

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА ПРОПЕДВТИКИ ВНУТРЕННИХ БОЛЕЗНЕЙ

**ПРИМЕНЕНИЕ ЛЕКАРСТВЕННЫХ СРЕДСТВ.
НАРУЖНЫЙ, ЭНТЕРАЛЬНЫЙ И ИНГАЛЯЦИОННЫЙ
ПУТИ ВВЕДЕНИЯ ЛЕКАРСТВЕННЫХ СРЕДСТВ**

**MEDICINE ADMINISTRATION.
NON-INVASIVE ROUTE CHARACTERISTICS**

Учебно-методическое пособие



Минск БГМУ 2022

УДК 616.1/4-08:615.032(075.8)-054.6
ББК 53.52я73
П76

Рекомендовано Научно-методическим советом университета в качестве
учебно-методического пособия 17.11.2021 г., протокол № 9

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Применение лекарственных средств. Наружный, энтеральный и ингаляционный пути введения лекарственных средств =
П76 Medicine Administration. Non-invasive route characteristics : учебно-методическое пособие / Т. Т. Копать [и др.]. – Минск : БГМУ, 2022. – 24 с.

ISBN 978-985-21-0991-8.

Содержит основные сведения о путях введения лекарственных веществ, особенности энтерального, ингаляционного, наружного введения лекарственных средств, их преимущества и недостатки.

Предназначено для студентов 2-го курса медицинского факультета иностранных учащихся, обучающихся на английском языке по специальности 1–79 01 01 «Лечебное дело», по учебной дисциплине «Медицинский уход и манипуляционная техника».

УДК 616.1/4-08:615.032(075.8)-054.6

ББК 53.52я73

ISBN 978-985-21-0991-8

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MOTIVATIONAL CHARACTERISTICS OF THE TOPIC

Topic of the class: ways of using medicines. External, enteral and inhalation routes of drug administration.

Total lesson time is 3 hours.

The purpose of the class: to acquaint students with the method of using medicines, the rules and methods of using medicines.

Objectives of the class:

1. To study the routes of drug administration.
2. To acquaint students with the characteristics of the enteral route of administration: through the mouth, under the tongue, through the rectum.
3. To acquaint students with the inhalation route of drug administration.
4. To acquaint students with the external route of drug administration.
5. To acquaint students with the parenteral route of drug administration.
6. To acquaint students with the advantages and disadvantages of each method of drug administration.

Requirements for the initial level of knowledge. To prepare for the lesson, students need to familiarize themselves with the materials from the list of recommended literature, reflecting the general provisions on the use of medicines, as well as information characterizing each method of using medicines.

Test questions from related disciplines:

1. List the main functions of the skin.
2. Describe the functions of the stomach and gastric juice.
3. Describe the functions of the oral mucosa.
4. Describe the functions of the respiratory tract mucosa.

Control questions on the topic of classes:

1. List the routes of drug administration.
2. Characterize the enteral route of administration.
3. Describe the technique of inhalation route of drug administration.
4. Characterize the external route of drug administration.
5. List the methods of parenteral drug administration.
6. List the advantages and disadvantages of each method of drug administration.

INTRODUCTION

Medicinal substances have both local and general effects on the body. The reaction to the introduction of medicinal substances depends on the individual characteristics of the organism, the degree of sensitivity of its organs and tissues.

In addition to the main — **the therapeutic effect**, drugs can also cause negative side reactions. Sometimes the interaction of medicinal substances leads to completely new physicochemical reactions of an unfavorable nature. Medical the sister should know which combinations of medicinal substances are unacceptable for use.

Negative reactions of the body to certain medications are often quickly eliminated when the dose is reduced or after the first days of treatment.

These reactions should be distinguished from intolerance, which is an expression of the body's rejection of a particular drug and can lead to severe complications, for example, anaphylactic shock. Sometimes the drug has to be replaced with another drug, similar in therapeutic effect, but better tolerated.

Before the use of certain drugs that cause intolerance phenomena, tolerance tests are carried out.

With prolonged use of a drug, a decrease in the therapeutic effect is often noted, which is explained by a loss of sensitivity or the acquisition of resistance of pathogens to this drug.

In order to prevent the resistance of pathogens, a number of different methods of using medicinal substances have been developed: a combination of certain drugs, an intermittent method of treatment, etc. Before prescribing the drug, it is advisable to sow the discharge (sputum, urine, etc.) to determine the sensitivity of the microbial flora, especially to antibacterial drugs, which immediately makes it possible to prescribe the most effective drug in this case.

