Routes of administration

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Pharmaceutical companies manufacture medicines in a range of different formulations, which they design to ensure that each medicine delivers an effective therapeutic response. Many factors will influence the prescriber's choice of formulation and route of administration, including the response required, the accessibility of the target site and patient factors. Pharmacokinetics describes how the body utilises medicines via the processes of absorption, distribution, metabolism and excretion (commonly referred to as ADME); see Key reading list. The route of administration and the formulation of the medicine will affect these processes.

Enteral administration of medicines results in their absorption through the gastrointestinal tract, while parenteral administration encompasses all other routes, including injections, and absorption through the skin or via mucous membranes, such as in the respiratory tract or vagina. The circulatory system distributes systemic medicines, and these exert an effect on the body as a whole. Topical preparations usually provide a local action at the site of application, although some, such as transdermal patches and nasal sprays, have a systemic effect.

This procedure will describe the various enteral and parenteral routes of administration, as well as special considerations for administering different formulations via these routes, such as oral liquids and tablets. You should read this procedure in conjunction with the clinicalskills.net procedure, "Administration of medicines: key principles".

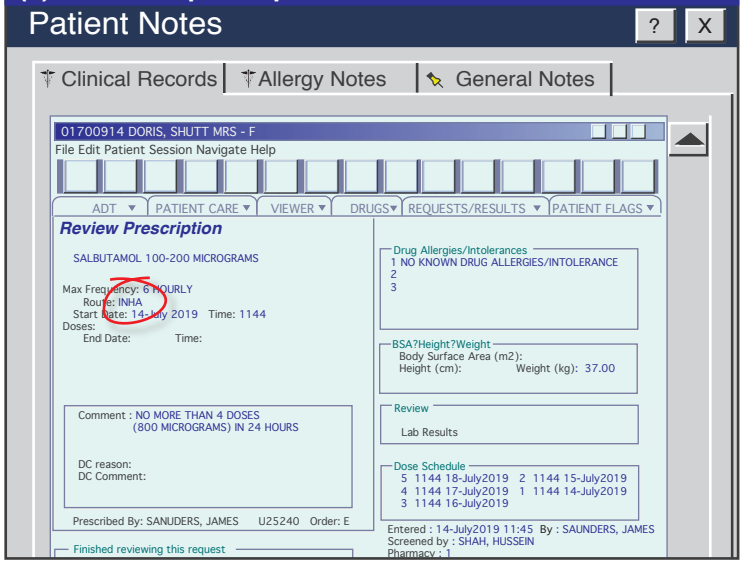
Prescriptions must specify the route of administration (a)

PRESCRIPTION

DRUG (APPROVED NAME) PARACETAMOL				Date	
Dose 1 g	Frequency 6 hourly	Route Oral	Start Date 25/09/19	Time	
Signature P Flemming		Valid Period	Pharm.	Dose / Route	
Additional Instructions/Indication No more than 4 doses (4 g) in 24 hours				Given by	
DRUG (APPROVED NAME)				Date	

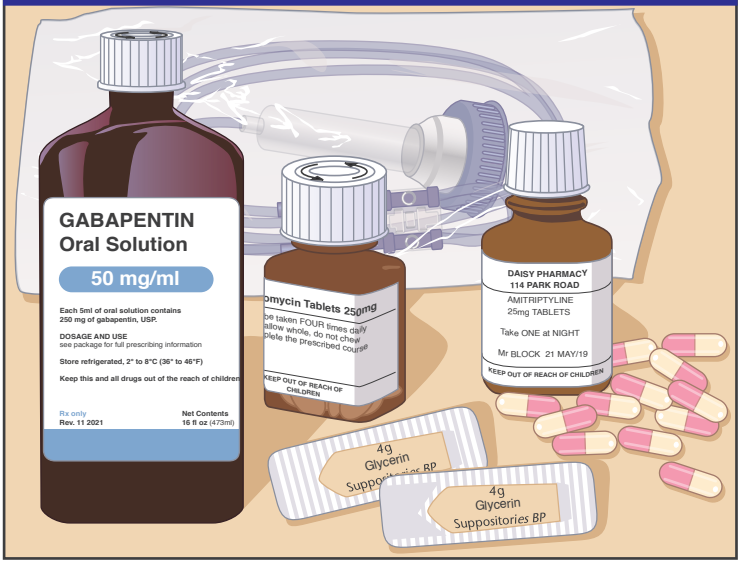
The prescription must indicate the route of administration for the prescribed medicine, as some have more than one route of administration. In order to avoid any possible confusion, the prescriber must write only one route on the prescription (not, for example, IV/oral). This handwritten prescription is for paracetamol, an analgesic used to treat mild pain, which is an example of a medicine that is commonly administered orally.

(b) Electronic prescription for an inhaled medicine



This electronic prescription for salbutamol, a medicine used to treat conditions associated with reversible airway obstruction such as asthma, specifies that administration is by the inhaled route.

Enteral routes



Enteral administration involves the gastrointestinal tract and includes any medicines administered via the oral route (e.g., oral tablets), the gastric route (e.g., liquid medicine via nasogastric tube), and the rectal route (e.g. suppositories/enemas). These medicines diffuse from the gastrointestinal tract into the bloodstream, and the circulatory system distributes them around the body (McFadden, 2014).

