or an intermittent PIVC. The advantages of the intermittent PIVC include increased mobility, comfort and safety, and the nurse not needing to monitor flow rates on an ongoing basis. As discussed previously, many acute healthcare facilities have volumetric pumps pre-programmed with medication libraries catered to common IV fluids, blood products or medications used in hospitals or specific wards, with predetermined dosages and delivery rates to minimise the risk of medication administration errors. The pump will alert the nurse if they try to program IV delivery outside of the set parameters. (See Figure 20.18.)

The National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines (2015) noted that incomplete or inaccurate labelling on IV devices/lines is a

recognised risk to the safe administration of injectable medicines and fluids. Labelling an infusion device/line communicates the contents of the IV medications and the individual for whom it is prescribed. Standardised labelling of injectable medications and administration lines is recommended to prevent medication errors. The use of standardised coloured labels on the IV bag/bottle/burette/syringe that has had any medications added, as well as the IV line, significantly improves the identification of the correct medications being administered. The Labelling Standard is a mandatory requirement for meeting the National Safety and Quality Health Service Standards and applies to all health services in the administration of all injectable medications. The labels must be completed and immediately applied to the front of the container once the medication has been added to ensure visibility during administration. Each label requires information



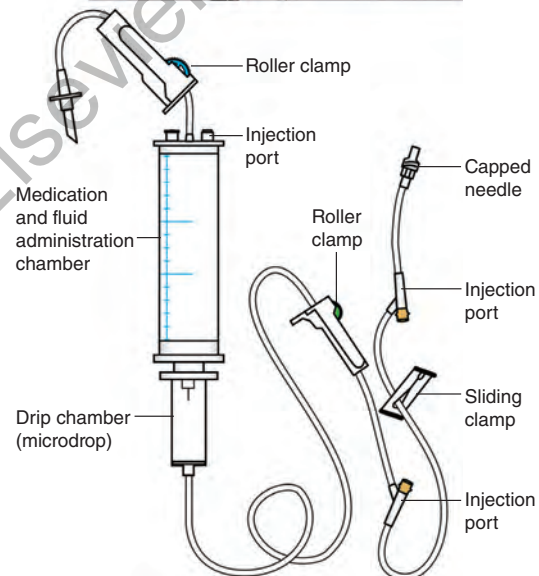
**Figure 20.19** Add-a-line/piggyback setup  
(McCuiston et al 2023)

including patient ID, diluent, medication name including units (e.g. mg/milligrams), dose, volume in mL, concentration in mg/mL and signatures of both nurses preparing and checking the medication. Medications that are pre-mixed and labelled (e.g. potassium chloride 10 mmol in 100 mL, paracetamol 1000 mg in 100 mL), or medications that are being administered immediately as a single dose and do not leave the hands of the nurse who prepared the medication, will not need to be labelled.

The preprinted colour coded labels will assist nurses to safely administer prescribed IV medications and manage IV device changes. For intravenous medication administration, the colour coded labels are blue, subcutaneous is beige and enteral is green. In addition, specific labels are required to be placed on IV lines/devices of continuous medication administration (e.g. opioids are blue [morphine, fentanyl], anticoagulants are teal [heparin], medications that are high risk are white labels with red font [e.g. potassium chloride, insulin], induction agents in theatre are yellow with a black font [ketamine, propofol]).

#### IV medication administration

Medication administered intravenously allows more control over the rate of medication being delivered, either as a bolus



**Figure 20.20** Burette delivery  
(McCuiston et al 2023)

or by diluting it in IV solution and giving it intermittently or over a longer timeframe (Gorski 2023). The therapeutic effect is immediate and therefore immediate adverse reactions and incompatibilities can also occur.

IV medications are often delivered concurrently with other IV fluids or medications and the nurse preparing the fluid or medication must ensure all fluids or medications being delivered are compatible. For the medication to be mixed successfully, the diluent and the medication must be compatible (Gorski 2023). Incompatibility occurs when fluids or medication alter the action of other medications

they are mixed with and are classified as physical, chemical or therapeutic incompatibilities (Gorski 2023).

Physical incompatibilities occur when mixing a medication with a fluid or another medication, causing insolubility (where the medication does not dissolve completely in the fluid) (Gorski 2023). Cloudiness, colour change or gas bubbles are a sign that there is an incompatibility (Broyles et al 2019). Chemical compatibility is influenced by the pH concentration of the medications and the diluents, temperature, the way they are mixed and time together after mixing (Gahart et al 2021). Incompatible medications and/or fluids, when mixed together, result in instability of one or both medications (Gorski 2023). Therapeutic incompatibility is where the individual suffers an ADR when two or more medications are given concurrently, resulting in a decreased or increased therapeutic response (Gorski 2023). Medication incompatibilities are outlined in the *SHPA Australian Injectable Drugs Handbook*, and these must be identified prior to mixing medications and fluids to ensure an incompatibility reaction does not occur. The nurse must observe the mixed medication while preparing and prior to administration of the medication, and if any changes in the solution have occurred the medication must not be administered (Broyles et al 2019).

In preparing medications for IV administration, the nurse must ensure that the medication solution being mixed or added to a fluid flask is adequately mixed. Inadequately mixed medications can mean the individual inadvertently receives a bolus of the medication (especially if the medication is dense and settles to the base of the fluid flask), which can result in serious ADRs (Gorski 2023). If the individual receiving the IV

medication complains of pain, burning or stinging in the arm, this is a warning that the concentration of the medication is irritating the vein wall. The concentration of the fluid may need to be altered by mixing in a larger volume of fluid or a slowing of the delivery rate, after review by the medical officer.

### Complications of IV therapy

In the delivery of IV fluids, blood products and medications it is the nurse's responsibility to assess and monitor the individual for complications. Complications occur either locally or systemically. Local complications occur as adverse reactions or trauma surrounding the IV cannula site (Gorski 2023). See Table 20.6 for a list of common local peripheral IV therapy complications and systemic complications related to infusion therapy. The most common complication is phlebitis, which primarily occurs from medication reactions (SESLHD 2019).

It is recommended that the IV cannula be assessed at least every 4 hours, and observations increased to 1- to 2-hourly for individuals who are critically ill, have been sedated or have cognitive impairments, and hourly for neonatal or paediatric individuals (Gorski et al 2021). These assessments allow for early detection of phlebitis to maintain safety and comfort of the individual with an IV cannula in place (SESLHD 2019). The most common signs and symptoms of phlebitis include pain, tenderness, swelling, erythema, palpable venous cord and purulent discharge (Marsh et al 2015). The Visual Infusion Phlebitis Score (VIPS) is a tool that nurses can use to assess and monitor the peripheral IV for signs and symptoms related to phlebitis. See Table 20.7

**TABLE 20.6 | Common complications of IV therapy and clinical manifestations**

Local complications	Clinical manifestations
<b>Infiltration</b> The IV cannula becomes dislodged from the vein or passes through the wall of the vein. Infusion fluid enters into the surrounding tissue. Often caused by poorly secured cannulas.	Oedema surrounding the cannula site, cool to touch, pale skin, infusion slows and pinkish coloured blood on draw back.
<b>Thrombosis</b> A blood clot forms in the vein at the tip of the cannula, causing an obstruction in the cannula. Do not force the flush since this can dislodge the clot into the systemic circulation.	Cannula does not flush, infusion does not flow and there is pain at site.
<b>Extravasation</b> Vesicant medication enters into the surrounding tissue. This may be caused by a dislodged cannula, increased pressure or irritation of the vesicant fluid on the vein wall, or vein wall being punctured on insertion of the cannula.	Site pain and tenderness, oedema, paleness around insertion site, burning sensation and slow or stopped infusion.
<b>Phlebitis</b> Inflammation of the vein may be caused by irritating medications or fluids, or from the cannula irritating the vein wall.	Local erythema, heat, swelling, cording, infusion rate slowed or stopped, and pyrexia.
<b>Haematoma</b> Infiltration of blood into the tissues commonly caused by trauma to the vein wall on insertion of the cannula.	Ecchymosis at the insertion site and surrounding tissue, swelling and discomfort.

**TABLE 20.6 | Common complications of IV therapy and clinical manifestations—cont'd**

Systemic complications	Clinical manifestations
<p><b>Peripheral oedema</b> Caused by infusion of excessive IV fluid or given too rapidly, failure to monitor the person's fluid balance status in a person with renal or cardiovascular compromise. Excess fluid causes pressure in the intravascular space, causing it to leak into dependent limbs (legs).</p>	Pitting oedema and pallor in lower extremities that can progress to abdomen, weight gain over short period, taut skin, indentation from pressure of socks and clothing.
<p><b>Acute pulmonary oedema</b> Caused by infusion of excessive IV fluid or given too rapidly, failure to monitor the person's fluid balance status, in a person with renal or cardiovascular compromise. Excess fluid causes pressure in the intravascular space, causing pressure in the pulmonary capillaries as fluid passes into the alveoli, causing pulmonary oedema. This is a life-threatening condition and an emergency call (MET or code blue) should be made.</p>	Shortness of breath, cyanosis around lips and mouth, decreasing oxygen saturations, restlessness, cough, pink frothy sputum, crackles to lung bases on auscultation, weight gain over short period.
<p><b>Speed shock</b> When the IV fluid or medication is delivered too quickly.</p>	Dizziness, hypotension, headache, flushing of the face, chest tightness, may progress further to circulatory shock.
<p><b>Septicaemia</b> Microorganisms enter the systemic circulation through poor aseptic procedure during insertion and in accessing the cannula.</p>	Pyrexia, diaphoresis, diarrhoea, nausea and vomiting, abdominal pain, tachycardia and hypotension.
<p><b>Air embolism</b> Rare but lethal. Air enters the cannula and the systemic circulation. Occurs when air is present in the IV line from poor priming or changing an IV bag without checking for air in the line.</p>	Dizziness, dyspnoea, cyanosis, cough and expiratory wheeze, hypotension and chest pain, confusion, coma.

(Adapted from Frotjold & Bloomfield 2021; Broyles et al 2019; Gorski 2023)

**TABLE 20.7 | Visual Infusion Phlebitis Score (VIPS)**

Observation	Score	Action
No abnormalities observed at IV cannula site	0	Continue to monitor the IV cannula site.
One of these signs and symptoms is present at cannula site: slight pain; redness	1	Possible initial clinical signs of phlebitis. Observe more closely.
Two of these signs and symptoms are present at cannula site: pain; erythema; swelling	2	Early stage of phlebitis. Resite the cannula.
All of these signs and symptoms are present at cannula site: pain along cannula path; erythema; hardening	3	Medium stage of phlebitis. Resite the cannula and consider treatment.
All of these signs and symptoms are present at cannula site: pain along cannula path; erythema; hardening; palpable venous cord	4	Advanced stage of phlebitis or start of thrombophlebitis. Resite the cannula and consider treatment.
All of these signs and symptoms are present at cannula site: pain along cannula path; erythema; hardening; palpable venous cord; pyrexia	5	Advanced stage of thrombophlebitis. Initiate treatment. Resite the cannula.

(Adapted from SESLHD 2019)

for the VIPS. It also indicates the nursing actions that need to be taken regarding the outcome of the VIPS. The VIPS recommends the cannula be removed and replaced if a VIPS of 2 is given. Nurses need to be aware of techniques to reduce the risk of and identifying complications related to the PIVC. When caring for a PIVC, adhere to practices such as standard precautions, hand hygiene and aseptic technique. Ensure the PIVC is secured and stabilised to prevent movement and that a transparent occlusive dressing is in place for ease of inspection, flush at regular intervals to maintain patency, and remove promptly if there are signs of infection or when it is no longer required (ACSQHC 2021b). The ACSQHC (2021b) clinical care standard for 'Management of Peripheral and Intravenous Catheters' recommends that if the PIVC has not been used for a therapeutic purpose in the last 24 hours a review needs to take place to determine its removal. See Clinical Skill 20.8 for removal of an IV cannula.

Systemic complications are less common; however, when they occur, they can be life-threatening (Gorski 2023). Early detection is required to prevent complications becoming more severe; therefore, any change in the individual's health status while receiving IV fluids, blood products or medication must be reported immediately to the nurse in charge (see Table 20.6) (Gorski et al 2021).

## Blood product administration

In the administration of **blood products**, it is important for nurses to have the required knowledge regarding the transport, storage, collection, administration and documentation processes. The Australian & New Zealand Society of Blood Transfusion *Guidelines for the Administration of Blood Products* (2019) provide best practice in the safe handling and administration of blood products as well as management of individuals transfused with blood products. See Clinical Skill 20.9 for safe blood product administration. Australian healthcare organisations require that nurses and other multidisciplinary staff who are involved in any step of blood product administration complete the blood safe transfusion practice courses relevant to the person's area of work.

Two of the major risks when administering blood products are blood incompatibility and blood transfusion reaction. The ACSQHC (2023) identify that complications are not uncommon and mainly occur due to allergic and immunological reactions, infections, and incorrect blood transfusions, and that a multidisciplinary team approach is required to ensure that individuals receive appropriate and safe blood and blood products. Therefore, it is imperative that the correct checking procedures outlined in the healthcare facility's blood transfusion procedural guidelines are followed immediately prior to the administration of the blood product. This will require that the EN checking with an RN must each independently check:

- The details of the blood component label with the order on the blood product prescription form including blood product type (ABO and Rh(D) blood group), batch number, expiry date, and cross match expiry date

- The individual's identity including full name and DOB verbally with the individual, and the hospital number against their ID band, patient label on blood product, the blood product prescription form
- Compatibility of the blood product to the individual receiving the blood.