A number of drugs are slowly excreted from the body and accumulate (cumulate) in the body, which should be taken into account when determining the dose of such drugs.

The dose of the drug is prescribed depending on body weight and age (adult and child).

Distinguish:

1. **Single dose** — the amount of a medicinal substance per dose.
2. **The highest single dose** — the limit for one dose.
3. **Daily dose** — medication intake limit.
4. **Maintenance dose** — an individual dose of a drug (minimum), which gives a visible therapeutic effect with regular use of the drug.
5. **Toxic dose** — a dose that can cause poisoning and become fatal for the patient.

A nurse has no right to give medicine to a patient without a doctor's prescription.

All complaints of the patient about discomfort when taking the medicine or any reasons for refusing to take it, the nurse should **immediately inform the attending physician, without changing anything on your own.**

MEDICINES

Medicines (means or medicines) are natural or synthetic substances or complexes of substances made for the purpose of prevention, diagnosis and treatment of a living organism.

The use of drugs for medicinal purposes can be etiotropic, i.e. aimed at eliminating the causes of diseases (for example, the use of antibacterial agents for infectious diseases), pathogenetic (affecting certain links in the mechanisms of disease formation), symptomatic (affecting individual symptoms of the disease), substitutional, i. e. replenishing the deficiency of various biologically active substances in the body (hormones, enzymes, etc.).

Dosage form is a condition that is given to a drug, which is convenient for practical use, in which the desired effect is achieved. Dosage forms are divided into solid, liquid, soft and gaseous. Medicines are grouped according to characteristics such as chemical composition, pharmacological effect, therapeutic use, etc.

SOLID DOSAGE FORMS

Tablets are a solid dosage form obtained by pressing powders and granules containing one or more medicinal substances with or without auxiliary substances or obtained by molding special masses.

According to the method of application and route of administration, they are divided: tablets that are swallowed whole, chewable tablets; tablets used after preliminary preparation on their basis of liquid dosage forms (tablets are soluble, dispersible, effervescent); tablets for use in the oral cavity (sublingual (sublingual), buccal (buccal) tablets, for resorption); orodispersible tablets; vaginal tablets.

A distinction is made between uncoated tablets and coated tablets.

Coated tablets — tablets coated with one or more layers of a mixture of various substances, such as natural and synthetic materials, carbon, possibly with the addition of surfactants, etc., intended for oral administration. Depending on dragee, film and pressed coatings are distinguished from the composition and method of application.

The shell can be protective or ensure the destruction of the tablet in a certain part of the gastrointestinal tract (gastro-soluble (soluble in the stomach) and enteric (enteric-soluble)), or regulate the release time of active substances.

Enteric tablets (gastro-resistant tablets) are tablets that are stable in gastric juice and release the active substance or substances in the intestinal juice.

Regarding the speed and nature of the release, tablets of normal and modified release are isolated.

Modified release tablets — coated or uncoated tablets containing special excipients or obtained using a special technology that allows you to program the rate or location of drug release.

Modified (non-standard) release can be delayed continuous, intermittent (pulsating), delayed and accelerated.

Framework tablets (duruls) are tablets with a continuous, uniformly extended release and a supporting effect of medicinal substances.

Retard tablets are tablets with prolonged (periodic) release of medicinal substances from the stock. Usually they are microbeads with a drug substance, surrounded by a biopolymer matrix (base); the base or microgranules dissolve in layers, releasing the next portion of the drug.

Rapid retard tablets are two-phase release tablets containing a mixture of microgranules with fast and prolonged release of the drug.

Depending on the dosage of the medicinal substance, the following are isolated:

- ***mite tablets*** — tablets with a minimum dosage and a minimum pronounced effect of a medicinal substance;

- ***tablets of seven*** — tablets with an average dosage and a minimal pronounced effect of the medicinal substance;

- ***forte tablets*** — tablets with a high dosage and a strong effect of a medicinal substance.

Powders — a dosage form in the form of a dry free-flowing mass with crushed particles. Powders are divided by purpose into external and internal. Oral powders with an unpleasant taste, irritant effect or coloring matter are dispensed in starch or gelatin capsules.

Dragee is a dosage form in the form of a coated ball. Dragee is produced at pharmaceutical factories (vitamins, vaccines, etc.).

Pills — a dosage form similar to dragees in the form of a ball. Pills are prepared in pharmacies by hand, so they are rarely used.