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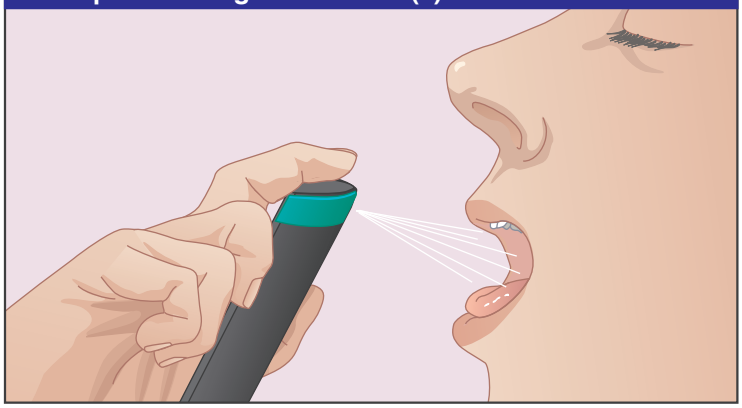
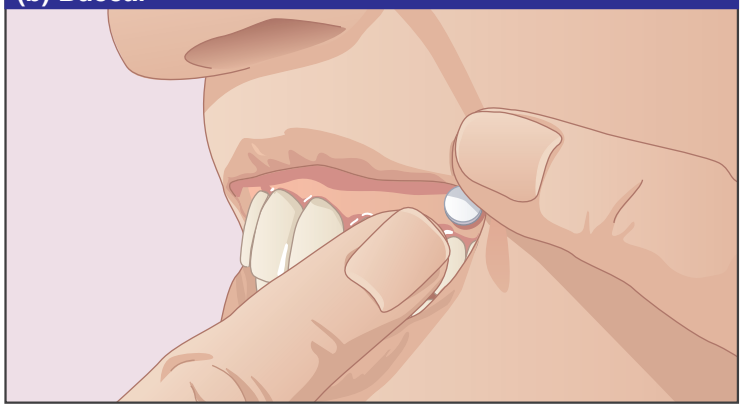
Absorption through the mouth (a)



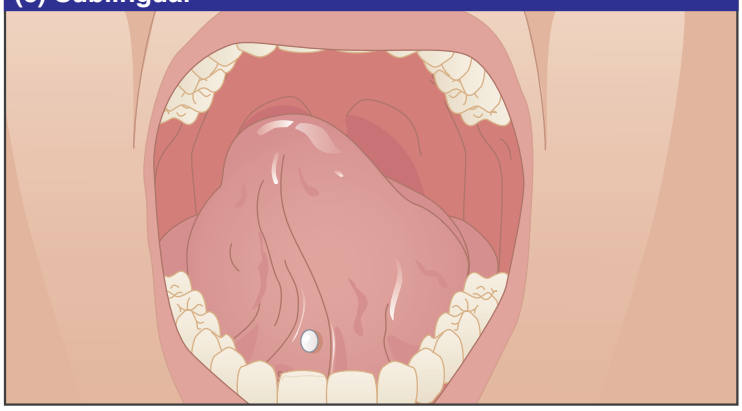
Orally absorbed medicine may take the the form of a tablet, lozenge or spray, e.g., nicotine replacement therapy, which is available in lozenge and spray formulations. Instruct the patient not to swallow the medicine, as they must absorb it through the oral mucosa (the lining of the mouth). Oral mucous membranes have a rich blood supply which enables rapid absorption of medicines into the circulatory system (Schellack, 2011). Do not give the patient any food or drink until they have absorbed the medicine.

(b) Buccal



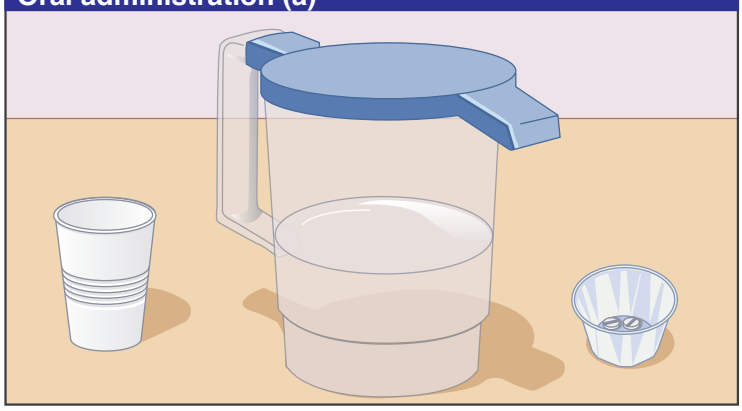
Administer a buccal medicine by placing it in the oral cavity between the gums and inner lining of the cheek. Here, the medicine will dissolve and diffuse into the bloodstream via the buccal mucosa, bypassing the gastrointestinal tract and avoiding deactivation. Prochlorperazine, an anti-emetic used to relieve nausea and vomiting, is available in a buccal formulation (*BNF*, 2019). Patients may mistakenly swallow buccal medicines, and some patients find the taste of medicines administered in this way unpalatable.

(c) Sublingual



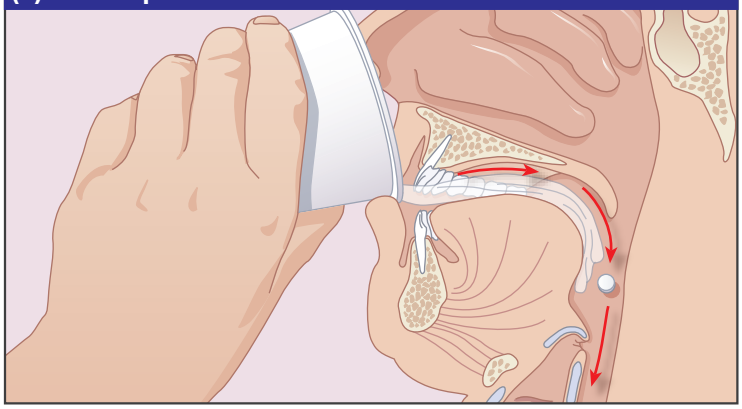
You should place sublingual medicines under the tongue, from where they will undergo rapid absorption into the bloodstream. An example of a sublingual medicine is glyceryl trinitrate (GTN), which treats chest pain associated with angina and is available in sublingual tablet and spray formulations (*BNF*, 2019). Some patients find it difficult to hold the dose under the tongue and may inadvertently swallow it, which will affect the efficacy of the medicine.

