6 Safe administration of medicines

It is the nurse's responsibility safely to prepare and give the drugs ordered by the doctor. If not given properly, medicines can be harmful or even fatal. Before giving any medication the nurse needs to know:

- the doses of the drug which are safe to administer
- the dose of the drug which has been prescribed for the patient
- the method of administration
- the drug's actions and expected effects
- possible side effects (unintended effects).

It is also important to know if a patient is allergic to a drug. Ask your patients about any bad reactions they have had to drugs in the past.

Five rights of drug administration:

◊ **right dose**
◊ **right drug**
◊ **right patient**
◊ **right route**
◊ **right time**

For safe administration of drugs: give the right dose of the right drug to the right patient in the right route at the right time.

When giving medications, the nurse needs to be aware of possible interactions between the patient's different drugs. Drug interactions can sometimes harm the patient.

It is the nurse's responsibility to protect the patient from harm. If you think the wrong drug or the wrong dose has been ordered, ask for help from the nurse or the doctor in charge.

Right dose

The nurse needs to know the doses of the drug which are safe to administer. Sometimes the pharmacy gives out drugs in grams when the order specifies milligrams, or the other way around. You need to convert these. Remember that:

1000 mg (milligrams) = 1 g (gram)

1000 g = 1 kg (kilogram)

1000 ml (millilitre) = 1 l (litre)

Liquid medicines

Sometimes liquid medicines are given in a vial or an ampoule. A vial is a glass or plastic bottle that may hold one or more doses of a drug. An ampoule is a small sterile plastic or glass container that holds one dose of a drug. Usually it has a small neck with a coloured mark to show where the neck can easily be snapped off and the drug drawn out .

Sometimes the vial may contain more than the dose you need to give. You need then to work out how much of the solution to give in order to have the correct dose.

You can calculate using this formula:

Dose you want (mg)
- - - - - - - - - - - - - - - x volume on hand = amount (volume in ml) needed to give
Dose on hand

Thus, if you need to give a dose of 500 mg of ampicillin and it is in a solution containing 250 mg in 5 ml, you would work out this formula:

$$\frac{500}{250} \times 5 \text{ ml} = 10 \text{ ml}$$

The correct dose would be 10 ml.

Pills or capsules

If the drug is in pills or capsules, look at the container to see how much of the drug is in each pill. If the drug is not separately packaged in the amount you need, calculate the amount to use. The correct number of pills is the desired dose divided by the amount of drug in each pill.

If you need to give 100 mg of the drug, and each pill in the bottle has 50 mg, then you need to give the patient two pills. Sometimes you have to calculate a fractional or smaller dose, particularly when giving a drug to a child. Adult dosages of most drugs are standard, but children's doses are not standard. A child's dose is normally based on his or her body weight in kilograms.

Right route

There are several routes for administration of drugs:.

- **by mouth** (orally), in pills, capsules or liquids
- **by injection** (parenterally), into the body tissues by a needle and syringe
- **on a certain area** (topically), applied to the skin or mucous membranes
- **in the eye or ear**
- **into the rectum** (rectally), in suppositories or by inserting some fluid.

Always make sure that you are using the right route.

Right drug

To make sure that you give the right patient the right drug, check what you are doing at every step.

Guidelines for administering medication:

- Check the patient's medication card or record against the doctor's order. Make sure that what is on the card is what the doctor ordered.
- Compare the label on the medicine bottle or package wrap with the patient's medication card or record. Make sure that you have the right medicine.
- After you have prepared the medication, recheck the label before taking the medicine to the patient's room.

Right patient

Make sure you give the right medication to the right patient. Many patients have similar last names. Therefore you must:

- check the medication card/record against the patient's name on the bed or other patient identification
- ask the patient to tell you his or her name.

Right time

Many drugs are ordered for certain times of the day. Insulin, for example, is normally given before meals. Antibiotics are usually ordered every 6, 8 or 12 hours, throughout the day and night (around the clock), not just during waking hours. They must be given around the clock to maintain high enough levels of the drug in the patient's body. Diuretics are usually given in the morning rather than the evening, so that the patient's sleep is not disturbed by frequent urination. Know the medication schedule your hospital or institution uses and give drugs at the scheduled times.