(Australian & New Zealand Society of Blood Transfusion Ltd 2019)

In addition, prior to administration of the blood or blood product the nurse will need to review the individual's health status and perform pre-transfusion base line vital signs, and check for any additional instructions such as diuretics or antihistamines.

If there are any discrepancies with any of the above criteria, then the blood transfusion cannot proceed, and the issue will need to be rectified immediately.

No other IV medication or fluid may be administered concurrently into the same IV line as blood unless it is through a central line; however, normal saline 0.9% can be used to flush the blood line post infusion to ensure the individual receives all of the blood (Australian & New Zealand Society of Blood Transfusion Ltd 2019).

To ensure the safety of the individual during the blood product administration the nurse is required to observe the individual for the first 15 minutes, when another set of vital signs are recorded. The majority of blood transfusion reactions occur within this timeframe; however, a reaction can occur at any time during the blood transfusion administration. Vital signs are recorded at prescribed intervals throughout the duration of the transfusion to allow for timely detection of any transfusion reaction (see Clinical Skill 20.9).

## Complications of IV blood product administration

Transfusion reactions can be mild, moderate or severe. Allergic reactions are usually mild and symptoms may include a localised rash, pruritus or an increase in body temperature by 1°C. Febrile non-haemolytic reaction is similar and is caused by a reaction to the donor's white blood cells that remain in the blood product. Symptoms include a low-grade fever and chills (Farrell 2017). If a mild transfusion reaction occurs the transfusion should be stopped and a review completed by the medical officer (Australian & New Zealand Society of Blood Transfusion Ltd 2019). Mild allergic reactions respond well to antihistamines and antipyretics, and after treatment the transfusion may be recommenced at a slower rate (Farrell 2017).

An acute haemolytic reaction may be a life-threatening event and is predominantly caused by an ABO blood type incompatibility (Farrell 2017). Symptoms of an acute haemolytic reaction may include an increase in body temperature of more than 1.5°C, hypotension, shock, tachycardia, rigors, tachypnoea, wheeze or stridor, nausea, vomiting, chest or flank pain or shock (Farrell 2017). Circulatory overload can occur if blood products are infused in a short timeframe. People with cardiac dysfunctions should be

## CLINICAL SKILL 20.8 Removal of intravenous cannula

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

Disposable gloves  
Dressing pack/sterile gauze (as per facility/organisation policy)  
Injection tray  
Antiseptic solution/swab (as per facility/organisation policy)  
Tape



### PREPARE FOR THE SKILL

(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Mentally review the steps of the skill.  
Discuss the skill with your instructor/supervisor/team leader, if required.  
Confirm correct facility/organisation policy/safe operating procedures.  
Validate the order in the individual's record.  
Identify indication and rationale for performing the activity.  
Assess for any contraindications.  
Locate and gather equipment.  
Perform hand hygiene.  
Ensure therapeutic interaction.  
Identify the individual using three individual identifiers.  
Gain the individual's consent.  
Assess for pain relief.  
Prepare the environment.  
Provide and maintain privacy.  
Assist the individual to assume an appropriate position of comfort.



### PERFORM THE SKILL

(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Perform hand hygiene.  
Apply PPE: gloves, eyewear, mask and gown as appropriate.  
Ensure the individual's safety and comfort throughout skill.  
Promote independence and involvement of the individual if possible and/or appropriate.  
Assess the individual's tolerance to the skill throughout.  
Dispose of used supplies, equipment, waste and sharps appropriately.  
Remove PPE and discard or store appropriately.  
Perform hand hygiene.

Skill activity	Rationale
Gently remove tapes securing the IV and the occlusive dressing, ensuring no pulling of excess hair. Use scissors to cut away hair if required.	Decreases discomfort and helps prevent complications to the surrounding skin.
Clean with normal saline 0.9%/chlorhexidine after removal of tape/dressing according to facility/organisation policy and allow to dry. Place sterile gauze over insertion site (do not press) and gently remove cannula along the line of the vein. Place gauze and a strip of tape over site or pressure pad ensuring adequate pressure until there is no further bleeding from site. Inspect the PIVC for completeness.	Prevents the introduction of microorganisms. Prevents a haematoma or injury to the vein post removal. Ensures whole cannula was removed and no fragments are left behind.

Continued

## CLINICAL SKILL 20.8 Removal of intravenous cannula—cont'd



### AFTER THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Document date and time of removal, condition of site at time of removal and whether cannula and tip were complete and intact.	Any adverse effects can be managed promptly. Provides individual's healthcare data to the healthcare team.

Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.

*(Gorski 2023; JBI 2022e; Queensland Health 2018)*

## CLINICAL SKILL 20.9 Administration of intravenous (IV) blood or blood products

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

**NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):**

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

**Equipment:**

Blood product prescription form  
Blood product administration consent form  
Blood component label  
Blood product  
Blood IV infusion giving set  
Antiseptic swabs  
Disposable gloves  
10 mL syringe  
10 mL normal saline 0.9%  
IV volumetric pump and fluid balance chart (FBC)  
Vital signs equipment  
Resource material (e.g. MIMS, *Australian Injectable Drugs Handbook*)



### PREPARE FOR THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.

Discuss the skill with your instructor/supervisor/team leader, if required.

Confirm correct facility/organisation policy/safe operating procedures.

Validate the order in the individual's record.

Identify indication and rationale for performing the activity.

Assess for any contraindications.

Locate and gather equipment.

Perform hand hygiene.

Ensure therapeutic interaction.

Identify the individual using three individual identifiers.

Gain the individual's consent.


Assess for pain relief.

Prepare the environment.

Provide and maintain privacy.

Assist the individual to assume an appropriate position of comfort.

**CLINICAL SKILL 20.9 Administration of intravenous (IV) blood or blood products—cont'd**

Skill activity	Rationale
<b>General procedures for administration of IV blood or blood product transfusions</b>	
Ensure correct blood or blood product is administered by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents transfusion errors from occurring and promotes correct and safe administration of blood and blood products.
Ensure blood or blood product orders are correctly prescribed and written. Verify indication for the administration of the blood or blood product. Assess for any contraindications: check individual's ABO and compare with the blood product ordered; ensure a dedicated IV line. Review all necessary information about the blood or blood product, including rationale, haemolytic and non-haemolytic reactions, any special administration information. Check blood product prescription form for signed consent.	Ensures correct blood or blood product administration is about to take place. Ensures the nurse understands why the individual is receiving the blood or blood product and is able to ask for a review by the medical officer if the individual's health status changes. Ensures compatibility of blood or blood product. Promotes correct and safe administration of the blood or blood product and prevents incorrect blood transfusion. Ensures individual has been fully informed and consents to the blood or blood product transfusion.
Review name of blood or blood product on the blood product prescription form: blood product, route, time of last administration and frequency of administration.	Ensures that the right blood product is being given at the right frequency and time, via the correct route. Prevents medication errors from occurring.
 <b>PERFORM THE SKILL</b>	
<p><b>(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)</b>            Perform hand hygiene.            Apply PPE: gloves, eyewear, mask and gown as appropriate.            Ensure the individual's safety and comfort throughout skill.            Promote independence and involvement of the individual if possible and/or appropriate.            Assess the individual's tolerance to the skill throughout.            Dispose of used supplies, equipment, waste and sharps appropriately.            Remove PPE and discard or store appropriately.            Perform hand hygiene.</p>	
Skill activity	Rationale
All blood checking processes independently verified by two nurses (one must be an RN). Check the blood product prescription form for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and the blood product prescription form and blood product label. Check batch number, blood group (ABO & Rh(D)), blood or blood product expiry date and cross match expiry date with the blood product prescription form and blood product label according to safe administration of blood products and facility/organisation policy. <b>Note:</b> Blood should not exceed the maximum time of 30 minutes away from the fridge; platelets should continue to be agitated by hand prior to administration.	Nurses checking individually the blood product prescription form and blood product label with the individual's ID ensures accuracy of information once compared, instead of one nurse trusting the other nurse that the information is correct as they read it out. Promotes safety prior to blood product administration. Confirms the individual's identity and prevents incorrect blood or blood product being transfused. Promotes safety prior to blood product administration. Ensures the correct blood product is being administered to the correct person.
Calculate the correct volumetric pump rate according to the rate documented on the blood product prescription form and volume recorded on the blood bag.	Ensures the blood product is administered at the correct rate and reduces the risk of transfusion reactions.
Check PIVC insertion site using the VIPS for any signs of redness, warmth, swelling, pain or tenderness on palpation.	Assesses early signs of phlebitis to ascertain if PIVC needs replacing.

Continued



**CLINICAL SKILL 20.9 Administration of intravenous (IV) blood or blood products—cont'd**

Perform pre-blood administration vital signs check before, during and after infusion of blood or blood product according to facility/organisation policy.	Allows nurse to monitor individual's response to blood product and allows for identification of blood transfusion reactions. Ensures safety of the individual during the administration of the blood or blood product.
Vigorously rub injection port with alcohol swab for 30 seconds and allow to dry for 30 seconds	Prevents contamination.
Attach syringe and flush with 10 mL of normal saline 0.9%. Identify patency.	Ensures safe administration of medication into venous system rather than into surrounding tissues. Assesses the patency of the cannula as per facility/organisation policy and procedure guidelines.
Prime a dedicated blood product IV volumetric giving set with the blood or blood product. Connect line to IV cannula.	Protocol is for blood not to be transfused with any other IV fluid or medication. Prevents incompatibility reaction from occurring by using a new IV giving set dedicated for blood.
Commence volumetric pump administration rate as per protocol. Commence blood transfusion at a slower rate for the first 15 minutes as per organisation protocol (if required). Perform and record routine blood observations as per protocol: 15 minutely, then hourly until the transfusion finishes, and at conclusion of the blood transfusion according to facility/organisation policy and individual health status. Observe and remain with the individual for the first 15 minutes. Observe closely and report any transfusion reactions such as: <ul style="list-style-type: none"> <li>• Fever, chills, headache, malaise</li> <li>• Flushing of the skin, urticaria, wheezing, itchy rash</li> <li>• Restlessness, anxiety, chest pain, tachypnoea, tachycardia, nausea, shock, haematuria, back pain.</li> </ul> Stop the blood transfusion if you suspect a reaction. Notify RN and medical officer, follow facility/organisation policy. Complete the transfusion when the blood unit is empty (or if 4 hours has elapsed since unit of blood removed from the blood fridge).	Some organisations require that blood transfusions commence at a slower rate to minimise transfusion reactions. Indicates afebrile non-haemolytic or haemolytic reaction or circulatory overload. Different actions may be implemented depending on the reaction and medical officer's orders. Allows medical officer to stop or change blood product promptly if a transfusion reaction occurs, and to treat the symptoms or manage blood transfusion administration. <b>Note:</b> Platelets, plasma (FFP), serum albumin and cryoprecipitate generally do not require regular observations, but refer to facility/organisation policy for further information. Minimises risk of bacterial infection and contamination.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Immediately record and sign blood administration commencement on blood product prescription form (two nurses to sign).	Ensures that blood or blood product administration is correctly recorded on the relevant charts.
Record blood volume on the fluid balance chart.	Ensures accurate recording of input.
Instruct the person to report any sudden chills, nausea, dyspnoea, fever, rash, itch, loin/flank pain.	Promotes participation in care and understanding of health status. Reduces risk of allergic reaction.

**CLINICAL SKILL 20.9 Administration of intravenous (IV) blood or blood products—cont'd**

On completion of each blood transfusion, medical officer notified to complete a review of the individual.  
Flush line via secondary spike with normal saline 0.9%.  
Change the giving set as per facility/organisation policy.

Ensures the safety of the individual and detects fluid overload and any delayed transfusion reaction.  
Medical officer may prescribe diuretics to prevent fluid overload.  
To ensure all blood or blood product is administered.  
Decreases risk of bacterial contamination, and retains efficiency of filter.

Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.

*(ACSQHC 2012; 2015; Australian & New Zealand Society of Blood Transfusion Ltd 2019; Department of Health 2018; 2021; Gorski 2023; JBI 2021e; Rebeiro et al 2021; SESLHD 2019)*

monitored closely. The individual receiving an IV blood transfusion should be reviewed by the medical officer after each blood product infusion to assess for circulatory overload (Gorski 2023), where diuretics may need to be prescribed to remove excess fluid from the body. Signs and symptoms of circulatory overload include anxiety, dyspnoea, orthopnoea (dyspnoea when lying flat) and crackles to the lung bases on auscultation (Farrell 2017). If these types of reactions occur, then the infusion should be stopped immediately, and an urgent medical review completed (Australian & New Zealand Society of Blood Transfusion Ltd 2019).

### Administration of subcutaneous infusions

Subcutaneous medication and fluid infusions are commonly used in the acute and community settings via a syringe driver (Niki T34<sup>®</sup>) or an ambulatory pump (CADD<sup>®</sup>) through a continuous or intermittent method. Subcutaneous infusions may be used in individuals experiencing pain or other distressing symptoms who have limited venous access, are in palliative care (Queensland Health 2021), or have a continuous infusion such as insulin. A subcutaneous infusion device is inserted into the subcutaneous tissue and covered with a transparent occlusive dressing to allow for inspection of the site (Queensland Health 2021). The preferred insertion sites are the upper anterior chest and abdomen (Queensland Health 2021). The longevity of the subcutaneous device can range from 1–14 days, and organisational procedural guidelines should be followed for maintenance, replacement times and rotation of sites and checked every 4 hours for complications such as redness, tenderness, haematoma or leakage (Queensland Health 2021). Medications delivered subcutaneously are absorbed into the bloodstream more slowly and evenly. (See Clinical Skill 20.10.)