Oral administration (a)



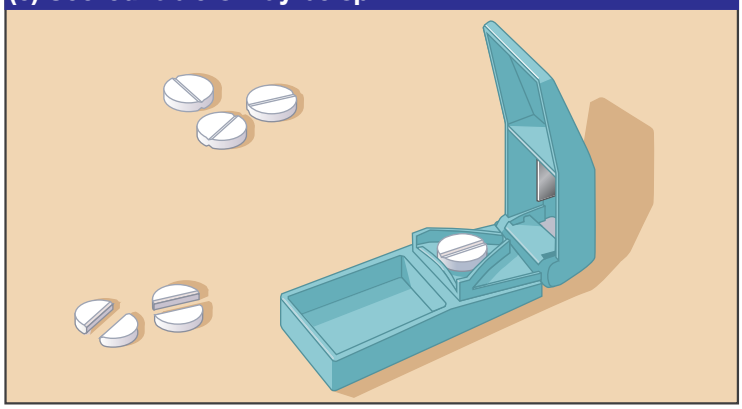
Orally administered medicines include tablet, capsule and liquid formulations. The patient swallows the oral medicine which then passes into the bloodstream through the stomach or intestinal tract. Give solid medications, such as tablets, with a glass of water, to ensure that they get into the stomach and do not stick in the oesophagus. Oral formulations are easy to prepare and quick to administer, so they are a cost-effective and common method of medicine delivery.

(b) Advise patients to swallow tablets whole



Mechanical actions such as chewing, and the effects of enzymes in salivary and gastric secretions can break down and partially deactivate oral medicines before the body has a chance to absorb them into the circulatory system. For these reasons, it may be necessary to give oral formulations in higher doses than medicines administered by other routes. Advise patients to swallow tablets whole to prevent premature breakdown of the medicine.

(c) Scored tablets may be split



Do not crush or break coated or unscored tablets, or those labelled “slow-release” or “sustained-action”, as this may affect the delivered dose and absorption of the medicine into the body (Smyth, 2019). Use a tablet splitter (pictured) to break scored tablets, otherwise you could give an inaccurate dose. Crushing tablets will make their use unlicensed, so do so only with the approval of the pharmacist and/or prescriber.

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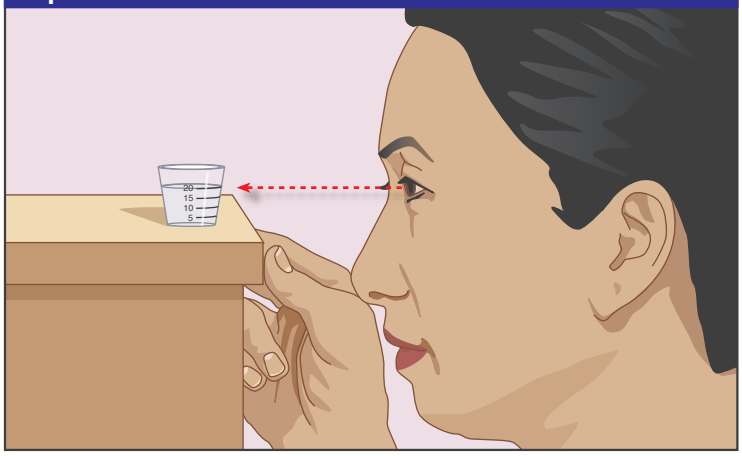
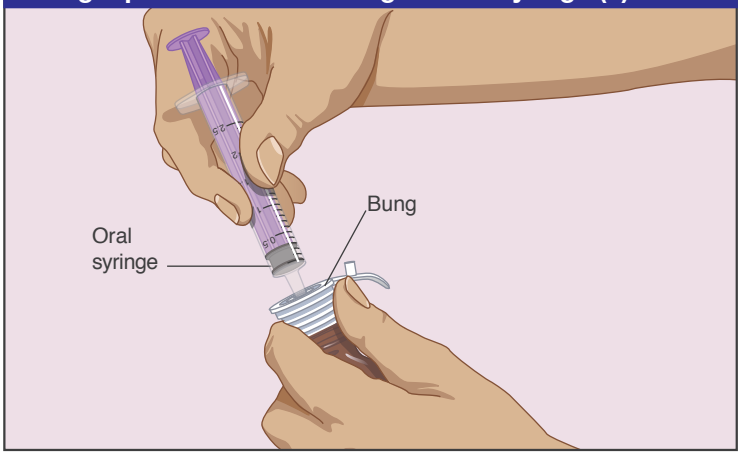
Liquid medications via the oral route



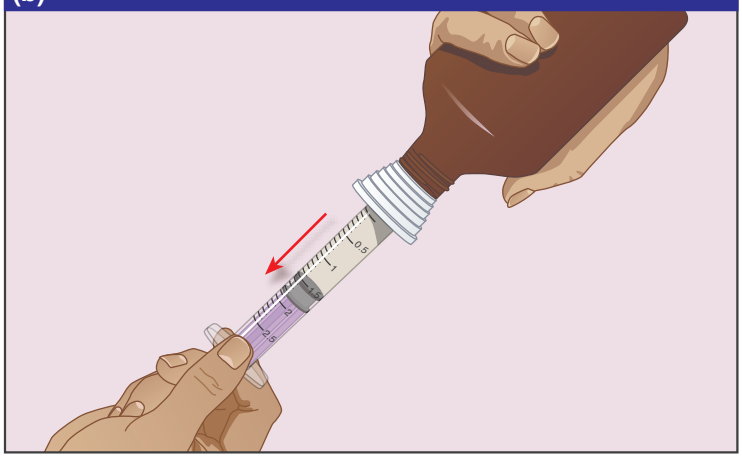
To administer liquid preparations orally, shake the bottle before pouring the liquid. Pour the liquid into a measuring pot on a flat surface and read the graduations at eye level for accuracy (see also NPSA, 2007).