Giving oral medication

The easiest, safest and most convenient way to give medication is through the mouth. If you know that it is difficult for the patient to swallow, you can crush tablets into a powder. Then mix the powder with some soft food that the patient can swallow. Not all drugs can be crushed. For example, drugs with a protective coating or those in a slow release form should not be crushed.

Wash your hands. Calculate the amount you need. Take the liquid or solid medicine to the patient's room on a cart or tray, and make sure that you have the right person.

If you are giving any medicines that require you to assess the patient, do that first. If the vital signs indicate problems, check with the doctor or the nurse in charge before giving the drug.

> ***Clinical alert*: Drugs that require you to check vital signs include:**
>
> - **digoxin--check pulse**
> - **hypotensive drugs (drugs that reduce blood pressure)--check blood pressure**
> - **narcotics--check breathing.**

If this is the first time the patient is getting a medication, explain what the drug is for. If it has side effects, tell the patient what to expect.

Help the patient to sit up or lie on one side. This makes it easier to swallow the medicine.

If the patient says that this medicine is not the same as he or she was given before, check the order again to make sure that it is correct.

Give liquid medicine in a cup to the patient to swallow. If the patient cannot hold the cup, bring it to his or her mouth. If the medicine has an unpleasant taste, give the patient some juice or bread with the medicine to cover its taste.

Give a glass of water to the patient with the pills. This will help the patient to swallow. If he or she cannot hold the cup, you should hold it, and give one pill at a time, followed by a sip of water.

Clinical alert: **Stay with the patient until he or she has swallowed all the medicines.**

Always go back and check the patient for any adverse reactions or side effects from the medication.

Write down the medication the patient has taken. Give the name of the drug, dose, method of administration, time of administration and any important patient information such as the pulse rate.

Oral medication for children

Many medications are given to children in a dropper, a syringe or cup. It is important to measure small amounts of medicine accurately. For volumes less than 1 ml, use a tuberculin syringe, if one is available, or other syringe, with no needle attached. You can put the medication directly into the child's mouth from the syringe, or pour it from a small cup.

Young children and some older children have trouble swallowing pills. If a liquid preparation is not available, crush the tablets and mix them with soft food.

Give medication to children while they are sitting up, so that they do not choke on it.

> ***Clinical alert*: The safest and cheapest way to give medicine is by mouth.**

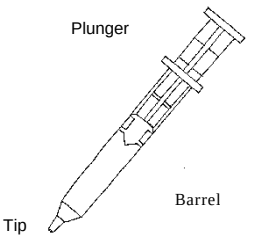
Injecting medication

Medicine may be injected (given parenterally) into the skin, under the skin, into a muscle, or into a vein. Drugs given in any of these ways are absorbed more quickly than drugs taken by mouth. Therefore it is especially important to be sure that you give the right drug to the right person in the right amount.

To give medicines parenterally, the nurse uses a vial or ampoule, a syringe and a needle. A syringe has three parts: the tip connecting with the needle; the outside or barrel, on which a scale is printed, usually in millilitres, to indicate how much is in the syringe; and the plunger, which fits inside the barrel and is used to push the drug up into the needle. Re-usable glass syringes and disposable plastic syringes are used in many hospitals and clinics. The plastic syringes are usually in individual packages to make sure they are sterile. They may come already filled with a unit dose.

> ***Clinical alert:* Plastic syringes must be thrown away after use to prevent the spread of infection.**

There are different sizes of syringes for different uses. The most common types are the hypodermic syringe (which is used to give medication), the insulin syringe and the tuberculin syringe. The insulin syringe is like the hypodermic syringe but it has a special scale on the side that shows the amount of insulin inside. The tuberculin syringe is narrow and is marked (calibrated) in tenths and hundredths of a millilitre. This type of syringe is useful for giving very small doses.



The three parts of a syringe

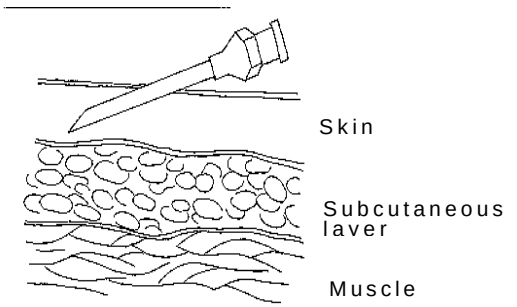
The needle also has three parts: the hub, which fits onto the syringe; the thin shaft fastened to the hub; and the bevel, which is the slanted part at the tip. Needles may be shorter or longer, with larger or smaller diameters (gauges) and smaller or longer slants. The gauge may vary from #14 to #28. The one with the largest diameter is #14 and #28 is the smallest.