### Administering topical medications

Topical medications are applied locally to the skin or mucous membranes such as the ear, eye, vagina, rectum and

nose. They can be in the form of lotions, pastes, creams, pessaries, powder, oil or ointments, which exert their action locally, at the site of application.

### Skin applications

Topical preparations such as those used in the treatment of dermatological conditions may be formulated as an ointment, lotion, cream, jelly, powder, paint, paste or spray (Broyles et al 2019). Medications may be applied to the skin by painting, spreading or spraying medication over an area, applying moist dressings or by soaking body parts in a solution. Medications applied to the skin generally have a local effect; however, traces of some medications may be absorbed transdermally into the bloodstream (e.g. cortisone). To avoid medication being absorbed through the skin of the hands, the nurse should wear disposable gloves for protection or use an applicator during administration of topical medications (Frotjold & Bloomfield 2021). To prevent accumulation, any residual medication on the skin should be removed before reapplication. In addition, removal of residual medication allows the nurse to assess the application site for healing or signs of irritation. When applying a prescribed topical preparation, the manufacturer's directions must be followed. (See Clinical Skill 20.11.)

### Applying transdermal medications

Certain medications can be applied to the skin to supply medications transdermally directly into the bloodstream for prolonged systemic effect. The medications are applied via an adhesive patch or disc that releases a known amount of medication per time (e.g. 5 mg over 24 hours). Transdermal medication patches include glyceryl trinitrate (prophylaxis for angina), nicotine (withdrawal symptoms) and oestrogen (hormone replacement therapy). Medications administered transdermally bypass the liver and therefore first-pass metabolism.

Adhesive patches or discs, which are applied to the skin, are composed of an adhesive layer, a rate-limiting membrane, a medication reservoir and a waterproof external layer. The discs are applied to a dry, clean, hairless area of the body. The waterproof external layer enables the individual to

## CLINICAL SKILL 20.10 Administration of subcutaneous (subcut) medications: Infusion

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

NIMC/EMM system medication orders (e.g. subcut continuous infusion chart)  
 Prescribed medication/s  
 Diluent  
 Subcutaneous infusion set (extension tubing line)  
 Syringe driver and appropriate size syringe  
 Needleless device (butterfly) and vial access (if applicable)  
 Subcutaneous additive and line label  
 Antiseptic swabs  
 Disposable gloves  
 Injection tray  
 Resource material (e.g. MIMS, Australian Injectable Drugs Handbook, APINCHS list)



### PREPARE FOR THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

- Mentally review the steps of the skill.
- Discuss the skill with your instructor/supervisor/team leader, if required.
- Confirm correct facility/organisation policy/safe operating procedures.
- Validate the order in the individual's record.
- Identify indication and rationale for performing the activity.
- Assess for any contraindications.
- Locate and gather equipment.
- Perform hand hygiene.
- Ensure therapeutic interaction.
- Identify the individual using three individual identifiers.
- Gain the individual's consent.
- Assess for pain relief.
- Prepare the environment.
- Provide and maintain privacy.
- Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
<b>General procedures for administration of all subcutaneous medications</b>	
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration. Review high-risk medicines on facility/organisation APINCHS list. Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes. Ensures that the right medication is being given at the right frequency and time, via the correct route. Review of APINCHS list alerts the nurse to checking procedures before, during and after high-risk medication delivery decreasing the risk of toxic or adverse events from occurring. Prevents medication errors from occurring. Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.

### CLINICAL SKILL 20.10 Administration of subcutaneous (subcut) medications: Infusion—cont'd

Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.	Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.
Assess individual's ability to receive the medication in the prescribed form via the prescribed route.	Before administering morphine, the nurse must check the individual's sedation score to ascertain conscious state as further administration may increase the risk of complications.
Check medication orders for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.
Perform any necessary assessments related to the medication such as sedation score (AVPU), respiratory rate (RR), blood glucose level (BGL).	Allows nurse to monitor individual's response to the medication. If any abnormalities are found, the nurse should not administer medication and should contact nurse in charge and medical officer.



#### PERFORM THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
Apply PPE: gloves, eyewear, mask and gown as appropriate.  
Ensure the individual's safety and comfort throughout skill.  
Promote independence and involvement of the individual if possible and/or appropriate.  
Assess the individual's tolerance to the skill throughout.  
Dispose of used supplies, equipment, waste and sharps appropriately.  
Remove PPE and discard or store appropriately.  
Perform hand hygiene.

Skill activity	Rationale
<p>Calculate correct dose and prepare medication according to Table 20.4 Preparation of medications from ampoules and vials and as per the <i>Australian Infectable Drugs Handbook</i>.</p> <p>Check the label and expiry date. Have two nurses check (one must be an RN) according to safe administration guidelines and the facility/organisation policy.</p> <p>Compare the medication container with the order on the subcutaneous infusion chart.</p> <p>Ensure right medication is being administered by comparing the label of the medication vial/ampoule and expiry date with the name of medication on the NIMC/EMM system three times:</p> <ul style="list-style-type: none"> <li>• first check: before removing from the medication room</li> <li>• second check: before removing medication from the vial/ampoule</li> <li>• third check: before discarding medication vial/ampoule.</li> </ul>	<p>Promotes safety during administration.</p> <p>Ensures the correct medication is being administered.</p> <p>Prevents preparation errors.</p> <p>Prevents chemical reaction occurring, which may result in clouding or crystallisation of the medication in the syringe.</p> <p>Ensures medication order is the same as the medication supplied.</p> <p>Ensures the correct medication is being administered.</p> <p>Prevents preparation and administration errors.</p>
<p>Assess subcutaneous butterfly insertion site for any signs of redness, warmth, swelling, pain or tenderness on palpation.</p> <p>Assess the patency of the subcutaneous butterfly as per facility/organisation policy.</p>	<p>Ensures safe administration of medication into the subcutaneous tissue.</p>

Continued

### CLINICAL SKILL 20.10 Administration of subcutaneous (subcut) medications: Infusion—cont'd

<p>Attach the extension tubing line to the end of the syringe and prime the line. Insert the syringe into the syringe driver locking it into place. Clean butterfly port with antiseptic swab for 30 seconds and allow to dry for 30 seconds. Attach the extension tubing line to the port on the end of the subcutaneous butterfly, maintaining ANTT.</p>	Prevents cross-infection.
<p>Attach additive label to the syringe and line label to the line. Avoid placing additive label over syringe volume markings. Program the syringe driver to required rate/hr or mm/24 hours. Place a locking canister over syringe driver.</p>	Ensures correct and safe administration of medication. To secure syringe and rate buttons preventing accidental administration of increased volume.
<p>If necessary, check vital signs before, during and after subcutaneous infusion of medication as recommended and/or as per continuous infusion chart and facility/organisation policy.</p>	Allows nurse to monitor individual's response to medication. Ensures safety of the individual during the administration of the medication.



#### AFTER THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

#### Skill activity

Record medication administration promptly on medication/subcutaneous continuous infusion administration chart.

Record volume of fluid in syringe in mm or volume on the continuous infusion chart.

Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.

*(ACSQHC 2012; 2015; 2023a; Gorski 2023; Queensland Health 2018; Rebeiro et al 2021; The SPHA 2023; Tollefson et al 2022)*

#### Rationale

Prevents medication errors from occurring (e.g. dose being duplicated).

Allows for monitoring of delivery of medication through the syringe driver over a 24-hour period.

### CLINICAL SKILL 20.11 Administration of a topical medication

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

**NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):**

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

#### Equipment:

NIMC/EMM system medication order  
Prescribed medication  
Disposable gloves  
Resource material (e.g. MIMS)

**CLINICAL SKILL 20.11 Administration of a topical medication—cont'd****PREPARE FOR THE SKILL****(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.  
 Discuss the skill with your instructor/supervisor/team leader, if required.  
 Confirm correct facility/organisation policy/safe operating procedures.  
 Validate the order in the individual's record.  
 Identify indication and rationale for performing the activity.  
 Assess for any contraindications.  
 Locate and gather equipment.  
 Perform hand hygiene.  
 Ensure therapeutic interaction.  
 Identify the individual using three individual identifiers.  
 Gain the individual's consent.  
 Assess for pain relief.  
 Prepare the environment.  
 Provide and maintain privacy.  
 Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration. Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions. Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes. Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring. Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring. Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.
Assess the individual's ability to receive the medication in the prescribed form via the prescribed route.	If the individual has a skin rash, infection, bruising at the site, a review will need to occur to reassess the ordered route.
Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.

**PERFORM THE SKILL****(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

Continued

**CLINICAL SKILL 20.11 Administration of a topical medication—cont'd**

Skill activity	Rationale
Prepare medication as per administration guidelines and calculate the correct dose. Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times: <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.
Apply required amount of topical medication onto the individual's skin as per administration guidelines.	The amount of topical medication applied depends on the type of medication being applied. For example, for applying a corticosteroid the fingertip unit is used as guide to determine how much product to apply. Other treatments such as emollients may require more generous application of the product.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Record and sign for each medication administered on NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSQHC 2012; 2019a; JBI 2022g; Rebeiro et al 2021; Tollefson et al 2022)</i>	

shower or bathe without adversely affecting the medication's action. Medications applied in this manner can exert their effects for as long as 72 hours. Education should include the correct application of the transdermal patch or disc (including the removal of the old disc), the frequency of application, the need to rotate application sites to prevent skin irritation occurring, correct storage of the discs, the need to wash the hands after application, and correct disposal of the discs after use. In the community setting, opioid patches should be folded with the sticky sides together, wrapped and disposed of either by returning to the pharmacist, or placing in the garbage well out of reach of others. Education should particularly stress the importance of keeping the discs out of reach of children. Gloves should be worn, and hands washed immediately after applying the discs to avoid the nurse absorbing any of the medication transdermally through the hands (Frotjold & Bloomfield 2021). (See Clinical Skill 20.12.)

## Instilling eye drops and ointments

Eye drops or ointments prescribed may include those that treat infection, dilate or constrict the pupil, act as a local anaesthetic, stain the cornea, reduce inflammation or reduce intraocular pressure. Key aspects regarding the use of ophthalmic medications include checking the:

- name, strength and number of drops or amount of ointment to be instilled
- frequency and time of last administration
- eye into which the eye medication is to be instilled (i.e. left, right or both eyes)
- expiry date on the container and discarding the medication if the expiry date has passed. Eye drops tend to have a short use-by date after opening; therefore, the date is written on the container the day it is opened so the discard date can be observed.

Eye drops are supplied in a squeeze bottle with a nozzle top through which the drops are instilled. To prevent

## CLINICAL SKILL 20.12 Applying transdermal medications

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

NIMC/EMM system medication order  
Prescribed medication  
Resource material (e.g. MIMS)  
Disposable gloves



### PREPARE FOR THE SKILL

(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Mentally review the steps of the skill.

Discuss the skill with your instructor/supervisor/team leader, if required.

Confirm correct facility/organisation policy/safe operating procedures.

Validate the order in the individual's record.

Identify indication and rationale for performing the activity.

Assess for any contraindications.

Locate and gather equipment.

Perform hand hygiene.

Ensure therapeutic interaction.

Identify the individual using three individual identifiers.

Gain the individual's consent.

Assess for pain relief.

Prepare the environment.

Provide and maintain privacy.

Assist the individual to assume an appropriate position of comfort.

### Skill activity

### Rationale

Ensure correct medication is given by following the '11 rights' throughout preparation and administration.

Identifies issues, which can be addressed prior to administration.  
Prevents medication errors from occurring and promotes correct and safe administration of medication/s.

Ensure medication orders are correctly prescribed and written.  
Verify indication for the medication on the NIMC/EMM system.  
Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration.  
Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions.  
Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.

Ensures correct medication administration is about to take place.  
Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes.  
Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring.  
Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.  
Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.

Assess individual's ability to receive the medication in the prescribed form via the prescribed route.

If the individual has a skin rash, infection, bruising at the site, a review will need to occur to reassess the ordered route.

Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.

Confirms the individual's identity.

Continued



## CLINICAL SKILL 20.12 Applying transdermal medications—cont'd



### PERFORM THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

Skill activity	Rationale
Prepare medication as per administration guidelines and calculate the correct dose. Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times: <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.
Inspect skin to ensure that it is intact. Identify previous application site and rotate site.	Broken skin can affect the medication's absorption. Rotating site reduces irritation. Increased absorption may occur if applied to the same site.
Ensure any previous transdermal patches in situ are removed before applying next patch. Patches that contain opioid agents must be folded with adhesive sides sticking together and disposed of in a sharps container.	Ensures the individual receives the correct dose of the medication. Ensures that these patches cannot be inappropriately used by another individual.
Write date and time on the patch. Remove the adhesive backing and apply the patch onto a dry, hairless area of the individual's skin. The patch cannot be cut into smaller pieces.	It can be clearly seen the date the patch was applied. Cutting the patch into smaller pieces can affect the dose of the medication that the individual receives.



### AFTER THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.  
 Restore the environment.  
 Report, record and document assessment findings, details of the skill performed and the individual's response.  
 Report, record and document any abnormalities and/or inability to perform the skill.  
 Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	

(ACSQHC 2012; 2019a; Rebeiro et al 2021; Tollefson et al 2022)

cross-infection, a separate container of drops or ointment is supplied for each individual. Single-dose packaging is preferred since contamination of the medication is likely to occur if a container such as a dropper bottle is used repeatedly. Guidelines for instilling eye drops and ointment are presented in Clinical Skill 20.13.