Giving liquid medication using an oral syringe (a)



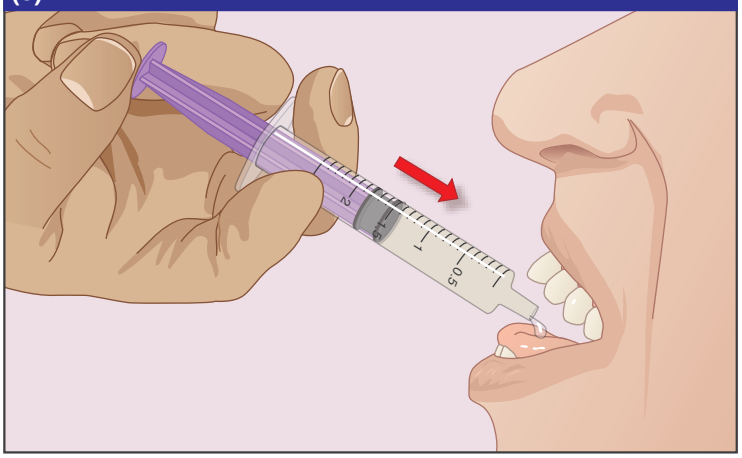
Wash your hands. Remove the lid from the bottle and fit the bung from the oral syringe. Push the syringe into the hole on the top of the bung. These syringes do not work with Luer lock needles. Never use a parenteral syringe for giving oral medicines; instead, use a specific oral syringe (HSIB, 2019).

(b)



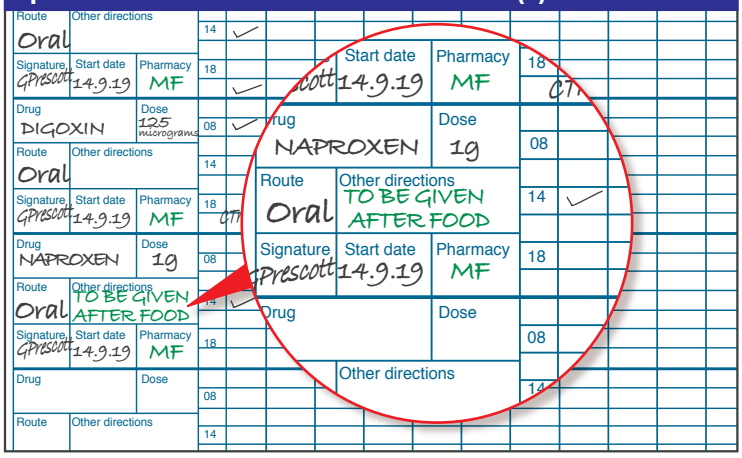
Turn the bottle upside down and slowly withdraw the correct amount of liquid. Check that the syringe contains no air bubbles. Give the medicine immediately after drawing it from the bottle.

(c)



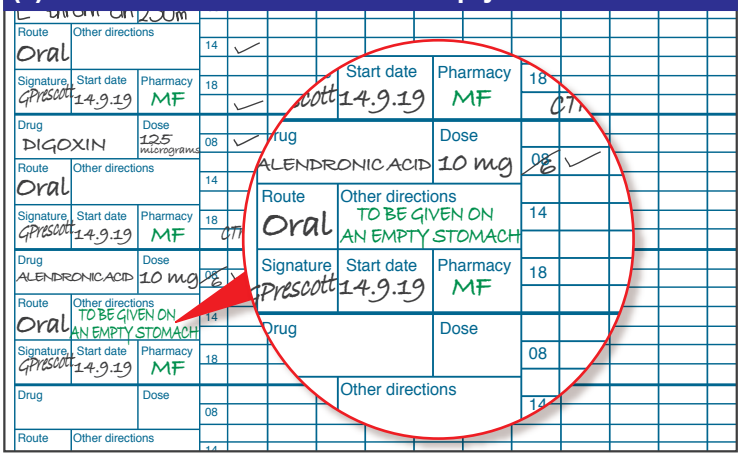
With the patient sitting upright, gently tip the patient's head back and administer the medicine under or above the tongue. If the patient is unable to sit, assist them into a side-lying position to ease swallowing and prevent aspiration.

Special instructions for oral medicines: (a)



Check the medication administration record for any special instructions from the pharmacist about how to administer the medicine. For example, "to be given after food", if the patient is taking medicines that could cause irritation or ulceration of the stomach lining, such as non-steroidal anti-inflammatory drugs (NSAIDs).

(b) Medicines to be taken on an empty stomach



The pharmacist will give an additional instruction such as "to be given on an empty stomach" when the presence of food in the stomach may affect the absorption rate of the medicine, making it less effective. Bisphosphonates, commonly used to slow bone loss and reduce the risk of fractures, are a group of medicines that should be taken on an empty stomach (*BNF*, 2019). However, you may allow the patient to have water in order to ensure the medication reaches the stomach.