Needles with longer bevels are sharper and are less uncomfortable for the patient. For injections under the skin, use a short needle with a small diameter and long bevel.

For injections into the muscle, use a longer needle with a larger diameter and a long bevel. Use a short bevel for injections into the skin or into a vein. Children and small adults usually need shorter needles. Assess the patient to decide on the right size. All packaged needles come with a cap.

> ***Clinical alert:*** **Never leave a needle in a vial.**

Injections into the skin



Intradermal injection

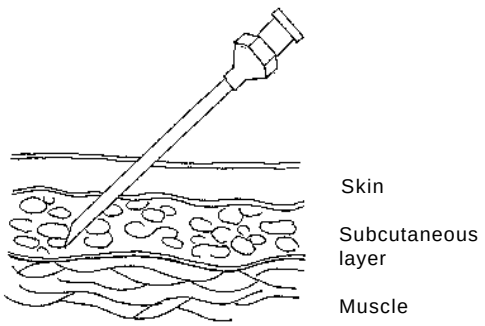
An intradermal injection is given in the dermal layer of the skin, just below the top layer, which is called the epidermis. Intradermal injections are used for allergy tests, tuberculin tests, and many immunizations. The most common site for this type of injection is the lower arm. Other sites include the upper chest and the back beneath the shoulder blade. BCG vaccination is also given intradermally. The most common sites are the upper arm, forearm and buttocks or upper thigh. To give a BCG injection or other intradermal injection:

- Wash your hands before you begin.
- Check the name of the patient.
- Tell the patient that the injection will cause a small lump, like a mosquito bite or small blister, but it will disappear quickly. Select a site that has no discoloration or rash or broken skin. Clean the site with alcohol if you have it, or another cleansing agent, using a circular motion.
- Pull the patient's skin flat. Hold the syringe at about a 15^{o} angle, and insert the needle through the epidermis into the dermis.
- Inject the fluid slowly until a lump appears. This indicates that the fluid is in the dermis.
- Take the needle out quickly and lightly wipe the site with an antiseptic swab or cotton ball.

Clinical alert: **Do not massage the injection site because that might make the medication go into the tissue or out of the injection site.**

Injections under the skin

Subcutaneous injections go into the fatty tissue just below the skin. Many drugs are injected subcutaneously, including vaccines, preoperative medications, narcotics, insulin and heparin. Common sites for subcutaneous injections are: the backs of the upper arms and the fronts of the thighs, the upper back, and the fat pads on the abdomen.



Subcutaneous injection

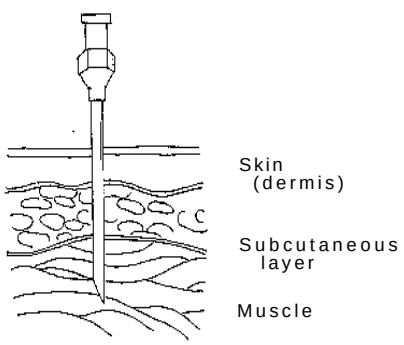
- Wash your hands.
- Before giving the medicine, check the patient's name.
- Draw the medication into the syringe.
- Get rid of any air bubbles in the syringe by tipping the syringe upside down and slowly pushing the plunger until you can see a drop of solution in the needle's bevel or end.
- Grasp the patient's skin with the thumb and forefinger of your left hand (right if you are left-handed) to raise up the subcutaneous tissue and form a fat fold.

- With your right hand, put the needle in at a 45° or 90° angle and pull slowly back on the plunger to see whether you have entered a blood vessel.

Clinical alert: **If blood comes into the syringe when you pull back the plunger, you have hit a vein. Then you must withdraw the needle, discard the syringe and prepare a new injection. That is because subcutaneous injections can be dangerous if they go directly into the bloodstream, where they are absorbed more quickly than from the fatty tissue.**

- If no blood comes into the syringe, give the injection by slowly and steadily pushing the plunger.
- Quickly take the needle out and press down on the skin.
- There is usually no bleeding from subcutaneous injections. However, if there is bleeding, press gently until it stops.