Medicinal charges — mixtures of medicinal plants in dried and crushed form. Fees are used for the preparation of infusions and decoctions intended for oral administration (medicinal tea), for gargling, etc.

LIQUID DOSAGE FORMS

Liquid dosage forms include solutions, infusions, decoctions, tinctures, extracts, emulsions, suspensions, and mixtures.

Solutions are clear liquids. Consisting of a drug in a solvent. Distilled water, 40–90 % ethyl alcohol, liquid oils (vaseline, olive), etc. are used as solvents. Solutions can be used for injection, ingestion and for external purposes.

Infusions and decoctions are aqueous extracts from medicinal plants. Infusions are often prepared from medicinal herbs, from flowers and leaves, which contain low-resistant volatile active ingredients. Decoctions in most cases are prepared from fruits, bark, roots and rhizomes of plants containing substances more resistant to heating.

Tinctures are transparent extracts that are alcoholic, alcohol-water or alcohol-ether extract. Unlike infusions, they can last for a long time, so they are prepared at pharmaceutical factories.

Extracts are condensed extracts from medicinal plants. Wine alcohol, ether, water and their mixtures are used as extractors. Depending on the consistency, there are liquid, thick and dry extracts.

Emulsions are liquid dosage forms, which are a two-phase dispersed system of liquids immiscible with each other. The constituent parts are oil and water. Outwardly similar to milk. Used internally. Shake them before use (almagel).

Suspensions are dispersed systems in which relatively large solid particles are suspended in liquid — water, glycerin, liquid oil. They are used externally, internally and intramuscularly. Shake them before use.

Potions are intended for internal use. Water serves as a liquid medium in mixtures, it is a mixture of several medicinal substances.

Liquid dosage forms are available in ampoules or vials. These drugs are sterile.

Medicines produced in ampoules are intended for single use, since after opening their sterility is violated.

Injection vials can contain powders, tablets or ready-to-use suspensions and liquids (hormones, etc.).

Solutions and suspensions from powders (for example, antibiotics) and tablets are prepared aseptically immediately before use. If several single or even daily doses of drugs are released in vials, then each single dose for injection is taken in compliance with asepsis.

When dispensing liquid dosage forms, *a number of rules should be observed:*

- for distribution of potions, broths, syrups, use a clean graduated beaker, pouring the required dose from the bottle;

- to dispense alcoholic tinctures, drops, extracts, you must take a clean graduated beaker, drip with a dropper installed on the bottle, or with a clean pipette (use a separate pipette for each drug!). The required number of drops, dilute with boiled water to a volume of 10 ml.

SOFT DOSAGE FORMS

Soft dosage forms — ointments, pastes, liniments, suppositories and plasters.

Ointments are a dosage form of a viscous consistency for external use. The composition of ointments includes medicinal substances and an ointment base (pe-

troleum jelly, lanolin, glycerin, beeswax, fats and fat-like substances). Ointments can be used for medicinal, nutritional and cosmetic purposes.

Pastes are thick topical ointments. It is used mainly for the treatment of affected, weeping skin areas as a drying agent, as well as in dentistry.

Liniments are thick liquids or jelly-like masses that melt at body temperature. Designed for external use by rubbing into the skin in order to obtain an analgesic or, conversely, irritating effect. Sometimes liniments are used, which have an astringent, drying, anti-inflammatory or disinfectant effect.

Suppositories are dosage forms that are solid under normal conditions and melt at body temperature. Designed for insertion into the vagina and rectum. Suppositories can have local anti-inflammatory and analgesic properties, resorptive action, contraceptive effect.

Patches are dosage forms for external use. Plasters are: solid, which is a plastic mass, which at body temperature can soften and adhere to the skin, and liquid, or skin, which have the property to quickly evaporate, leaving an elastic film on the skin.

WAYS AND METHODS OF DRUG ADMINISTRATION

Drug therapy is the most important part of the treatment process, which has both local and general effects on the body. Medicines are introduced into the human body in various ways.

Routes of drug administration:

1. *Enteral:*

- through the mouth (per os);
- sublingual (under the tongue);
- through the rectum (per rectum);
- buccal (cheek).

2. *Outdoor:*

- on the skin;
- on mucous membranes (eyes, ears, nose, vagina).

3. *Inhalation:*

- through the respiratory tract;
- intranasal.

4. *Parenteral:*

- intravenous;
- intramuscularly;
- intra-arterial;
- intradermal;
- subcutaneously;

- in the cavity;
- intraosseous;
- c subarachnoid space.