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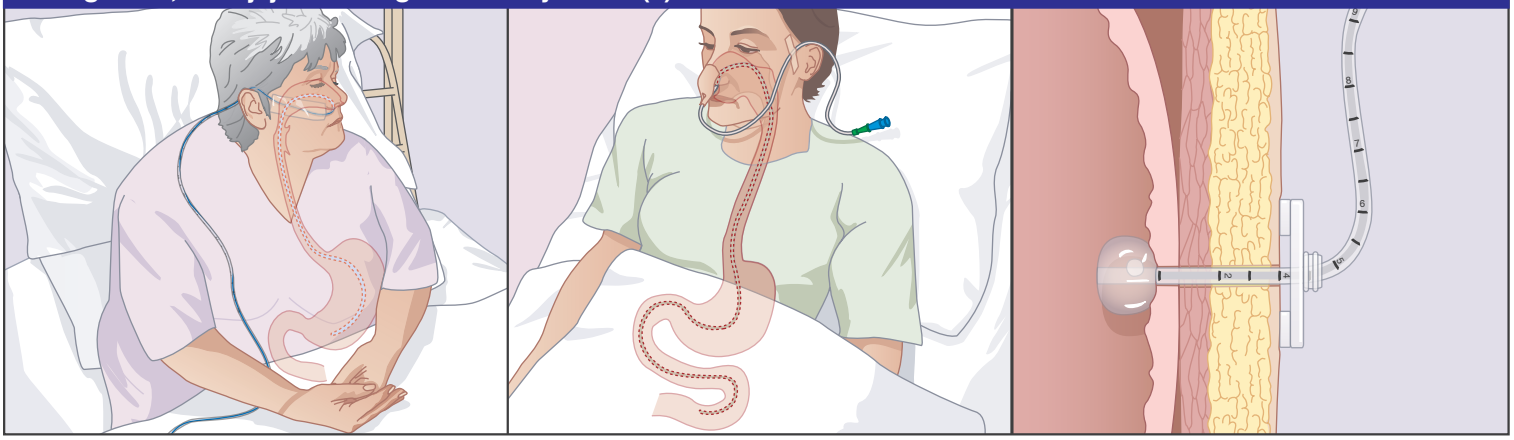
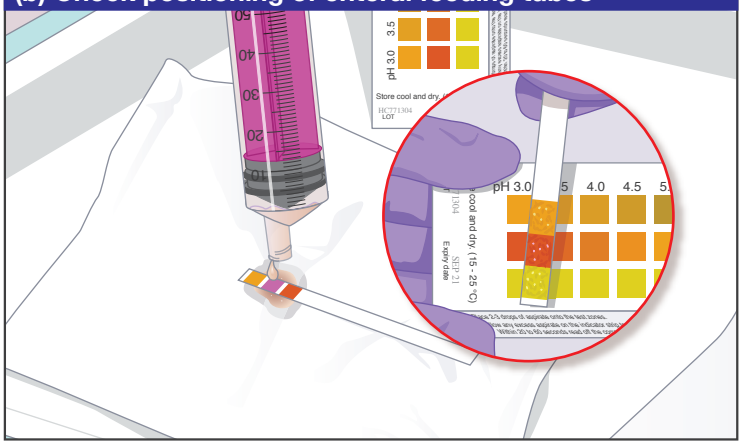
Nasogastric, nasojejunal and gastrostomy tubes (a)



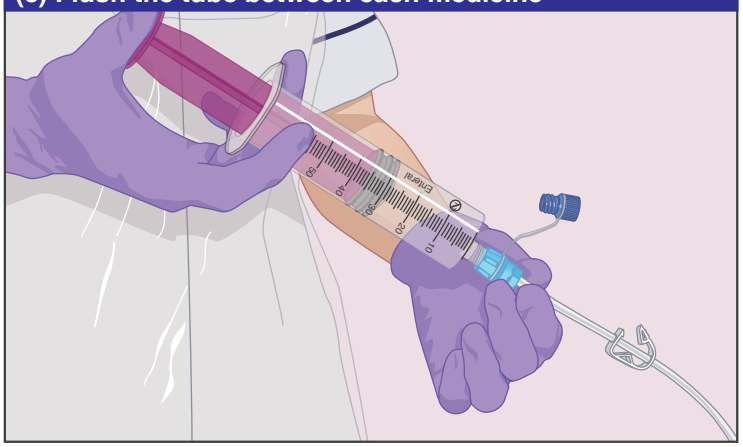
It is possible to administer medicines via enteral feeding tubes that provide direct access to the stomach or small intestine (CQC, 2018). Nasogastric tubes pass via the nose directly into the stomach; nasojejunal tubes pass via the nose and into the jejenum (small intestine); and gastrostomy tubes pass through the abdominal wall directly into the stomach. Liquid preparations are the easiest to administer via these routes. Do not crush tablets to administer medication via these routes unless advised to do so by a pharmacist; not all tablets are suitable for crushing, as this can affect absorption. In addition, small-bore tubes can block if used to give crushed tablets. If in any doubt, consult a pharmacist (Downie *et al.*, 2008).

(b) Check positioning of enteral feeding tubes



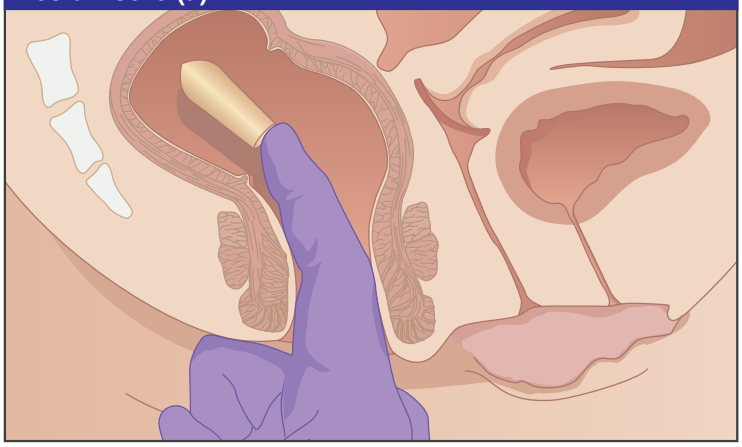
Follow local policy for checking the position of enteral tubes. Ensure that a nasogastric tube is correctly positioned in the stomach before administering medicines by this route (NHS Improvement, 2016). (Also, see clinicalskills.net procedure, "Inserting a fine-bore nasogastric tube".) Check the position of nasojejunal tubes by comparing the position of external markers at the nostril to the position documented at insertion (NICE, 2017).