Injections into the muscle



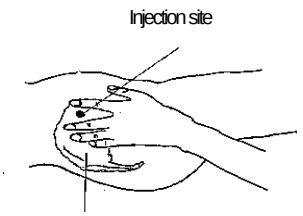
Intramuscular injection

Intramuscular injections (that is, injections into the muscle) are absorbed faster than subcutaneous injections. Large injections (up to 1-2 ml for a child and 3 ml for an adult) can be given this way because muscle can absorb more fluid than fatty tissues.

The preferred sites for intramuscular injections are the dorsogluteal site in the gluteus medius muscle in the posterior hip or the ventrogluteal site in the gluteus medius muscle in the lateral hip (see below).

Ventrogluteal site

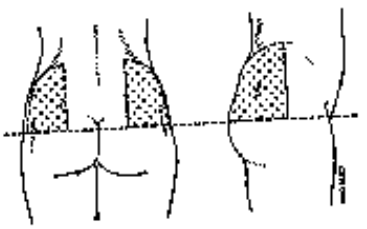
The ventrogluteal injection site is easy to identify and safe to use. It avoids major nerves and blood vessels.



Ventrogluteal site for intramuscular injection

Dorsogluteal site

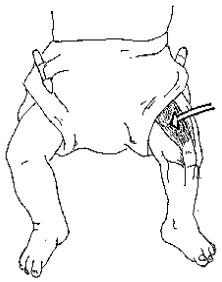
If you use the dorsogluteal site, you must be careful to avoid the sciatic nerve, because accidental injection into this nerve can cause permanent or partial paralysis of the leg.



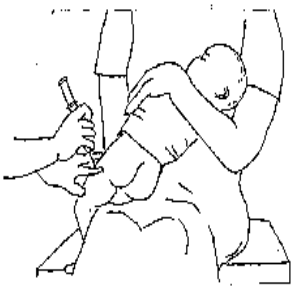
Dorsogluteal site for intramuscular injection

Clinical alert: **Never use the dorsogluteal site in the posterior hip for infants or children who have not yet begun to walk. Give the injection in the rectus femoris muscle or the vastus lateralis site in the middle third of the thigh.**

Intramuscular injection sites for infants and small children



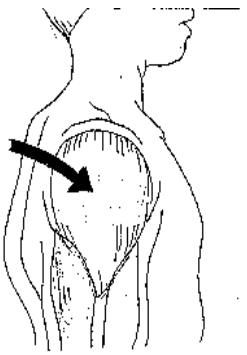
Rectus femoris site for intramuscular injection



Giving intramuscular injection to child. Vastus lateralis site for intramuscular injection

Deltoid muscle

The muscle of the upper arm, the deltoid muscle, can also be used for an older child or an adult. However, remember that you cannot inject as much fluid into the arm as into the muscles of the hip.



Injection into deltoid muscle

How to give injections into the muscle

- Wash your hands.
- Protect the patient's privacy by putting a sheet over body parts that do not need to be exposed.
- If you are giving an injection to a child, show the mother how to hold the child.
- Choose a site for the injection that has no broken skin, swelling, hardness, tenderness, redness or warmth. Locate the exact site and clean it

> ***Clinical alert:*** **Do not inject more than 1 ml into the arm of an adult or a child.**

with an antiseptic swab or cotton ball using a circular motion and extending outward about 5 cm on each side or 10 cm in total.

- Using your left hand, stretch the skin at the site. This makes it firmer so that it is easier to insert the needle.
- Insert the needle quickly at a 90^{o} angle through the skin and into the muscle.
- Aspirate by pulling back on the plunger. If blood appears in the syringe, pull out the needle, throw away the syringe and prepare a new injection.

Clinical alert: **Do not let the injection go into a blood vessel.**

- If blood does not appear, then slowly, steadily push the plunger to inject the medication.
- Quickly remove the needle and apply firm pressure to the site using an antiseptic swab.
- Wash your hands.

Intravenous therapy (drip)

Intravenous therapy is putting a sterile fluid through a needle directly into the patient's vein. Usually the sterile fluid contains electrolytes (sodium, calcium, potassium), nutrients (usually glucose), vitamins or drugs.

Intravenous therapy

Intravenous (IV) therapy is used to give fluids when the patient cannot swallow, is unconscious,

is dehydrated or is in shock, to provide salts needed to maintain a balance of electrolytes, or glucose needed for metabolism, or to give medication.