### Instilling ear drops

Ear drops prescribed may include those that treat infection or soften wax. The ear drops must be at room temperature

when instilling, as the inner ear is sensitive to temperature extremes, and cold fluids can provoke vertigo or nausea (Frotjold & Bloomfield 2021). Guidelines for instilling ear drops are presented in Clinical Skill 20.14.

### Inserting vaginal medications

Vaginal medications are available as creams, jellies, ointments or pessaries (Broyles et al 2019). Pessaries and creams are generally administered with an inserter or applicator, allowing the medication to be placed high in the vaginal

## CLINICAL SKILL 20.13 Instilling eye drops or ointment

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

NIMC/EMM system medication order  
Eye drops/ointment  
Gauze  
Normal saline 0.9% (if required)  
Disposable gloves  
Resource material (e.g. MIMS)



### PREPARE FOR THE SKILL

(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Mentally review the steps of the skill.  
Discuss the skill with your instructor/supervisor/team leader, if required.  
Confirm correct facility/organisation policy/safe operating procedures.  
Validate the order in the individual's record.  
Identify indication and rationale for performing the activity.  
Assess for any contraindications.  
Locate and gather equipment.  
Perform hand hygiene.  
Ensure therapeutic interaction.  
Identify the individual using three individual identifiers.  
Gain the individual's consent.  
Assess for pain relief.  
Prepare the environment.  
Provide and maintain privacy.  
Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes.

Continued

**CLINICAL SKILL 20.13 Instilling eye drops or ointment—cont'd**

<p>Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration.</p> <p>Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions.</p> <p>Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.</p>	<p>Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring.</p> <p>Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.</p> <p>Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.</p>
<p>Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.</p>	<p>Confirms the individual's identity.</p>

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

**Skill activity**

Prepare medication as per administration guidelines and calculate the correct dose.  
 Document opening date on the container.  
 Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times:

- first check: before removing from the trolley or cupboard
- second check: before removing from the container
- third check: before returning to the trolley or the cupboard, or discarding.

**Rationale**

Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered.  
 Ocular medications are required to be discarded in a certain timeframe after opening.  
 Ensures medication order is the same as the medication supplied.  
 Ensures the correct medication is being administered.  
 Prevents preparation and administration errors.

Assist the individual to a position with the head tilted well back (if possible).

Facilitates correct instillation of medication.

If eye contains any discharge or crusting, it should be cleaned with normal saline and gauze swabs before instilling drops or ointment.

Discharge or crusting prevents adequate absorption of medication.

Remove the cap of the container and hold the dropper or tube slightly away from the eye.

Avoids contacting any part of the eye and contaminating the nozzle.

Gently pull down the lower lid to form a pouch.

Facilitates correct instillation of medication.

Instil prescribed medication into the pouch of the lower lid (e.g. 1 drop BE). Five minutes should be left between administering multiple eye drops.


Medications should be instilled correctly (e.g. into the pouch of the lower lid and not directly onto the eyeball). If eye drops are administered too quickly the previous eye drops may be washed away and not absorbed.

Advise individual to close their eye and place index finger against the side of nose near the eye and apply light pressure for 60 seconds after the drop has been administered.

This helps the drop to spread over the eye and be absorbed and prevents the drops running into the nose and being swallowed.

**CLINICAL SKILL 20.13 Instilling eye drops or ointment—cont'd**

If ointment is being instilled, the eye drops should be administered first.	Ointment waterproofs the eye.
Discard 1.25 cm of ointment onto a swab. Direct nozzle of the tube near the lid, and apply a ribbon of ointment along the rim of the lower lid.	Reduces the risk of instilling contaminated ointment.
Give individual any special instructions related to medications. Instruct to close the eyelid gently. Wipe away any excess with a gauze swab. Instruct individual to blink gently several times. Ask individual to report any side effects/complications.	Facilitates even distribution of the medication over the eye's surface. Keeps individual informed and creates an opportunity to initiate medication education. Monitors for adverse effects and ensures that complications can be prevented or addressed early.
Apply eye pad if required (see Clinical Skill 34.1).	A pad may be prescribed for comfort or protection.

 **AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**  
 Communicate outcome to the individual, any ongoing care and to report any complications.  
 Restore the environment.  
 Report, record and document assessment findings, details of the skill performed and the individual's response.  
 Report, record and document any abnormalities and/or inability to perform the skill.  
 Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSGHC 2012; 2019a; JBI 2021b; Rebeiro et al 2021; Tollefson et al 2022)</i>	

**CLINICAL SKILL 20.14 Instilling ear drops**

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

**NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):**

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

**Equipment:**

NIMC/EMM system medication order  
 Ear drops  
 Cotton balls  
 Cotton-tipped applicator  
 Resource material (e.g. MIMS)

**PREPARE FOR THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.  
 Discuss the skill with your instructor/supervisor/team leader, if required.  
 Confirm correct facility/organisation policy/safe operating procedures.  
 Validate the order in the individual's record.  
 Identify indication and rationale for performing the activity.  
 Assess for any contraindications.  
 Locate and gather equipment.  
 Perform hand hygiene.

*Continued*

### CLINICAL SKILL 20.14 Instilling ear drops—cont'd

Ensure therapeutic interaction.  
 Identify the individual using three individual identifiers.  
 Gain the individual's consent.  
 Assess for pain relief.  
 Prepare the environment.  
 Provide and maintain privacy.  
 Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration. Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions. Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes. Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring. Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring. Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.
Assess individual's ability to receive the medication in the prescribed form via the prescribed route.	If the individual has an ear infection, pain, ear wax build-up or occlusion such as no ear canal, a review will need to occur to reassess the ordered route.
Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.



#### PERFORM THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

Skill activity	Rationale
Prepare medication as per administration guidelines and calculate the correct dose Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times: <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.

**CLINICAL SKILL 20.14 Instilling ear drops—cont'd**

Assist the individual to lie on the side with affected ear facing upward.	Facilitates instillation of the drops into the ear.
Inspect the ear for any wax or drainage. Wipe out gently using a cotton ball, ensuring that wax is not forced inwards.	Any occlusion will prevent drops from being evenly distributed.
Pull auricle gently up and back. For a child under 3 years, the earlobe is pulled down and back.	Straightens the ear canal.
Ensure drops are at room temperature. Instil prescribed number of drops ensuring they fall against the sides of the ear canal and not onto the tympanic membrane.	Cold drops may cause vertigo and nausea. Avoids discomfort.
Massage gently or apply pressure to the projection in front of the meatus (the tragus).	Ensures that the drops flow into the canal.
Wipe the outer ear free of excess drops. Place a cotton wool swab loosely into the meatus if instructed.	Promotes comfort. Prevents the medication from leaking out.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

**Skill activity**

Instruct to lie with affected ear upwards for 10 minutes.

**Rationale**

Prevents the medication from leaking out.

Record and sign for each medication administered on the NIMC/EMM system.

Prompt documentation prevents medication errors.

Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.

*(ACSQHC 2012; 2019a; JBI 2023; Rebeiro et al 2021; Tollefson et al 2022)*

vault for maximum effect. Vaginal pessaries are presented in conical, oval or cylindrical shapes and are supplied in individual foil or plastic wrappers. Vaginal anti-infective medications are prescribed to treat vaginal infections, and vaginal hormone preparations are prescribed to treat conditions such as senile vaginitis. Unlike the rectum, the vagina does not have a sphincter and therefore the pessaries and creams, when they melt as they warm to body temperature, may run out (Frotjold & Bloomfield 2021). To help avoid this, vaginal preparations should be instilled at night whenever possible, when the individual is in bed ready for sleep. Sanitary pads are recommended to prevent staining or soiling of underwear. The use of tampons is not recommended.

Individuals who require vaginal medication may prefer to self-administer to avoid embarrassment and should be provided the privacy to do so (Frotjold & Bloomfield

2021). The nurse may be required to perform the technique or to instruct the individual in how to insert vaginal medications. A suggested procedure is outlined in Clinical Skill 20.15.

## Administering medications by inhalation

Medications can be inhaled to produce a local or systemic effect via the respiratory tract and administered by steam inhalation, nebuliser, atomiser or aerosol spray. Most commonly, medications are delivered to the membranes of the lungs as sprays from pressurised aerosol dispensers, or as dry powder from an inhaler (Frotjold & Bloomfield 2021).

Aerosol inhalers are widely used to administer bronchodilators for the management of asthma, chronic obstructive pulmonary disease (COPD) or bronchitis. The

## CLINICAL SKILL 20.15 Administration of a vaginal medication

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

NIMC/EMM system medication order  
Medication  
Applicator  
Disposable gloves  
Tissues  
Perineal pad  
Lubricant for a suppository/ pessary  
Resource material (e.g. MIMS)



### PREPARE FOR THE SKILL

#### (Please refer to the Standard Steps on pp. xviii–xx for related rationales.)

Mentally review the steps of the skill.  
Discuss the skill with your instructor/supervisor/team leader, if required.  
Confirm correct facility/organisation policy/safe operating procedures.  
Validate the order in the individual's record.  
Identify indication and rationale for performing the activity.  
Assess for any contraindications.  
Locate and gather equipment.  
Perform hand hygiene.  
Ensure therapeutic interaction.  
Identify the individual using three individual identifiers.  
Gain the individual's consent.  
Assess for pain relief.  
Prepare the environment.  
Provide and maintain privacy.  
Assist the individual to assume an appropriate position of comfort.

#### Skill activity

#### Rationale

Ensure correct medication is given by following the '11 rights' throughout preparation and administration.

Identifies issues, which can be addressed prior to administration.  
Prevents medication errors from occurring and promotes correct and safe administration of medication/s.

Ensure medication orders are correctly prescribed and written.  
Verify indication for the medication on the NIM/EMM system.  
Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration.  
Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions.  
Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.

Ensures correct medication administration is about to take place.  
Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes.  
Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring.  
Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.  
Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.

Assess individual's ability to receive the medication in the prescribed form via the prescribed route.

If the individual has PV discharge or is menstruating a review will need to occur to reassess the ordered route.

Prepare individual and direct to empty bladder.

If the bladder is emptied, the individual may experience less discomfort. Voiding after the medication is administered may result in the medication not being retained.

Assess the individual's ability to self-administer the medication in the prescribed form via the vaginal route.

Promotes independence and avoids embarrassment and loss of privacy and dignity.

**CLINICAL SKILL 20.15 Administration of a vaginal medication—cont'd**

Check the medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.

Confirms the individual's identity.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.

Apply PPE: gloves, eyewear, mask and gown as appropriate.

Ensure the individual's safety and comfort throughout skill.

Promote independence and involvement of the individual if possible and/or appropriate.

Assess the individual's tolerance to the skill throughout.

Dispose of used supplies, equipment, waste and sharps appropriately.

Remove PPE and discard or store appropriately.

Perform hand hygiene.

**Skill activity****Rationale**

Prepare medication as per administration guidelines and calculate the correct dose.

Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times:

- first check: before removing from the trolley or cupboard
- second check: before removing from the container
- third check: before returning to the trolley or cupboard, or discarding.

Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.

Ensure privacy and assist the individual into the dorsal recumbent position, with legs flexed and extended apart, using a privacy towel/cover.

Privacy reduces embarrassment. Position provides easy access to and adequate exposure of the vaginal canal.

Attach applicator to the tube of cream or place the pessary in the applicator. Apply lubricant to the applicator.

Promotes correct and safe administration of the medication. Lubrication facilitates insertion.

Retract the labial folds gently or instruct individual on technique of self-administering.

Exposes the vaginal orifice. Maintains independence, and privacy and dignity.

Insert applicator into the vagina in an upwards and backwards direction, about 7.5 cm. Push plunger to deposit medication.

Proper placement ensures equal distribution of medication along the walls of the vaginal cavity.

Withdraw applicator, offer individual tissues to wipe any residual cream from labia and apply a perineal pad.

Promotes comfort; perineal pad prevents staining of clothing.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

**Skill activity****Rationale**

Encourage individual to remain in a recumbent position for at least 10 minutes after administration.

Allows medication to melt and be absorbed into the vaginal mucosa. The vagina has no sphincters, and the medications may not be retained if the individual stands immediately after administration. Medication given via the vaginal route is best administered at night for this reason.

*Continued*



**CLINICAL SKILL 20.15 Administration of a vaginal medication—cont'd**

Wash applicator in warm soapy water, rinse and dry. The applicator is stored for future use by that individual only.	Cleans applicator for next administration.
Record and sign for administration on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSQHC 2012; 2019a; JBI 2021f; Rebeiro et al 2021; Tollefson et al 2022)</i>	

medication and its inert propellant are maintained under pressure in a small canister. When the valve is activated, a measured quantity of propellant carrying the medication is released through the mouthpiece (metered dose inhaler [MDI]). It is important that the individual is instructed in the correct technique on MDI use, otherwise the medication will be deposited on the tongue and not into the airways. In the use of an MDI, the inhaler is shaken well and held upright; the mouth is placed over the mouthpiece, the individual inhales through the device causing medication particles (in powder form) to be drawn into the respiratory tract. If two inhalers are to be used, the bronchodilator medications should be given before the other medication to open the airways, allowing the second medication to enter more easily to exert a maximal effect. If steroids are used, the mouth must be rinsed post dose to prevent fungal infections.