(c) Flush the tube between each medicine



Administer each medicine separately with a flush of water between each (CQC, 2018). (See also the clinicalskills.net procedures, "Medicines administration via a gastrostomy/PEG tube" and "Administration of medicines: key principles".)

Rectal route (a)



Administer rectal medication by inserting it into the rectum via the anus, for absorption through the rectal mucosa to act systemically, or for a local effect, e.g., to relieve the symptoms of haemorrhoids. Available rectal medications include solid (suppository) and liquid (enema) formulations. Medications that you may administer via the rectal route include anti-inflammatory medicines, e.g., diclofenac, and anti-emetics, e.g., domperidone.

(b)

You may use the rectal route to administer medicine when the patient is unable to take medication orally, for example because of nausea or vomiting. Patients should have an empty bowel before rectal administration of medicines as faeces may inhibit their absorption. (See also the clinicalskills.net procedures on "inserting a rectal suppository" and "Administration of an enema".)

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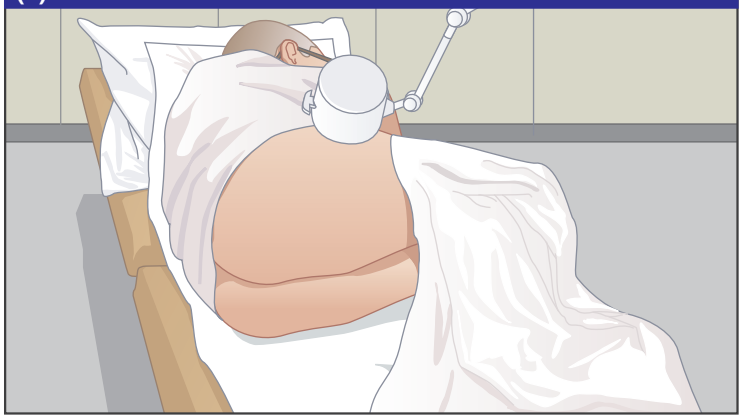
(c) Difficulties with rectal administration

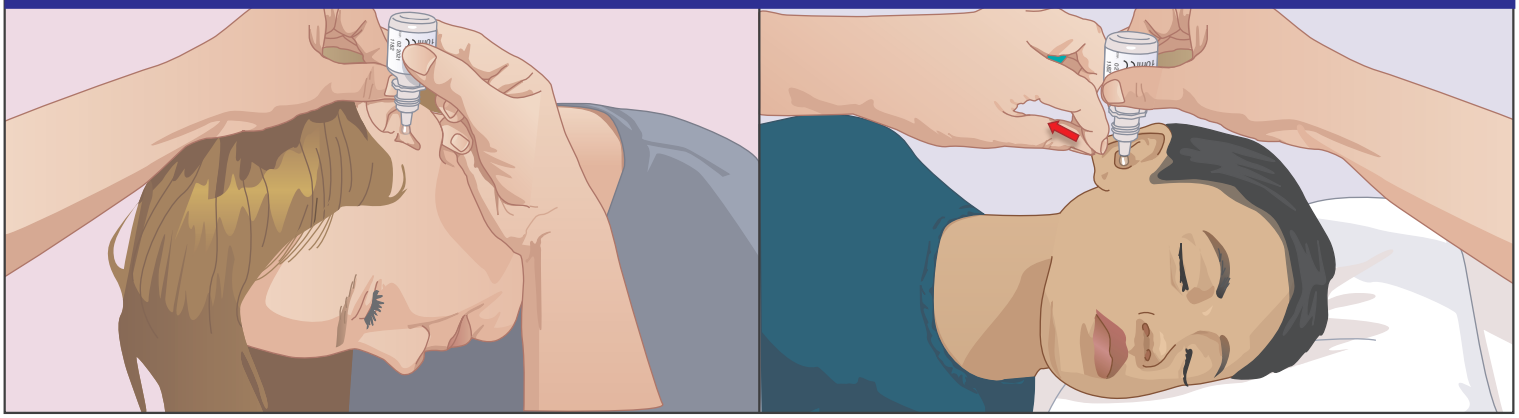


The rectal route is a useful route of administration, but many patients find it embarrassing and unacceptable (Crouch & Chapelhow, 2008). Some patients find it difficult to retain rectal medication. To encourage retention and absorption, the patient should lie on the left side, as the rectum runs downward when in this position; expulsion of medication may still occur.

Parenteral routes

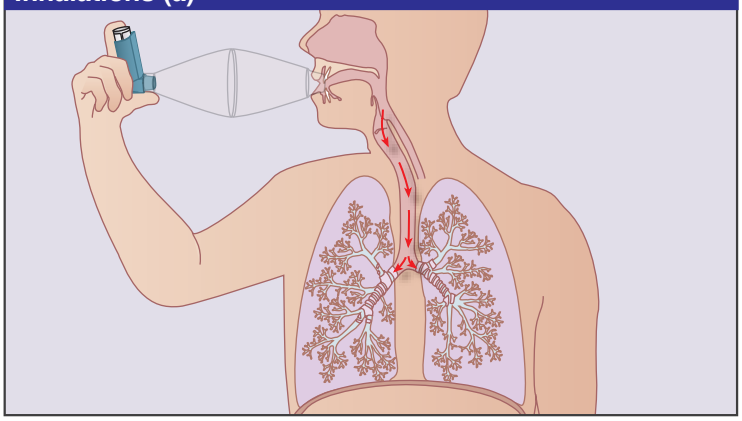
Parenteral routes of administration bypass the gastrointestinal tract (McFadden, 2014). Parenteral formulations include patches, creams, sprays, drops, inhalers, nebulisers and injections. Sometimes these formulations have a systemic action while others deliver the medicine directly to the site of action (topical administration), e.g., lignocaine, a local anaesthetic which is used to numb the skin and subcutaneous layers before suturing.