Drugs given intravenously enter the bloodstream directly and are absorbed faster than any other kind of medication. Therefore, drugs are given in this way when a rapid effect is needed, or when the drug is too irritating to body tissues to be given any other way. Drugs given in this way are usually put in (infused) slowly to prevent reactions.

Guidelines for intravenous therapy

- Know the fluid or drug that is ordered, its actions and side effects
- Know the amount of fluid or drug to be given over what period of time
- Know the amount and type of solution in which drugs can be diluted
- Know how long a drug can be safely administered
- Know the compatibilities of all the drugs the patient is receiving
- Monitor carefully both the patient and the rate of infusion

How to give intravenous fluids and drugs safely

You must take special care to avoid errors in calculating doses and in preparing drugs, because intravenous drugs take effect immediately. Double check the five "rights" of drug administration: right dose, right drug, right patient, right route, right time.

You must also know the desired action and potential side effects of all the intravenous drugs you give.

- Most drugs require a minimum dilution and/or rate of flow.

- Many drugs are very irritating or damaging to tissues outside the veins.
- Only one antibiotic is given at a time intravenously. The IV line is washed out (flushed) between antibiotics.
- Never give medications, sterile water, or dextrose water with blood or blood products.
- You must carefully monitor all patients on IV therapy. Watch the patient for any signs of an adverse reaction, including a rash, trouble with breathing, increased pulse rate, vomiting, and signs of dehydration or fluid overload (for these last two signs see the chapter on caring for the patient who has problems with elimination).
- Check the insertion site for swelling, redness, hardness, pain or warmth.
- Check the IV flow rate to make sure it is correct. The flow rate must be monitored extremely carefully and frequently in infants, children, the elderly, acutely ill patients and patients with dehydration, heart or kidney disease or diabetes.

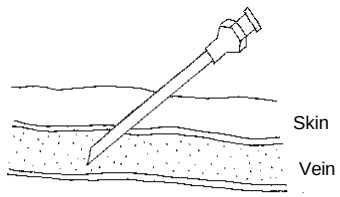
How to determine how fast the IV fluid should be going in:

- First work out the drop rate of the IV tubing. A macrodrip tube can deliver 10 or 15 drops per 1 ml. Microdrip tubing delivers 60 drops per 1 ml. The number of drops required for 1 ml is called the drop factor.
- Work out the number of millilitres of fluid to administer in an hour. Divide the total amount of solution to be delivered by the number of hours the infusion will last. Then multiply that figure by the drop factor.
- To determine how many drops to administer per minute, divide by 60.
- Count the number of drops per minute that are being infused. If that is not the correct flow rate, adjust the drip rate.

Starting intravenous therapy

The site for venepuncture (inserting the needle into the vein) is usually one of the veins of the forearm or hand. Patients requiring faster running infusions or blood transfusions require larger needles and therefore larger veins.

- Starting IV therapy requires sterile technique.
- Pick a vein that is easy to feel and that is fairly straight. The vein should be full, soft, and easy to feel. It should not feel hard or rubbery. Avoid veins that are inflamed (red and warm), irritated or painful.
- Try not to use a vein that has been used before, because it may be damaged.



Intravenous injection

How to add medication to an IV line

Intravenous medication can be given slowly from a bottle or bag containing a solution. This is called a continuous infusion and is similar to other intravenous therapy. Alternatively, the drug can be given all at once, and this is called an intravenous push or bolus. For a continuous infusion, the drug can be added to a new fluid container before it is hung or added to a container that is already running.

- Carefully check the medication order against the patient's medication card or record, just as you would for other routes of administration. Also make sure that the medication is compatible with the solution it is to be mixed with.

- Put the patient's name on the container with the name and amount of the drug, the flow rate, the time infusion begins, and your name or initials.

- Always check the patient to be sure that there is no adverse reaction to the drug being infused. Look for a change in pulse rate, chills, nausea, vomiting, headache or trouble with breathing. If the patient has a reaction, stop or slow the infusion rate and tell the doctor or the nurse in charge immediately.

- Record the name and amount of the drug, the solution to which it was added, and the time it was given.

How to give an IV push

For an intravenous push, you give the medication all at once, injecting the drug into an existing continuous infusion IV line.