A spacer is recommended to be used with the MDI to ensure maximal benefit from inhalation and can be particularly beneficial for young children or individuals who find it difficult to manage aerosol inhalation (Frotjold & Bloomfield 2021). The MDI is shaken and attached to the spacer, the dose is released into the plastic chamber with

the individual placing their mouth over the mouthpiece and breathing four to five gentle breaths.

A nebuliser adds moisture and/or medications to inspired air, using the aerosol principle. Nebulisation is often used for administering bronchodilators or mucolytic agents. A high-pressure gas source (air or oxygen) is used to draw up the medication from a chamber creating a mist, which the individual inhales. Small-volume nebulisers are generally used for administering medications. These medications come prepared in 0.9% sodium chloride in plastic vials and are emptied into the aerosol chamber. To prevent cross-infection, each individual should be provided with their own nebuliser and mask for use on repeated occasions. The mask and nebuliser should be cleaned at regular intervals and disposed of when treatment is discontinued, or the individual is discharged. (See Clinical Skill 20.16.) Care should be taken in an individual with COPD and who is a CO<sub>2</sub> retainer, as administering nebulised medications through high flow FiO<sub>2</sub> may decrease their respiratory drive, and therefore air is recommended to be used for CO<sub>2</sub> retainers.

The procedure for administering inhaled medications is outlined in Clinical Skill 20.17.

**CLINICAL SKILL 20.16 Administration of a medication via nebuliser**

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

**NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):**

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

**Equipment:**

NIMC/EMM system medication order  
 Prescribed medication  
 Nebuliser mask  
 Nebuliser bowl  
 Oxygen tubing  
 FiO<sub>2</sub> outlet or air outlet  
 Appropriate PPE for droplet or airborne precautions:
 

- Disposable gloves
- Mask
- Protective eyewear or face shield

 Resource material (e.g. MIMS)

## CLINICAL SKILL 20.16 Administration of a medication via nebuliser—cont'd

### PREPARE FOR THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.  
 Discuss the skill with your instructor/supervisor/team leader, if required.  
 Confirm correct facility/organisation policy/safe operating procedures.  
 Validate the order in the individual's record.  
 Identify indication and rationale for performing the activity.  
 Assess for any contraindications.  
 Locate and gather equipment.  
 Perform hand hygiene.  
 Ensure therapeutic interaction.  
 Identify the individual using three individual identifiers.  
 Gain the individual's consent.  
 Assess for pain relief.  
 Prepare the environment.  
 Provide and maintain privacy.  
 Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure the correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written. Verify indication for the medication on the NIMC/EMM system. Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration. Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions. Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.	Ensures correct medication administration is about to take place. Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes. Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring. Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring. Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.
Assess individual's ability to receive the medication in the prescribed form via the prescribed route.	If the individual is vomiting, and is not able to tolerate a nebuliser mask, a review will need to occur to reassess the ordered route.
Check medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.	Confirms the individual's identity.
Perform any necessary assessments related to the medication such as potassium levels, chest auscultation, pulse, respiratory rate (RR) and SpO <sub>2</sub> . Check if individual is a CO <sub>2</sub> retainer.	Salbutamol drives potassium into the cells and individual may have hypokalaemia. Salbutamol causes tachycardia as it stimulates the beta cells in both the lungs and heart. Assessment of lung sounds may indicate a respiratory wheeze and further assessments post dose may need to occur. An increase in respiratory rate or decrease in SpO <sub>2</sub> may indicate a decreased intake of O <sub>2</sub> .

Continued

**CLINICAL SKILL 20.16 Administration of a medication via nebuliser—cont'd**

	Will need to use the air outlet instead of O <sub>2</sub> outlet since level of FiO <sub>2</sub> required to mist medication can decrease the respiratory drive in a person who retains CO <sub>2</sub> . If any abnormalities are found, the nurse should not administer medication and should contact nurse in charge and medical officer.
Assess for transmission-based precautions such as airborne or droplet and PPE required: gloves, mask and protective eyewear/face shield.	Ensures the nurse is wearing the correct PPE if the individual sneezes from medication insertion since the PPE prevents contact with body fluids.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

Skill activity	Rationale
Prepare medication as per administration guidelines and calculate the correct dose. Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times: <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.
Assist individual into a semi-Fowler's or high Fowler's position.	Position facilitates entry of the medication into the respiratory tract.
Attach oxygen tubing to the oxygen or air outlet (if CO <sub>2</sub> retainer). Open the nebuliser and add medication into the nebuliser bowl.	Nebuliser can be administered using the air or the oxygen outlet. Individuals who are CO <sub>2</sub> retainers must not be given high doses of FiO <sub>2</sub> .
Attach nebuliser mask to the oxygen tubing. Turn the oxygen/air on to 6–8 L/min and check that mist is coming from the nebuliser mask, and apply mask to individual's face looping the elastic straps behind the individual's head.	Setting the oxygen/air delivery to 6 L/min ensures that the medication is nebulised. Holds mask in place while medication is administered.
Remove mask once medication has ceased misting. Check bowl if all medication has been delivered.	Mist will no longer come from the mask once the medication has been delivered. Mask may need repositioning to allow residual medication to mist.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.  
 Restore the environment.  
 Report, record and document assessment findings, details of the skill performed and the individual's response.  
 Report, record and document any abnormalities and/or inability to perform the skill.  
 Reassess the individual to ensure there are no adverse effects/events from the skill.

**CLINICAL SKILL 20.16 Administration of a medication via nebuliser—cont'd**

Skill activity	Rationale
Dispose of or clean mask as per facility/organisation policy.	It is imperative that the nurse follows the facility/organisation policy in regards to the use of nebuliser masks to ensure standard or transmission-based precautions are adhered to.
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSQHC 2012; 2019a; 2020; Department of Health 2021; JBI 2021c; Tollefson et al 2022)</i>	

**CLINICAL SKILL 20.17 Use of a hand-held inhaler and spacer**

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

<p><b>NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):</b></p> <ol style="list-style-type: none"> <li>1. Am I educated?</li> <li>2. Am I authorised?</li> <li>3. Am I competent?</li> </ol> <p>If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.</p>	<p><b>Equipment:</b></p> <p>NIMC/EMM system medication order Medication—MDI Spacer Appropriate PPE for droplet or airborne precautions:</p> <ul style="list-style-type: none"> <li>• Disposable gloves</li> <li>• Mask</li> <li>• Protective eyewear or face shield</li> </ul> <p>Resource material (e.g. MIMS)</p>
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**PREPARE FOR THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.  
Discuss the skill with your instructor/supervisor/team leader, if required.  
Confirm correct facility/organisation policy/safe operating procedures.  
Validate the order in the individual's record.  
Identify indication and rationale for performing the activity.  
Assess for any contraindications.  
Locate and gather equipment.  
Perform hand hygiene.  
Ensure therapeutic interaction.  
Identify the individual using three individual identifiers.  
Gain the individual's consent.  
Assess for pain relief.  
Prepare the environment.  
Provide and maintain privacy.  
Assist the individual to assume an appropriate position of comfort.

Skill activity	Rationale
Ensure correct medication is given by following the '11 rights' throughout preparation and administration.	Identifies issues, which can be addressed prior to administration. Prevents medication errors from occurring and promotes correct and safe administration of medication/s.
Ensure medication orders are correctly prescribed and written.	Ensures correct medication administration is about to take place.

*Continued*

### CLINICAL SKILL 20.17 Use of a hand-held inhaler and spacer—cont'd

<p>Verify indication for the medication on the NIMC/EMM system.</p> <p>Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration.</p> <p>Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions.</p> <p>Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.</p>	<p>Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes.</p> <p>Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring.</p> <p>Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.</p> <p>Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.</p>
<p>Assess the individual's ability to self-administer the medication in the prescribed form using MDI &amp; spacer.</p>	<p>Promotes independence and confidence with administration.</p>
<p>Check the medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.</p>	<p>Confirms the individual's identity.</p>
<p>Assess for transmission-based precautions such as airborne or droplet and PPE required: gloves, mask, and protective eyewear/face shield.</p>	<p>Ensures the nurse is wearing the correct PPE if the individual sneezes from medication insertion since the PPE prevents contact with body fluids.</p>



#### PERFORM THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.  
 Apply PPE: gloves, eyewear, mask and gown as appropriate.  
 Ensure the individual's safety and comfort throughout skill.  
 Promote independence and involvement of the individual if possible and/or appropriate.  
 Assess the individual's tolerance to the skill throughout.  
 Dispose of used supplies, equipment, waste and sharps appropriately.  
 Remove PPE and discard or store appropriately.  
 Perform hand hygiene.

Skill activity	Rationale
<p>Prepare medication as per administration guidelines and calculate the correct dose.</p> <p>Ensure the right medication is being administered by comparing the label of the medication and expiry date with the name on the NIMC/EMM system three times:</p> <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	<p>Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied.</p> <p>Ensures the correct medication is being administered.</p> <p>Prevents preparation and administration errors.</p>
<p>Assist individual into a semi-Fowler's or high Fowler's position.</p>	<p>Position facilitates entry of the medication into the respiratory tract.</p>
<p>Load MDI with canister of medication. Remove mouthpiece cap and shake MDI.</p>	<p>Prepares the MDI for administration of the medication. Not shaking the MDI can cause sedimentation and affect the dosage delivered.</p>
<p>Attach mouthpiece of inhaler into spacer.</p>	<p>The use of a spacer is recommended to ensure more of the medication is delivered into the respiratory tract.</p>

**CLINICAL SKILL 20.17 Use of a hand-held inhaler and spacer—cont'd**

Instruct individual to: <ul style="list-style-type: none"> <li>Place the mouthpiece of the spacer well into mouth, close lips firmly around it and tilt head back slightly</li> <li>Start to breathe in through mouth and to press canister to deliver one puff of medication</li> <li>Breathe in and out normally for four to five breaths.</li> </ul>	Tight seal is necessary to prevent the escape of medication into the air. Ensures the whole dose is delivered into the respiratory tract.
Repeat technique if necessary until the prescribed dose has been inhaled or if a different inhaler is also required. Time between inhalations depends on which medications are being inhaled.	Time between inhalations allows deeper penetration of the second inhalation.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.  
 Restore the environment.  
 Report, record and document assessment findings, details of the skill performed and the individual's response.  
 Report, record and document any abnormalities and/or inability to perform the skill.  
 Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Instruct individual to rinse their mouth after administration.	Prevents hoarseness, irritated sore throat or oropharyngeal candidiasis.
Clean mouthpiece and spacer after each use with mild soap and water. Replace the cap on the mouthpiece.	Prevents contamination of mouthpiece.
Record and sign for each medication administered on the NIMC/EMM system.	Prompt documentation prevents medication errors.
Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.	
<i>(ACSQHC 2012; 2019a; 2020; Department of Health 2021; JBI 2021a; Rebeiro et al 2021; Tollefson et al 2022)</i>	

## Administering medication by intranasal absorption

Medications may be administered intranasally via aerosol or drops instilled in the nose. The medication is rapidly absorbed through the vascular network in the nasal tissues. They may be used to loosen secretions or treat infections of the nasal cavity or sinuses, and to administer medications for rapid systemic absorption to treat pain (fentanyl) or seizures (midazolam) (ACSQHC 2020b). Repeated use may lead to nasal irritation or a rebound effect (an increase in nasal congestion). If excess nasal decongestant is swallowed, systemic effects may also develop. It is usually easier for the individual to self-administer sprays. They are positioned in a supine position with the head tilted back (see Clinical Skill 20.18).

## MONITORING THE EFFECTS OF MEDICATIONS

The nurse plays a vital role in monitoring the effects of prescribed medications that have been administered. Evaluating the individual's response is essential and the nurse is required to assess, report and record all responses to the medication. To monitor the effects of any medication, the nurse must first have a clear understanding of the purpose of the medication, its desired therapeutic effects and any expected adverse reactions. Table 20.8 lists the major classes of common medications and their actions and provides the nurse with a guide to the expected effects of various groups of medications. For example, the nurse needs to be aware that an analgesic medication is administered for the purpose of alleviating pain, an anti-inflammatory

## CLINICAL SKILL 20.18 Administering nasal sprays and drops

Please adhere to the policy and procedures of the facility/organisation prior to undertaking the skill. Ensure this skill is in your scope of practice.

### NMBA Decision-making Framework considerations (refer to NMBA Decision-making framework for nursing and midwifery 2020):

1. Am I educated?
2. Am I authorised?
3. Am I competent?

If you answer 'no' to any of these, do not perform that activity. Seek guidance and support from your teacher/a nurse team leader/clinical facilitator/educator.

### Equipment:

NIMC/EMM system medication order  
Nasal spray/drops  
Tissues  
Appropriate PPE for droplet or airborne precautions:

- Disposable gloves
- Mask
- Protective eyewear or face shield

Resource material (e.g. MIMS)



### PREPARE FOR THE SKILL

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Mentally review the steps of the skill.  
Discuss the skill with your instructor/supervisor/team leader, if required.  
Confirm correct facility/organisation policy/safe operating procedures.  
Validate the order in the individual's record.  
Identify indication and rationale for performing the activity.  
Assess for any contraindications.  
Locate and gather equipment.  
Perform hand hygiene.  
Ensure therapeutic interaction.  
Identify the individual using three individual identifiers.  
Gain the individual's consent.  
Assess for pain relief.  
Prepare the environment.  
Provide and maintain privacy.  
Assist the individual to assume an appropriate position of comfort.

### Skill activity

Ensure correct medication is given by following the '11 rights' throughout preparation and administration.