Aural administration in adults and children



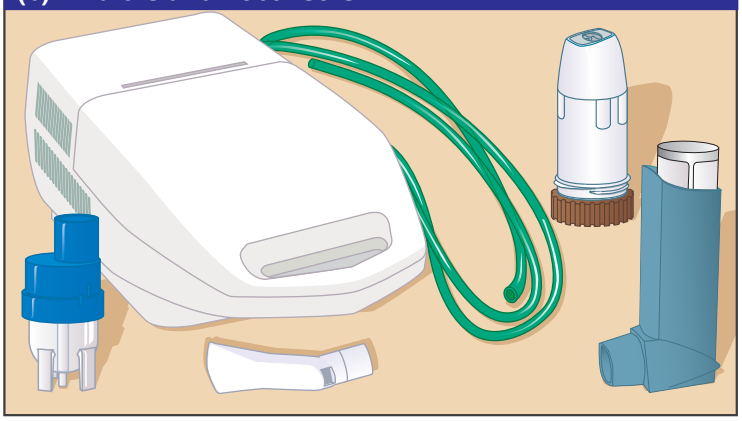
Aural medication, which is inserted into the ear, has only local effects. The prescription should state the number of drops to be administered and whether the patient needs the drops in the right, left or both ears. The patient should tilt their head to one side so that the drops administered into the external auditory canal will run downwards into the auditory canal. To ensure the medication is accurately administered in adults (left), gently pull the outermost part of the ear (the pinna) in an upward and backward direction to straighten the ear canal (British Society of Audiology, 2016). In children (right), you should pull the pinna in a downward and backward direction (British Society of Audiology, 2016). (See also the clinicalskills.net procedure, “Instillation of ear drops”.)

Inhalations (a)



Administration via the inhaled route delivers medication into the lungs. The respiratory membrane in the lungs has a very large surface area with an excellent blood supply, so the body rapidly absorbs these medications. Inhaled medications have local effects on the bronchial mucosa or smooth muscle of the respiratory tract. Examples include inhaled bronchodilators, e.g., salbutamol, which treat the symptoms of asthma and COPD (NICE, 2019).

(b) Inhalers and nebulisers



Inhalers deliver a single dose of medication under pressure. Nebulisers deliver a continuous stream of medication over a limited period of time: the liquid medication becomes a fine spray as pressurised air or oxygen is passed through it. The patient inhales the spray via a face mask or mouth piece. (For more information, see the procedure on “Nebulisers”.)

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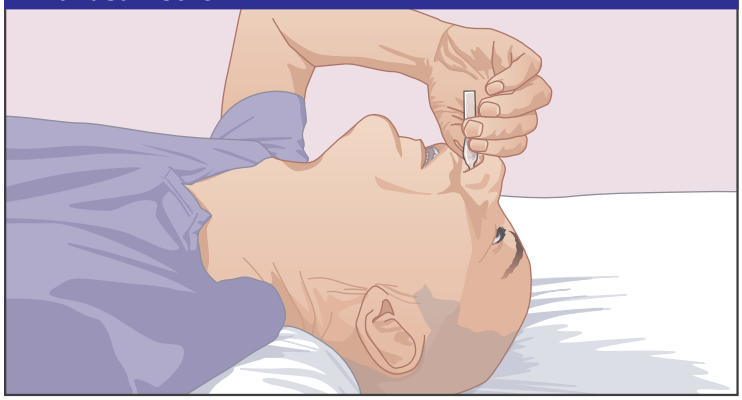
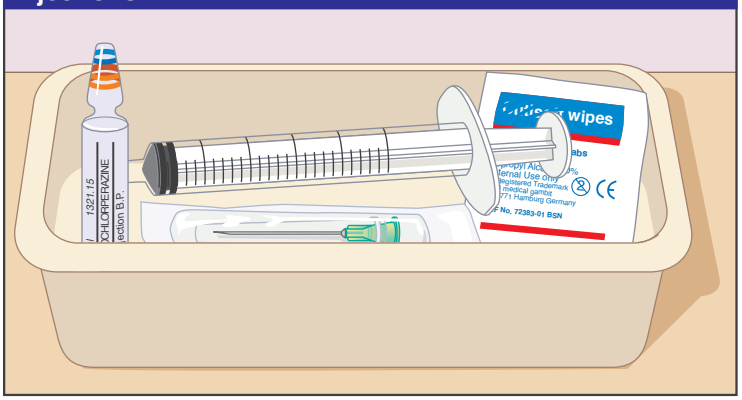
Intranasal route



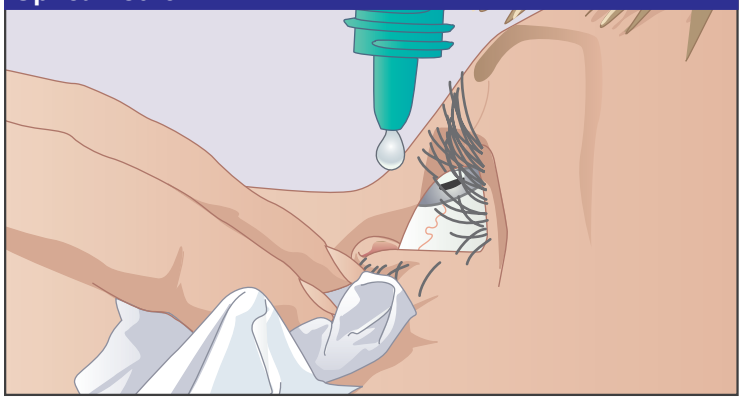
Intranasal medications include sprays, ointments and powder formulations. An example is an intranasal formulation of the steroid fluticasone, which is administered via droplets into each nostril in order to treat rhinitis. Intranasal medicines can enter the circulatory system via the nasal mucosa, with its rich blood supply, and exert a systemic effect. Intranasal medicines work best when the nasal passages are clear (Andrews & O'Brien, 2014).