- After inserting the needle, draw back the plunger to withdraw blood (to be sure the needle is in a vein).
- Inject the drug at the rate ordered. Be careful not to inject the drug too fast.

How to give a blood transfusion

Before giving a blood transfusion, send a sample of the patient's blood to the laboratory for typing and crossmatching, unless you already have clear information about this on the chart.

- When the blood arrives, make sure the patient's name, blood type and Rh factor are the same as those on the blood to be transfused. Do not give the blood if the information is not exactly the same.
- To prevent bacterial growth, transfuse the blood within 30 minutes of its arrival on the ward.
- Check the patient's vital signs before beginning.

- Make sure the drip chamber has a filter to trap clots or debris.
- Give a blood transfusion only with normal saline. Any other solution is incompatible with blood products.
- Stay with the patient for at least 15 minutes and observe him or her carefully for signs of a reaction. These signs include chills, nausea and vomiting, headache, muscle aches, difficulty with breathing, wheezing, fever, sweating, chest pain, tingling, numbness, and rapid pulse. **The sooner a reaction occurs, the more severe it is likely to be.**
- If there are any signs of reaction, stop the transfusion and notify the doctor immediately.
- If the patient shows no signs of reaction, continue the infusion. Check the vital signs 15 minutes after beginning the infusion. Then check again every 30 minutes until 1 hour after the transfusion is complete. Tell the patient to call a nurse immediately if he or she notices anything unusual.
- Record the time, the type of blood, the amount, and drip rate.

How to give eye medication or irrigate the eye

Sometimes the eye needs to be washed out, to clean it or to get rid of foreign particles. Also, medication may be given in the eye. Sterile technique should always be used to wash (irrigate) the eye or put in medication.

Irrigating the eye:

- Tell the patient what you are going to do and explain that it will not hurt.

- Ask the patient to tilt his or her head towards the side of the eye you are going to wash and place a small basin below the eye.

- Wash your hands. Using cotton balls moistened with sterile solution or saline, wipe the eyelids, working from the inner part to the outer side.

- Now separate the lids of the eye with your thumb and forefinger and gently press on the cheekbone beneath the eye to hold the eyelids apart and make a gutter.

- Hold the irrigator above the eye and direct the solution to the gutter. Work from the inner to the outer part of the eye.

- Then tell the patient to close his or her eye and move the eyeball around from time to time, to make sure the solution reaches all of the eye.

Instilling liquid medication into the eye:

- Tell the patient what you are going to do. Explain that it will not hurt, though the medicine may sting briefly.

- As the patient looks up, with the head tilted backward, gently pull the lower eyelid downward to make a gutter.

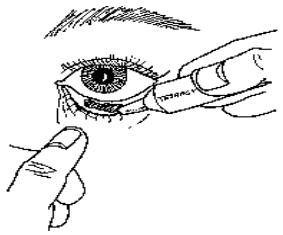
- Stand to the side of the patient as you work. He or she is less likely to blink if you are not directly in front.

- Put the correct number of drops into the gutter in the lower part of the eye, not directly onto the cornea.

Instilling ointment into the eye:

- To put ointment into the eye, ask the patient to hold his or her head back and look up.

- Discard the first amount of ointment that comes out of the tube. It is considered to be contaminated.



Medicine being put in the eye

- As the patient looks up, gently pull the lower eyelid downward to make a gutter.

- Hold the tube as close as possible above the eye, **without touching it,** and squeeze out 2 cm (about 1/4 the size of the fingertip) of the ointment into the gutter, working from the inner to the outer edge of the eyelid.

- Tell the patient to close the eye for two minutes but not to squeeze it shut.

When you have finished, give the patient a gauze sponge or cotton to wipe off the excess ointment on the eyelid.

How to give medication in the ear

The ear sometimes needs to be irrigated to soften earwax, remove pus, or take out a foreign object in the ear canal (see the chapter on daily care of the patient).

If the ear is inflamed or the patient feels pain there, you may need to put medicine in the ear.

- Have the patient lie on one side.

- Warm the medicine container in your hands so that the medicine will not feel cold to the patient. Then fill the ear dropper with the correct amount of medication.

- Pull the patient's earlobe up and back. Put the correct number of drops along the side of the ear canal.

- Tell the patient to continue lying on one side for five minutes to keep the medication from going out of the ear.

  Put a small sterile cotton ball in the ear to keep the medicine inside when the patient is standing up.