Ensure medication orders are correctly prescribed and written.  
Verify indication for the medication on the NIMC/EMM system.  
Review name of medication on the NIMC/EMM system, dose, route, time of last administration and frequency of administration.  
Assess for any medication contraindications; check allergy status on the medication chart and with the individual; compare with the medication ordered; check for medication interactions.  
Review all necessary information about the medication, including action, purpose, normal dose, side effects, any special administration information.

Assess the individual's ability to self-administer the medication in the prescribed form.

Check the medication chart for the individual's identifiers, including asking the individual to state their full name, date of birth (DOB) and then check these as well as the UR number with the ID band and NIMC/EMM system.

### Rationale

Identifies issues, which can be addressed prior to administration.  
Prevents medication errors from occurring and promotes correct and safe administration of medication/s.

Ensures correct medication administration is about to take place.  
Ensures the nurse understands why the individual is receiving the medication and is able to ask for a review by the medical officer if the individual's health status changes.  
Ensures that the right medication is being given at the right frequency and time, via the correct route and prevents medication errors from occurring.  
Ensures all medication allergies are recorded and determines if a medication should be given. Reduces risk of allergic reactions occurring.  
Promotes correct and safe administration of the medication and enables the nurse to monitor the therapeutic effects of the medication.

Promotes independence and confidence with administration.  
Avoids individual being startled during administration triggering a cough or sneeze.

Confirms the individual's identity with the individual and documentation.

**CLINICAL SKILL 20.18 Administering nasal sprays and drops—cont'd**

Assess for transmission-based precautions such as airborne or droplet and PPE required: gloves, mask, and protective eyewear/face shield.

Ensures the nurse is wearing the correct PPE if the individual sneezes from medication insertion since the PPE prevents contact with body fluids.

**PERFORM THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Perform hand hygiene.

Apply PPE: gloves, eyewear, mask and gown as appropriate.

Ensure the individual's safety and comfort throughout skill.

Promote independence and involvement of the individual if possible and/or appropriate.

Assess the individual's tolerance to the skill throughout.

Dispose of used supplies, equipment, waste and sharps appropriately.

Remove PPE and discard or store appropriately.

Perform hand hygiene.

Skill activity	Rationale
Prepare medication as per administration guidelines and calculate the correct dose. Ensure right medication is being administered by comparing the label of the medication and expiry date with the name of medication on the NIMC or EMM system three times: <ul style="list-style-type: none"> <li>• first check: before removing from the trolley or cupboard</li> <li>• second check: before removing from the container</li> <li>• third check: before returning to the trolley or cupboard, or discarding.</li> </ul>	Following administration guidelines ensures the medication's effectiveness and the correct dosage of medication is being administered. Ensures medication order is the same as the medication supplied. Ensures the correct medication is being administered. Prevents preparation and administration errors.
Ask individual to gently blow their nose.	Clears the nasal passages of mucus that may inhibit absorption of the medication.
Assist individual into supine position with head tilted back.	Facilitates administration of the medication.
Instil the nasal medication, aiming for the midline of the nose. Drops: hold the dropper 1 cm above the nares and instil the prescribed number of drops. Pressurised container: hold the spray container just into the nostril and press down as the individual slowly breathes in. Pump bottle: squeeze the pump as the individual inhales. Use tissues to wipe away any excess fluid.	Promotes correct administration of the medication. Promotes comfort.

**AFTER THE SKILL**

**(Please refer to the Standard Steps on pp. xviii–xx for related rationales.)**

Communicate outcome to the individual, any ongoing care and to report any complications.

Restore the environment.

Report, record and document assessment findings, details of the skill performed and the individual's response.

Report, record and document any abnormalities and/or inability to perform the skill.

Reassess the individual to ensure there are no adverse effects/events from the skill.

Skill activity	Rationale
Advise individual not to blow their nose and to remain in the supine position for a few minutes.	Promotes absorption of the medication.
Record and sign for each medication administered on the NIMC or EMM system.	Prompt documentation prevents medication errors.

Safe medication management guidelines, outlined in Clinical Interest Box 20.3, should be incorporated into relevant aspects of this skill.

(ACSQHC 2012; 2019a; Department of Health 2021; JBI 2022d; Rebeiro et al 2021; Tollefson et al 2022)



**TABLE 20.8 | Major actions of common medication classes**

Medication class	Action
<i>Medications acting on the cardiovascular system</i>	
Antianginal agents	Relax smooth muscle and reduce myocardial oxygen demand, thereby reducing angina.
Antiarrhythmic agents	Prevent, alleviate or correct cardiac arrhythmias.
Antihypertensive agents	Reduce high blood pressure.
Antiplatelet agents	Decrease platelet aggregation to prevent thrombus formation.
Cardiac glycosides	Increase force of myocardial contraction.
Diuretics	Promote the formation and secretion of urine.
Fibrinolytic agents	Activate the endogenous fibrinolytic system to dissolve intravascular blood clots.
Lipid-regulating agents	Reduce blood cholesterol level.
Vasodilators	Dilate blood vessels, improving circulation.
<i>Medications acting on the respiratory system</i>	
Antiasthma agents	Prevent asthma symptoms.
Bronchodilators	Relax bronchiole smooth muscle to relieve bronchospasm and improve ventilation.
Cough suppressants; expectorants and mucolytics	Depress the cough centre in the medulla oblongata; break up mucus, enabling expectoration.
<i>Medications acting on the nervous system</i>	
Analgesics	Alter the perception of pain.
Antianxiety agents	Prevent or relieve anxiety.
Antidepressants	Prevent or relieve depression.
Antiepileptics	Also called anticonvulsants. Prevent or reduce the severity of epileptic seizures.
Antimigraine agents	Prevent or relieve migraine headaches.
Antimuscarinic agents	Also known as anticholinergics. Inhibit the transmission of parasympathetic nerve impulses, resulting in reduced muscle spasm, decreased secretion of sweat, saliva and nasal, bronchial and gastrointestinal secretions.
Antipsychotic agents	Counteract or reduce symptoms of psychosis.
Dopaminergic agents	Either stimulate dopamine receptors or replenish supply of dopamine. Commonly used in the treatment of Parkinson's disease.
General anaesthetics	Used to induce and maintain anaesthesia during surgery.
Local anaesthetics	Block nerve conduction.
Muscle relaxants	Reduce contractility of muscle fibres, thereby reducing muscle spasm.
Neuromuscular-blocking agents	Have an action at the muscle receptor endplate and are used as an adjunct to general anaesthetics to relax muscle.
Opioid analgesics	Alter perception of pain, induce euphoria, depress respiratory and cough reflexes.
Parasympathomimetic agents	Central nervous system stimulants. Either mimic action of acetylcholine or block acetylcholine breakdown at receptor sites, thereby increasing total amount of acetylcholine.

**TABLE 20.8 | Major actions of common medication classes—cont'd**

Medication class	Action
Sedatives and hypnotics	Depress the central nervous system.
Stimulants	Excite the central nervous system.
Sympathomimetic agents	Mimic noradrenaline (norepinephrine) and have effects including cardiac stimulation and relaxation of bronchial smooth muscle.
<b>Medications acting on the endocrine system</b>	
Antidiabetic agents	Regulate the metabolism of glucose.
Antithyroid agents	Inhibit synthesis of thyroid hormone (levothyroxine sodium).
Calcium-regulating agents	Lower blood calcium levels.
Corticosteroids	Hormones that influence or control key processes in the body, including carbohydrate and protein metabolism, electrolyte and water balance.
Hypothalamic and pituitary hormones	Used as replacement therapy.
Thyroid agents	Replace thyroid hormones.
<b>Medications acting on the gastrointestinal tract</b>	
Anorectic and weight loss agents	Suppress hunger sensation.
Antacids	Neutralise gastric acidity and reduce pepsin activity.
Antidiarrhoeal agents	Relieve diarrhoea.
Antiemetics	Prevent and relieve nausea and vomiting.
Antiulcer agents	Assist in the healing of gastric and duodenal ulcers.
Laxatives	Promote peristalsis and evacuation of the bowel by increasing the bulk of faeces by softening the stool or by lubricating the intestinal wall.
Prostaglandins	Inhibit gastric secretion.
Topical rectal agents	Reduce pain associated with haemorrhoids.
<b>Medications acting on the urinary system</b>	
Bladder function disorder agents	Treat disorders of the bladder to re-establish normal bladder function.
Diuretics	Promote the formation and secretion of urine.
<b>Medications acting on the reproductive system</b>	
Androgens	Control development and maintenance of male sex organs and male secondary sex characteristics.
Erectile dysfunction agents	Treats erectile dysfunction by promoting blood flow.
Oestrogens	Control development and maintenance of female sex organs, secondary sexual characteristics and mammary glands.
Progestogens	Convert the endometrial proliferative phase to the secretory phase in preparation for a fertilised ovum.
Prostaglandins	May cause contraction or relaxation of smooth muscle in blood vessels, bronchi, uterus or gastrointestinal tract.

Continued

**TABLE 20.8 | Major actions of common medication classes—cont'd**

Medication class	Action
Sex hormones	Sex hormones are prescribed for a variety of reasons, including the development or control of male or female sex organs and secondary sex characteristics. Common uses include oral contraceptives, hormone replacement medications to treat primary amenorrhoea, delayed onset of puberty or to relieve the symptoms of menopause. Sex hormones may also be used therapeutically to treat osteoporosis, to promote sex drive and fertility and in treatment related to breast or prostatic cancer. The sex hormones include anabolic steroids, androgens, antiandrogens, oestrogen and progesterone.
<b>Medications acting on the musculoskeletal system</b>	
Analgesics	Prevent and reduce pain.
Antigout agents	Reduce pain and inflammation associated with gout or alter production or distribution of uric acid.
Disease-modifying antirheumatic medications (DMARDs)	Treat rheumatoid arthritis.
Muscle relaxants	Reduce contractility of muscle fibres, reducing muscle spasm.
Non-steroidal anti-inflammatory medications (NSAIDs)	Reduce inflammation.
<b>Medications acting on the immune system</b>	
Antihistamines	Reduce the effects of histamine released from cells.
Corticosteroids	Hormones that influence or control key processes in the body, including carbohydrate and protein metabolism, electrolyte and water balance.
Immunomodifiers	Modify the immune system.
Vaccines, immunoglobulins and antisera	Vaccines induce a specific active artificial immunity. Antisera contain antibodies (immunoglobulins) against a specific disease to confer passive immunity.
<b>Medications acting on the blood</b>	
Anticoagulants	Prevent or delay the coagulation cascade of blood.
Antiplatelet agents	Decrease platelet aggregation to prevent thrombus formation.
Fibrinolytic agents	Activate the endogenous fibrinolytic system to dissolve intravascular blood clots.
Haemostatics	Treat or prevent haemorrhage by inhibiting fibrin clot breakdown.
Lipid-regulating agents	Reduce blood cholesterol level.
Vasodilators	Dilate blood vessels, improving circulation.
<b>Medications acting on the skin</b>	
Dermatological agents	Prevent or treat skin infections; cleansers; moisturising agents; sunscreen agents; topical anaesthetics; topical analgesics.
<b>Anti-infective agents</b>	
Anthelmintics	Treat worm infestations.
Antibacterial agents	Inhibit the growth of or destroy bacteria.
Antifungal agents	Inhibit the growth of or destroy fungal infections.
Antimalarial agents	Prevent or treat malaria.

**TABLE 20.8 | Major actions of common medication classes—cont'd**

Medication class	Action
Antimycobacterial agents	Treat tuberculosis and Hansen's disease (leprosy).
Antiprotozoal agents	Treat protozoal infections.
Antiviral agents	Prevent or treat viral infections.
<i>Medications used in neoplastic disorders</i>	
Antineoplastic agents	Also called cytotoxics. Prevent the proliferation of malignant cells by attacking them at various stages of the cell cycle.
Corticosteroids	Hormones that influence or control key processes in the body, including carbohydrate and protein metabolism, electrolyte and water balance.
Immunomodifiers	Modify the immune system.

(Adapted from Knights et al 2023; Tiziani 2022)

medication to relieve inflammation and an antipyretic to lower body temperature. Assessment and documentation should therefore indicate whether the medication has successfully achieved the desired therapeutic effect (e.g. if the pain has been successfully relieved by the analgesic).

Whenever medication of any sort is administered there is always a possibility that side effects or adverse reactions may occur. Adverse reactions to a medication may be due to overdose, idiosyncrasy, toxic effects, allergy or medication interactions (Frotjold & Bloomfield 2021). Early detection of the manifestations of an adverse reaction and immediate, factual and concise reporting of these manifestations allows prompt action to be taken. Manifestations of an adverse reaction will depend on the type of medication administered and on each individual. It is important for the nurse to refer to either the manufacturer's information or a reliable textbook to have all the information concerning possible adverse reactions. The nurse must be informed and knowledgeable about every medication before it is administered and document and report any adverse reaction or side effect immediately to the nurse in charge and medical officer.

## SAFE HANDLING OF HAZARDOUS SUBSTANCES

Medications that are considered hazardous are categorised into cytotoxic (chemotherapy agents), hazardous non-cytotoxic (e.g. aminoglycosides, ACE inhibitors, oestrogen, testosterone) and reproductive hazards (e.g. simvastatin, warfarin, doxycycline), which are listed on the National Institute for Occupational Safety and Health's List of Hazardous Drugs in Healthcare Settings 2020 and the Cancer Institute NSW hazardous medicines lists (Victorian Therapeutics Advisory Group 2021).