The speed of the onset of the effect, the severity and duration of the action of the substance depends on the method of administration.

GENERAL RULES FOR THE USE OF DRUGS

A nurse does not have the right to prescribe and replace some medicines with others without the knowledge of the attending physician.

All medications must be given to patients on time. Before giving medication to a patient, it is necessary to read the label on the label.

If the medicine must be given (or injected) several times a day, the intervals must be strictly observed. For example, when antibiotics are administered four times, the interval between injections should be 6 hours: at 24 hours, 6, 12 and 18 hours. This is necessary to maintain a sufficient level of medication at all times.

Medicines prescribed with meals (such as enzymes) are given with food. Means prescribed «before meals» should be given 15 minutes before meals. The remedies prescribed to the patient «after meals» should be taken by him 15 minutes after the meal. The funds prescribed to the patient «on an empty stomach» are distributed in the morning 20–60 minutes before breakfast; sleeping pills are given to patients 30 minutes before bedtime; nitroglycerin or validol should be on the patient's bedside table at all times.

Infusions, decoctions, mixtures, solutions are usually prescribed in table-spoons (15 ml); in a hospital environment, it is convenient to use graduated beakers. After use, the beakers are disinfected in 1 % chloramine solution for 30 minutes.

Alcoholic tinctures, extracts and some solutions (for example, 0.1 % solution of atropine sulfate, motherwort tincture) are prescribed in drops. If the vial with the medicinal substance does not have a built-in dropper, then pipettes are used. A separate pipette should be available for each drug.

Pills, dragees, capsules, tablets containing iron are taken unchanged. Iron tablets are washed down with a solution of ascorbic acid.

The patient should be told what to take with the medicine. He should be made aware of the peculiarities of the interaction of the drug used by him with food. Often, patients stop taking the prescribed medications, citing the fact that their condition has already improved.

In these cases, it is necessary to convince the patient to complete the course of treatment, since a relapse is possible, and to see if he really continues to take them. Some patients have psychological denial, rejection of drugs in general, as they constantly remind them of the disease.

The nurse should calmly and tactfully explain the importance of regular medication intake, the need for a continuous course of treatment and strict adherence to these conditions for a successful recovery. With a decrease in memory or intelligence, patients need not only to explain the rules for taking medications, but also to write them on a separate sheet of paper.

A nurse has no right to prescribe or replace some medicines with others without the knowledge of the doctor. If a drug is given by mistake or its single dose is exceeded, you should immediately inform your doctor about it.

ENTERAL ROUTE OF DRUG ADMINISTRATION

The enteral route of administration is through the gastrointestinal tract.

The enteral route of administration includes the administration of drugs:

- through the mouth (per os);
- sublingual (under the tongue);
- through the rectum (per rectum);
- buccal (cheek).

The oral (per os, oral) route of administration is the simplest and safest, and the most common.

When taken orally, medicinal substances are absorbed mainly in the small intestine, through the portal vein system they enter the liver, where they can be inactivated, and then into the general bloodstream. The therapeutic level of the drug in the blood is reached within 30–90 minutes after taking it and lasts for 4–6 hours, depending on the properties of the active ingredient and the composition of the drug.

When drugs are administered orally, their ratio with food intake is of great importance. Medicine taken on an empty stomach is usually absorbed faster than medicine taken after a meal. Most drugs are recommended to be taken $\frac{1}{2}$ –1 hour before meals, so that they are less destroyed by the enzymes of the digestive juices and better absorbed in the digestive tract. Drugs that irritate the mucous membrane (containing iron, acetylsalicylic acid, calcium chloride solution, etc.) are given after meals. Enzyme preparations that improve digestion processes (festal, natural gastric juice, etc.) should be given to patients during meals. Sometimes, to reduce irritation of the gastric mucosa, some medicines are taken with milk or jelly.

The oral route of drug administration has several advantages:

- simplicity and availability of the method;
- there is no need to maintain sterility;
- the possibility of introducing various dosage forms (tablets, powders, decoctions, pills, mixtures, infusions, extracts, etc.).

To swallow a tablet (dragee, capsule, pill), the patient places it on the root of the tongue and seals it with water. Some tablets can be chewed beforehand (with

the exception of iron tablets). Dragee, capsules, pills are taken unchanged. The powder can be poured onto the root of the tongue and allowed to wash down with water or pre-dilute it with water.

Sublingual (sublingual) route of administration — the use of drugs under the tongue; they are well absorbed, enter the bloodstream, bypassing the liver, and are not destroyed by digestive enzymes.