Injections



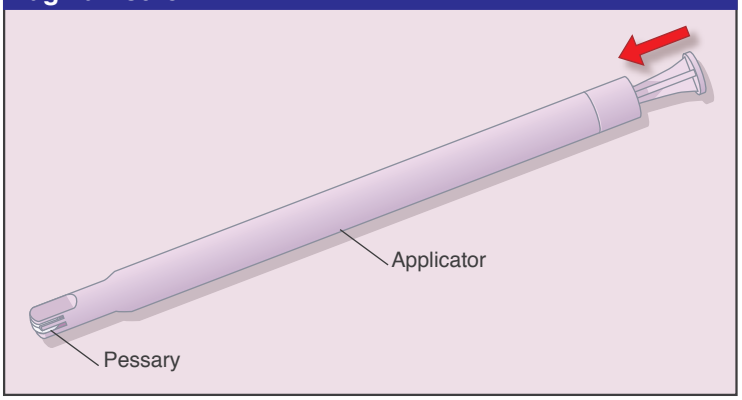
In order to administer medication by injection, it is necessary to penetrate the skin using a needle and syringe, unless the patient has a device in place, such as a cannula. The different injection routes include: subcutaneous, intramuscular, intradermal and intravenous. For more information about the different injection routes, see the clinicalskills.net procedures in the "Injection Administration" section.

Optical route



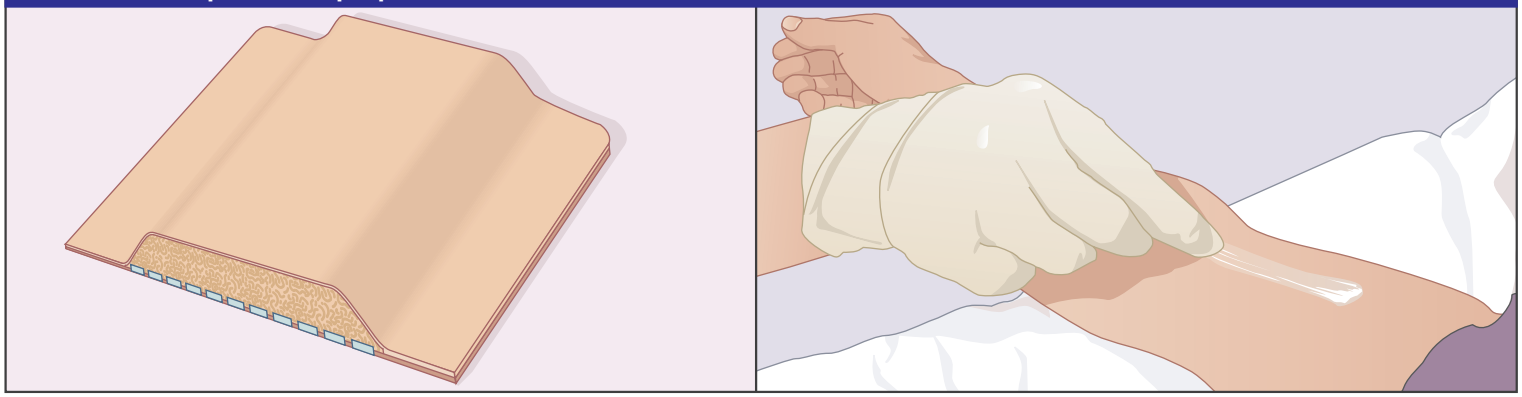
Medicines that are administered into the eye exert a local (topical) effect. The prescription should state the number of drops required and whether the patient needs the drops in the right, left or both eyes. Using a separate bottle/tube of medicine for each eye can reduce the risk of cross-contamination. For more details, see the clinicalskills.net procedure, "Instillation of eye medication".

Vaginal route



Vaginal medicines exert a topical effect. Normally, the patient will use an applicator to insert the medicine high into the vagina, either in the form of a pessary (vaginal suppository) or a cream. An example of a medicine administered via the vaginal route is clotrimazole, which is available in cream and pessary formulations to treat fungal infections such as candidiasis (*BNF*, 2019).

Transdermal/topical skin preparations



Formulations that are applied to the skin include pastes, creams, ointments and patches: some, such as fentanyl, pass through the skin into the bloodstream and have a systemic effect, while others act locally, such as emollients used to treat eczema. Prescriptions for dermal creams and ointments often state the amount to be applied as weight in grams; as an approximate guide, 2 g is a 10 cm length from a standard tube nozzle (Greenstein, 2009). It is important to use the correct amount, and ensure that you apply certain ointments and creams sparingly, e.g., steroid creams. Healthcare professionals should wear gloves when applying dermal preparations, to prevent absorption of the medicine into their own skin (Andrews & O'Brien, 2014). Administering medicines such as the analgesic fentanyl or hormone replacement therapy via impregnated, adhesive transdermal patches, ensures slow absorption of medicine through the skin resulting in steady blood levels. Place the patch on clean, dry and relatively hairless skin, where it will not get dislodged. Rotate the application site when applying a new patch, and document that you have done so (Andrews & O'Brien, 2014). To reduce the risk of adverse incidents when using transdermal patches, do not cut patches, avoid exposing them to heat (including hot water from baths and showers), and always remove old patches before applying a new one (MHRA, 2018).