Cytotoxic agents can be absorbed through the skin of people handling cytotoxic medication or bodily fluids from an individual who is being administered cytotoxic medication (Knights et al 2023). Cytotoxic medications (used in chemotherapy) may be prescribed in the treatment of malignant disease to inhibit the growth of malignant cells and may be administered orally or IV. Because cytotoxic agents are harmful to normal cells as well as malignant cells, extreme care is required during their preparation and administration.

Although the EN may not be required to administer cytotoxic medications, they may nonetheless assist in the care of an individual receiving chemotherapy. It is essential, therefore, that the nurse is aware of, and understands, the related safety guidelines. Clear guidelines, which are developed by health authorities and are available in health-care facilities, set down procedures to be followed in the preparation and administration of cytotoxic agents (Knights et al 2023). In addition, the guidelines specify how to deal with spillages, extravasation (leakage of anti-neoplastic agents into the individual's subcutaneous tissues) and the safe disposal of used equipment and the individual's body wastes (Knights et al 2023). Nurses who are pregnant must avoid contact with any cytotoxic agent, especially during the first trimester, when foetal organs are developing. The Victorian Therapeutic Advisory Group (2021) provides the Victorian Framework: Handling of Hazardous Medicines to assist in assessing the risk in handling hazardous medications and provide strategies to mitigate exposure in healthcare settings.

Each state and territory has legislation relating to the handling of cytotoxic medications and related waste in the workplace. A material safety data sheet (MSDS) should be available with every hazardous substance used in a healthcare facility. It is the primary source of safety

information provided for people using hazardous substances in the workplace. It provides essential information, direct from the manufacturer, about what to do in the event of leakage, spillage or any type of accident or incident involving the chemical (Worksafe Victoria 2022). See Chapter 18 for more information about cleaning and spills.

## SAFE STORAGE, ADMINISTRATION AND DISPOSAL OF MEDICATIONS

Safety precautions with medications in the healthcare facility include the following:

- Locking the area in which medications are stored, to make them inaccessible to unauthorised persons.
- Schedule 8 medications are to be stored in a lockable cupboard or safe, affixed to the wall or floor in a locked room.
- Recognising that the pharmacist is responsible for the contents of most medical substances supplied.
- Recognising that only the pharmacist may attach or alter a label, fill a container or transfer medication from one container to another. If a label on a container is illegible, the container must be returned to the pharmacist for clarification.
- All unused medications are returned to the pharmacy department for correct disposal.
- Observing the 11 rights and safety precautions for prescribing, preparation and administration of all medications.

## MEDICATIONS AND THE OLDER ADULT

Older adults are at particular risk of developing ADRs by prescribed medications since they take more prescribed and OTC medications than any other age group, take multiple medications and their increased age alters the rate at which medications are absorbed, metabolised and excreted from the body and toxicity can occur as a result (Knights et al 2023). Body weight is often lost as people age, resulting in altered distribution of medications around the body, and this will result in the need for a lower dose than would normally be prescribed (Knights et al 2023). This can often result in more older adults being admitted to hospital with ADRs than younger adults (Knights et al 2023).

Older adults generally consume more prescription and OTC medications than any other age group and frequently take a combination of many different medications on a daily basis. Commonly older adults are referred to medical specialists and therefore may be prescribed medications by more than one doctor (Knights et al 2023). This results in what is known as polypharmacy, a potentially dangerous indiscriminate use of multiple medications at the same time (Knights et al 2023). Nurses can help prevent toxicity

by prescribed medications in older adults by keeping these factors in mind, and actively:

- observing for and promptly reporting any signs of toxicity (e.g. tinnitus, gastric disturbance, cognitive changes, or visual disorders)
- advocating for frequent reviews of individual medication regimens
- encouraging older individuals to ask questions of the medical officer, RN or pharmacist about prescribed and non-prescribed herbal or other medications
- encouraging older people to discuss with the medical officer the possibility of ceasing medications that may no longer be essential
- ensuring that non-pharmacological approaches are considered whenever appropriate
- checking that the individual has understood instructions about taking medications and, if necessary, seeking the help of an RN or pharmacist to clarify instructions
- reviewing serum blood levels of renal and liver function to ascertain if metabolism and excretion of certain medications are affected
- reviewing serum blood levels of medications to ensure the medications are within the required therapeutic range
- checking for medication interactions or contraindications.

ENs can participate in medication-related interventions only under the supervision of the RN within their scope of practice, and in accordance with the NMBA Enrolled nurse standards for practice, and legislation in the state or territory in which they work.

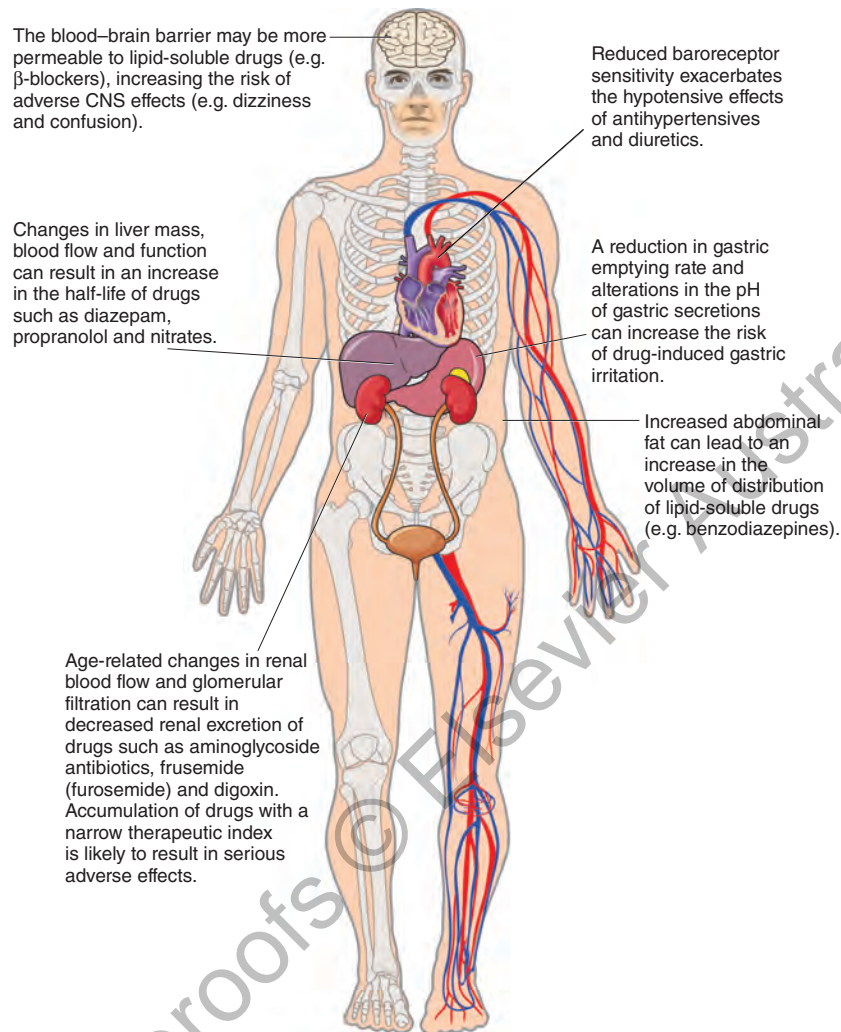
## MEDICATIONS AND THE CHILD

Many medications that have been proven to be safe and effective in adults may not be safe for children (Knights et al 2023). Standard medication dosages for children often do not exist and therefore the dosage will be calculated based on the weight or the BSA of the child (Knights et al 2023). Since children have a higher ratio of body water (75%) than adults (50–60%) and also less adipose tissue than adults, some water-soluble medications need to be given at a higher rate (Knights et al 2023). However, according to the Australian Medicines Handbook (2023), if the calculated dose based on weight or the BSA is greater than the adult dose then the adult dose should be given.

### CRITICAL THINKING EXERCISE 20.5

#### Age-related changes

As a person ages, there are many physiological changes that can affect the way in which the body responds to a medication (review Clinical Interest Box 20.2). What are some pathophysiological and psychosocial aspects that can be problematic in prescribed medications in the older adult? (Review Figure 20.21.)



**Figure 20.21** Physiological changes with ageing that impact on the pharmacokinetics of drugs  
(Knights 2023)

IV medication and fluid administration in children require accurate prescribing and close monitoring, especially IV fluids since more ADRs occur with IV fluids than any other individual medication (The Royal Children's Hospital Melbourne 2020). Review Clinical Interest Box 20.4 for requirements for interventions when administering IV medications to an infant or child.

## CONTINUATION OF MEDICATION REGIMEN AFTER DISCHARGE

It is important that individuals have the correct information to enable them to engage in self-care activities and maintain compliance with the prescribed medication regime (Broyles

et al 2019). The nurse must assess the individual's ability and readiness to absorb information and ensure that it is geared towards the individual's level of understanding (Broyles et al 2019). Review Nursing Care Plan 20.1.

Before discharge from a healthcare facility with medications, the nurse must ensure that the individual:

- can demonstrate safe self-medication techniques after being adequately instructed
- understands the medication regimen, including the purpose of the prescribed medications, the frequency of administration and any contraindications
- understands the importance of any related blood tests
- understands the importance of not stopping medications abruptly without first discussing the matter with the general practitioner or other medical officer

## NURSING CARE PLAN 20.1

**Assessment:** Mr John Johnston is a 73-year-old man who presented to the emergency department with his wife this morning experiencing shortness of breath and feeling unwell at rest. John's vital signs were within normal limits; however, his ECG showed slight ST elevation and John was treated with glyceryl trinitrate and morphine sulfate with resolution of chest pain and ST elevation. His troponin levels after 6 hours were positive (0.6 ng/mL). After review by the medical officer, it was determined that John has had a slight AMI and was admitted to the medical ward for observation and medication management. John has a past history of hyperlipidaemia, type 2 diabetes mellitus and hypertension. He currently takes atorvastatin 20 mg mane, perindopril 2.5 mg mane and Optisulin 30 units mane. The medical officer has commenced him on enoxaparin 1mg/kg subcutaneous BD, metoprolol 25 mg oral BD, glyceryl trinitrate 300 microg subling PRN as per protocol and increased his atorvastatin to 40 mg oral mane. He is scheduled for a repeat ECG, and troponin in 6 hours.

**Issue/s to be addressed:** Knowledge deficit regarding unstable angina management.

**Goal/s:** John will demonstrate ability to follow steps for unstable angina chest pain management on discharge date. John will understand rationale for managing chest pain in relation to unstable angina and preventing AMI within 2 days.

John will understand and verbalise rationale for PRN administration of glyceryl trinitrate spray for unstable angina within 2 days.

Care/actions	Rationale
Assess John's readiness and ability to absorb information.	Assessing for and ensuring the individual is ready is paramount in delivering education. If the individual is distracted by stress or other issues, they will not be able to take in the information.
Identify any barriers to the education including numeracy and literacy levels, vision, hearing and cognition.	Ensuring that the individual has their glasses on or they may need handouts in larger print to be able to read the information. If there is a hearing deficit, ensure hearing aid is in and working if applicable and that you face the person so they can read your lips and see your facial expressions. Ensuring that the individual is able to understand what you are conveying to them; if there is a cognitive impairment a family member or carer may need to be present.
Develop a therapeutic relationship and provide information in simple terms at the level of the individual.	Individual will trust the information being given and will be able to understand layman terms rather than medical jargon/terminology.
Provide a fact sheet to follow when experiencing chest pain.	The fact sheet will give step-by-step instructions to the individual to follow as well as strategies if the interventions are not effective.
Refer to pharmacist for information on new medications.	Gives the individual the most current information.
Provide pharmacy information sheet on individual medications.	Gives the individual an easy reference tool showing when and how medications need to be taken and noting expiry dates.
Instruct on correct administration, dosage and timing of medication administration process when experiencing chest pain.	Allows individual to self-manage medication regimen effectively to prevent worsening of condition and when to call for an ambulance and to not drive self to hospital.
Instruct on storage, expiry date and common side effects (headache and dizziness) for PRN glyceryl trinitrate spray.	Provides information to ensure glyceryl trinitrate medication is taken correctly and is discarded 90 days after opening to ensure medication effectiveness.
Provide fact sheet or fridge magnet for easy access for chest pain management and glyceryl trinitrate medication regimen: <ul style="list-style-type: none"> <li>• Rest</li> <li>• Prime the glyceryl trinitrate spray</li> <li>• Hold nozzle of spray close to the mouth and administer one spray under the tongue</li> <li>• Wait 5 minutes and if chest pain not resolved repeat two more times.</li> </ul> <p>If chest pain not resolved after 15 minutes dial 000 and ask for MICA.</p>	Provides quick and easy access to information so when chest pain is experienced the correct regimen is followed.

**NURSING CARE PLAN 20.1—cont'd**

Encourage John to ask questions.

Provides clarification and evidence that the individual has understood the education given.

**Evaluation:** John states the rationale for taking his newly prescribed medication. John states the process for taking the new medications at the required time and correct dose. John is able to recall the process for taking glyceryl trinitrate spray for when he is experiencing chest pain, according to protocol.

(Broyles et al 2019)

- is advised to consult the medical officer about any toward effects from the medication
- understands the importance of notifying other health professionals about the medication regimen (e.g. the visiting community health nurse)
- understands the reasons for not sharing medications with others
- knows how to store the medications correctly and safely
- has the contact numbers for emergency services (e.g. ambulance service and Poisons Information Centre) readily at hand (e.g. kept close to the telephone)
- knows how to discard out-of-date or unwanted medications safely
- knows how to dispose of used syringes and needles safely
- has been provided with written instructions on each medication
- has had instructions from the pharmacist for any new medications or changes to medication regimen.