The sublingual route is used relatively rarely, since the suction surface of this area is small. Therefore, only very active substances are prescribed «under the tongue», used in small quantities and intended for self-administration in urgent situations, for example: nitroglycerin at 0.0005 g, validol at 0.06 g, as well as some hormonal preparations.

The rectal route of administration is through the rectum. Both liquid medicines (decoctions, solutions, mucus) and suppositories are injected rectally. In this case, medicinal substances have a resorptive effect on the body, being absorbed into the blood through the hemorrhoidal veins, and locally, on the rectal mucosa. In general, when administered rectally, drugs are poorly absorbed, and therefore this route of administration should be used only as an alternative in order to obtain systemic effects.

Before the introduction of medicinal substances into the rectum, a cleansing enema should be done.

Rectally, you can use the introduction of liquid forms of drugs in the form of enemas.

Medicinal substances of resorptive action enter the bloodstream, bypassing the liver, and, therefore, are not destroyed. Due to the lack of enzymes in the rectum, they are not degraded. Medicinal substances of proteinaceous, fatty and polysaccharide nature are not absorbed from the rectum into the bloodstream, therefore they are prescribed for local exposure in the form of medicinal microclysters.

Rectal drug administration is used in those cases. When oral administration is impossible or impractical (with vomiting, impaired swallowing, unconsciousness of patients, lesions of the gastric mucosa, etc.) or when a local effect is needed.

Buccal — polymer films are used that «stick» to the mucous membrane of the cheeks or gums. Under the influence of saliva, the film melts, the active substance of the drug is released (for example, nitroglycerin in trinitrolong) and the therapeutic concentration of the drug is maintained in the body for a certain time.

THE EXTERNAL ROUTE OF ADMINISTRATION OF DRUGS

The external route of administration of drugs is designed for mainly local action and includes the introduction of drugs to the skin and mucous membranes, eyes, nose, ears.

There are many ways of external administration of dosage forms: ointments, emulsions, solutions, talkers, powders, tinctures, pastes, etc. These are compresses, lotions, dusting, lubrication, rubbing, dressings on the wound surface, instilling drops in the eyes, nose, ears, laying ointments in the eyes, ears. Only fat-soluble substances are absorbed through intact skin.

Rubbing — the introduction of medicinal substances through the skin in the form of liquids or ointments; produced in areas where the skin is thin and hairless (flexor surface of the forearms, back of the thighs, lateral surfaces of the chest, abdomen). The skin at the site of rubbing must be clean. The required amount of ointment or liquid is applied to the skin and rubbed in circular motions until it becomes dry (30–40 minutes). Inflammatory changes in the skin (eczema, dermatitis, etc.) are contraindications to rubbing. In some cases, the ointment is applied to the skin, without rubbing, in a thin layer and covered with plastic wrap for better absorption.

A patch is a sticky ointment base of a thick consistency covered with impermeable gauze. The ointment base contains active medicinal substances. Before applying the patch, the skin is degreased with alcohol, and the hair is shaved off. Then a plaster of the required size is cut out with scissors and applied to the skin. Remove the patch gradually, starting from one edge, after wetting the edges with alcohol. The patch is also used to secure the dressings.

Dusts or dusting with powdered medicinal substances (talc) are also used to dry the skin with diaper rash and sweating.

In medical practice, **electrophoresis** is widely used, based on the transfer of medicinal substances from the surface of the skin to deep-lying tissues using a galvanic current.

INJECTING THE MEDICINE INTO THE EYE

The eye is a very delicate organ that is extremely susceptible to infection and injury. The eye is never free of microorganisms, but because the tear fluid has an antimicrobial effect, it inhibits the multiplication of many pathogenic microbes. All solutions and ointments injected into the conjunctival sac (for the eyelids) must be sterile; household and tools with which drugs are injected into the eye should be sterile.

Since the drugs cannot be applied directly to the very sensitive cornea, they are injected into the lower conjunctival sac.

To inject the drug into the eye, the lower conjunctival sac must be opened:

- 1) ask the patient to look up;
- 2) place the thumb on the edge of the lower eyelid directly in front of the eyelashes and pull the eyelid down;
- 3) having twisted and removed it from the eyeball, we open the conjunctival sac.

In medical practice, *the introduction of eye drops and the laying of eye ointment are used.*

Sterile eye drops are produced either in plastic bottles (there is a hole in the neck through which the medicine drips when the bottle is turned upside down and pressed), in glass bottles equipped with a dropper.