Alternatively, if the individual is unable to complete the above, a family member or friend should be instructed in the safe administration of the medication, covering all the points listed. Another alternative is a visiting district or community nurse, who may be required to call on the individual at home and assist in the administration or

monitoring of the medication therapy. The nurse may also be able to gain an understanding of any difficulties the individual is experiencing, offer information that may help the individual deal with them, and monitor **compliance/concordance/adherence** with the medical officer's directions (Broyles et al 2019). Sometimes individuals do not comply/adhere with the prescribed medication regimen after they return home. There are a variety of reasons why this may occur (Clinical Interest Box 20.5). One measure to promote safe medication administration in the home for older individuals, improve adherence to medication regimens and provide professional support is the use of dose administration aids (DAAs), which allows medications to be organised into individual doses to assist the individual with the timing of taking their medications (Pharmacy Programs Administrator 2022). (See Figure 20.22.) DAAs are commonly used in residential aged-care facilities (RACFs) and home care.

When an older individual has vision impairment, it will help if instructions for taking the medications are clearly printed in large bold letters. If individuals are confused, it may be necessary for the medications to be taken under the supervision of a family member and kept out of reach at other times. Clinical Interest Box 20.6 provides suggestions to help the nurse enhance individual compliance/concordance/adherence with medication regimens after discharge.

**CLINICAL INTEREST BOX 20.5 Issues with non-compliance with medication regimens**

How many of us have been guilty of not completing a course of antibiotics because we 'feel better'? Or forget to take them and decide we are better anyway? Or keep a few of those antibiotics for the next time it happens, to save going to the medical officer again? Non-compliance/concordance/adherence with medication therapy can be both deliberate and unintentional. Some reasons for non-compliance/concordance/adherence with medication therapy are that individuals:

- Do not understand the information given to them regarding illness and medication regimen.
- Disregard the information given to them, perhaps because they do not believe in, or have a fear of, using medications or believe another sort of remedy is more likely to be effective. Attitudes and beliefs about medications can be influenced by cultural background and past experiences with medications.
- Alter the medication regimen to fit with lifestyle (e.g. not taking furosemide if going on an outing to avoid frequently going to the toilet and subsequent embarrassment).
- Decrease dose or stop medication because of adverse effects.
- Take double doses to make up for missed doses.

Continued



## CLINICAL INTEREST BOX 20.5 Issues with non-compliance with medication regimens—cont'd

- Stop medication because there is no change in condition ('It isn't doing me any good').
- Find them too expensive.
- Perceive that they do not need them anymore.
- Receive unclear directions (given in a rush, too much jargon, given rapidly in English when English is not the first language of the individual).
- Have problems with changing routine (e.g. their medication routine differs from their previous regimen).
- Have difficulty implementing the regimen (e.g. multiple medications to be taken at several different times of the day).
- Simply forget to take them.
- Feel there are too many medications to take.

Several nursing interventions may enhance the ability and willingness of individuals to comply with the prescribed medication regimen (review Clinical Interest Box 20.6).

(Adapted from Frotjold & Bloomfield 2021; Broyles et al 2019)



**Figure 20.22** Dose administration aid: Webster-pak® colour-coded blister pack

(Courtesy Manrex Pty Ltd, WebsterCare 2023, <https://www.webstercare.com.au/shop/item/community-webster-pak>)

## CLINICAL INTEREST BOX 20.6 Nursing interventions to enhance individual compliance with medication regimens after discharge

### Education

- Assess the individual's knowledge base prior to education so they do not tune out because they already know some of the information.
- Assess the individual's understanding of English; if they do not understand English, arrange for an interpreter.
- Assess the individual's memory and cognitive function for understanding and retention of information.
- Assess the individual's level of hearing (e.g. hearing aid in place and switched on).
- Assess the individual's readiness and level of concentration (e.g. are they uncomfortable, needing the toilet, in pain, thirsty, hungry or anxious).
- Provide a quiet, calm private area so that the individual is not distracted while you are providing information and so that the individual's medical condition remains confidential.
- Provide verbal and written instructions to the individual and family members when appropriate. Other visual material may be available (video instructions are available for education about certain medications, such as insulin).
- Ascertain the individual's level of understanding by asking them to repeat the instructions back to you. Encourage them to ask any questions they have about the purpose of the medication and when and how to take it. If necessary, arrange for a visiting nurse to check on the individual's ability to cope with more complex medications, such as insulin injections and disposal of sharps. In the home, sharps can be safely disposed of in an empty plastic milk container that has a screwtop cap and a 1:10 bleach to water solution in the bottom of it. The environmental biohazard waste-management strategies in the local area should be followed when disposing of the full container.
- Provide adequate time when educating the individual about medication. Avoid giving instructions just as the individual is ready to leave the hospital. Provide time for individual to practise and demonstrate their ability with devices such as needles and syringes or nebulisers and inhalers.

### Willingness to follow the medication regimen

- Discuss the individual's feelings, attitudes and beliefs about health alteration and the need for the medication prescribed. If the individual indicates an unwillingness to carry out the medication after being provided with reasons to comply, refer this information to the medical officer and nurse in charge. Alternative therapies may be possible.
- Discuss how the regimen fits in with the individual's lifestyle and how any adverse effects might cause a problem to planned activities.

### Ability to follow the medication regimen

- Ensure that the individual will be able to read labels on medication pots and bottles. If vision is a problem, contact the pharmacy about printing bigger labels or providing additional large print information.
- Check that motor skills will allow the individual to successfully use the medication (e.g. that they can open the childproof lid on the container or are able to pour out liquid medication or instil their own eye or ear drops).
- Evaluate the individual's social situation (e.g. is the cost of the medication a problem? Is the individual sufficiently mobile to go to the pharmacist to fill the prescription?).

This is certainly not an exhaustive list. Make a list of your own and see how many more actions you can add to it.

(Adapted from Frotjold & Bloomfield 2021; Broyles et al 2019)

## CRITICAL THINKING EXERCISE 20.6

### Medication compliance

There are many factors that can result in an individual not being compliant/concordant/adherent with medication therapy. Outline some nursing actions that you could apply before an individual is discharged to improve compliance with prescribed medication therapy.

**Progress Note 20.1**30/06/2024  
2100 hrs

Nursing: John Johnston was admitted to the medical ward at 1630 hrs for observation and medication management. John presented to the casualty department with his wife at 0940 this morning after experiencing central chest pain radiating into his jaw. Pain was described as 7/10. ECG and bloods attended. Chest pain resolved with 3 × 600 micrograms of glyceryl trinitrate subling and 2.5 mg of morphine sulfate IV. ECG showed ST elevation, which resolved when he became pain free. Troponin was positive and other bloods NAD. John was pain free on arrival to the ward and no further chest pain this shift. Six-hourly routine troponin levels and ECG performed. Admission and discharge plan completed. John has a past history of hypertension, T2DM and hyperlipidaemia. He has reported an allergy to shellfish. Routine urinalysis NAD. Vital signs: Temp 36.7°C, RR 22 breaths/min, HR 90 beats/min and BP 170/95 mmHg, BGL 17.5 mmol/L. Reviewed by medical officer who ordered a stat dose of actrapid as per protocol 2 units, and a transdermal glyceryl trinitrate patch 25 mg. Referral to cardiac nurse completed. Education commenced for AMI and unstable angina and education information pack given. Subcut enoxaparin and oral medications given as per NIMC. LFTs, FBE, U&Es & repeat troponin ordered for tomorrow morning. Request for angiogram has been sent by senior medical officer. Awaiting information from angiogram clinic on time.

*H. Brown (BROWN), EN***DECISION-MAKING FRAMEWORK EXERCISE 20.1**

You have just been employed in the medical ward as an Enrolled Nurse. You are working on an afternoon shift and one of the people you are assigned to care for is a 57-year-old woman who is in palliative care. She has end-stage ovarian cancer. She has a syringe driver in situ, giving subcutaneous delivery of 120 mg of morphine and 40 mg of metoclopramide over a 24-hour period. You remember learning about syringe drivers when you studied the medication unit in your training; however, that was almost 12 months ago. The syringe driver medication is due to be changed on your shift.

1. Using the decision-making framework, determine your scope of practice in caring for and monitoring the individual in delivering the medication by the syringe driver.
2. Do you accept responsibility of caring for the lady over the shift?
3. What is your long-term plan to ensure competency?

**Summary**

As part of the holistic care of the individual, the EN may be required to administer and monitor the effects of prescribed enteral medications or parenteral medications, fluids or blood products; it is therefore essential to have the necessary knowledge to ensure the safety of all individuals who are receiving medications, fluids or blood products. Of particular importance is an understanding of the legal responsibilities involved in administering medication. Nurses must be willing to accept that responsibility and work within their scope of practice as dictated by Ahpra and the NMBA codes and guidelines. To promote accurate and safe medication, IV fluid or blood product administration, the nurse must understand the system of weights and measures used in prescriptions, know the meanings of abbreviations and be competent in performing the correct calculation of dosages.

The nurse must have a basic understanding of how medications are transported in the body, their action, and how they are metabolised and excreted. Furthermore, it is important to have an understanding of the actions of the various medication groups so that the nurse will know what the desired effects of the medication are and will therefore be able to monitor the individual's reaction more adequately.

Medications are presented in a variety of forms (e.g. tablets, capsules, mixtures and injectable solutions), which are administered via a variety of different routes. The nurse should not only be competent in administering medication via these routes, but also in monitoring both the therapeutic effects and any adverse reactions and side effects that may occur.

The nurse must observe the 11 rights of medication administration (right prescription, right medication, right dose, right expiration date, right route, right time, right form, right person, right documentation, right to refuse and right response) at all times and understand the procedure if a medication error occurs. Nurses must follow the principles of asepsis during the preparation and administration of medications via any route and must constantly assess and promote the individual's safety and comfort throughout the administration of any medication therapy. The nurse has an important role in ensuring that the individual understands all aspects of any prescribed medication regimen before being discharged from a healthcare facility. To maintain a safe working environment, it is important that the nurse understands the guidelines regarding safe handling of hazardous substances.

## Review Questions

1. Medications are divided into three different naming categories. Describe which naming convention should be used when prescribing medications on the NIMC or EMM system.
2. Describe the term 'Quality Use of Medicines'.
3. Identify two factors that affect medication metabolism or excretion.
4. What is first-pass metabolism?
5. What is the percentage of medication errors that are largely preventable and what is your role in ensuring a medication error does not occur?
6. Describe the importance of monitoring therapeutic levels of medications such as warfarin.
7. Explain the differences between side effects and allergic reactions.
8. What is the role of the international non-proprietary names?
9. Describe the nursing actions regarding the '11 rights' the nurse must follow when administering a medication.
10. According to the National Safety and Quality Health Service Standards (2021a) Communicating for Safety Standard what are the three patient identifiers in identifying an individual for medication administration?
11. Identify the criteria for a legal medication order (right prescription) and the process if the order does not meet those requirements.
12. Describe what you will do as an EN if an individual refuses to take a medication.

## Calculation exercises

1. Convert the following to milligrams (mg):
  - a. 0.5g
  - b. 1.2g
  - c. 0.06g
2. Convert the following to grams (g):
  - a. 600mg
  - b. 2.5mg
  - c. 1000mg
3. Convert the following mg to micrograms (microg):
  - a. 1mg
  - b. 0.125mg
  - c. 0.005mg
4. Convert the following to milligrams (mg):
  - a. 62.5microg
  - b. 250microg
  - c. 600microg
5. An individual is prescribed 150 microg Anginine sublingually. Stock on hand is 600 microg strength tablets. How many tablets would you administer?
6. Mr Stewart is ordered 0.1875mg digoxin orally daily. Digoxin tablets are available in 62.5 microg strength. How many tablets should you administer to Mr Stewart?
7. Mr Newton has epilepsy and has been ordered carbamazepine 160mg oral BD. Stock is a suspension carbamazepine 100mg/5mL. Calculate the volume to be administered.
8. Maddy is a 12-month-old infant weighing about 18kg. She is ordered paracetamol for pain. Stock on hand is 120mg/5mL. The dose is weight-based at 15mg/kg. Calculate the dose required.
9. A child is prescribed erythromycin suspension 250mg orally 8-hourly. Erythromycin penicillin syrup is available as 200mg/5mL. Calculate the total amount (in mL) that the child will receive in a 24-hour period.
10. Poppy is ordered 1000mL sodium chloride 0.9% to be delivered over 12 hours via a gravity feed line.
  - a. Calculate the volume of sodium chloride 0.9% she will receive per hour.
  - b. The drip chamber delivers 20 drops/mL. What would be the drip rate in drops per minute?
  - c. If you were to deliver the fluid through a volumetric pump, what rate would you set the pump at?
11. If Alex Brown is ordered 1L of Hartmann's to be given over 10 hours, what rate would you set the volumetric pump at? What will be the volume to be infused?
12. Sara Hart has been ordered 500mg metronidazole to be given over 30 minutes. The stock is 500mg in 100mL. What rate will you set the volumetric pump at?
13. Calculate the required pump rate per hour if Alice is to receive cefalexin 1000mg in 60mL of sodium chloride 0.9% delivered over 30 minutes.
14. Mr Lee is critically ill and has two intravenous lines inserted. One line is running at 100mL/hour, the second at 20mL/hour. What volume of fluid would Mr Lee receive over 24 hours?