For the introduction of eye drops, it is necessary to ensure that the patient is looking up; then we bury the required number of drops into the lower conjunctival sac, without touching any part of the eye with the dropper. To distribute the medication evenly, ask the patient to close their eyes and rotate the eyeball.

It is imperative to remember that you can **only use a sterile medication** specially designed for injection into the eye. Before applying the ophthalmic ointment, it is necessary to clean the eyelids and eyelashes from secretions with a wet sterile swab, wiping the eyelids in the direction from the inner corner to the outer corner. We hold the tube of ointment almost horizontally; this will prevent the tip of the tube from touching the eyeball or conjunctiva; then squeeze about 1.5 cm of ointment into the lower conjunctival sac. Then we ask the patient to close the eyelids and move the eyeball, which will evenly distribute the ointment over the inner surface of the eyelids and over the surface of the eyeball. Remove excess ointment with a sterile swab (fig. 1).

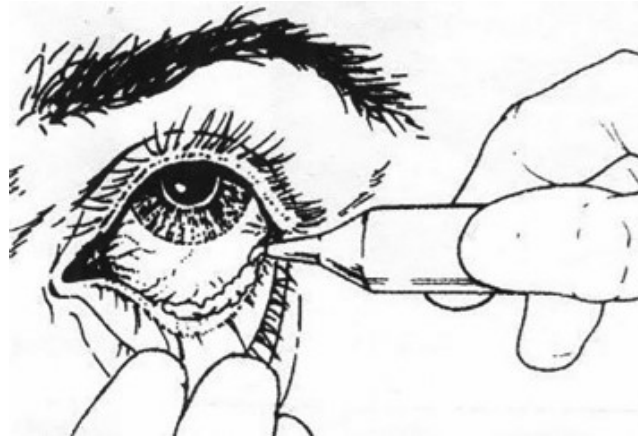


Fig. 1. Administration of eye drops

A sterile isotonic solution is used to irrigate the conjunctiva. Before carrying out the procedure, cleanse the eye of discharge. Then, spreading the eyelids, we press on the bottle of solution from the inner corner of the eye to the outer one.

INJECTION OF THE MEDICINE INTO THE EAR

In order to avoid discomfort, medications intended for injection into the ear must be preheated, but in no case overheated. When injecting ear drops, the patient should lie on his side so that the affected ear looks up. In some cases, it may be

necessary to remove earwax from the external ear canal with a cotton swab before inserting ear drops.

Before administering the medicine, it is necessary to straighten the external auditory canal, for which we slightly pull the auricle up and back, then bring a bottle with a dropper or a pipette to the opening of the external auditory canal and instill a few drops. We ask the patient to continue lying on his side for a few minutes so that the medicine goes away to act on the walls of the external auditory canal and does not flow out of the ear.

INHALATION ROUTE OF ADMINISTRATION MEDICINAL SUBSTANCES

Inhalation route of administration medicinal substances is carried out through the respiratory tract, including intranasally.

By inhalation it is possible to enter into the body drugs of both local and systemic action: gaseous (nitrous oxide, oxygen), vapors of volatile liquids (ether, fluorothane), aerosols (suspensions of the smallest particles of solutions). Usually, drugs are injected into the nose (in the form of drops or aerosols) that cause narrowing of the vessels of the mucous membrane and thereby eliminate nasal congestion.

In respiratory diseases, inhalation procedures are widely used, taking into account the following advantages of this method of administering medicinal substances:

- exposure directly at the site of the pathological process in the respiratory tract;
- the medicine enters the lesion focus, bypassing the liver, in an unchanged form, which allows it to maintain its high concentration in the blood.

However, one of the possible disadvantages of inhalation therapy should also be taken into account: in the presence of a significant amount of sputum and a sharp violation of bronchial patency, the drug does not penetrate well into the pathological focus. The disadvantages also include the irritating effect of drugs on the mucous membrane of the respiratory tract.

The inhalation route of drug administration is the most effective for the treatment of patients with respiratory diseases.

Currently, four types of inhalation systems are known: metered dose inhaler, metered dose inhaler and spacer, dry powder inhaler and nebulizer. Each of the systems has its own advantages and disadvantages.

The task of the inhalation delivery method is to create the highest therapeutic concentration of the drug in the respiratory tract with a minimum concentration in the general bloodstream, and, accordingly, without subjecting it to active metabolism and inactivation.

Individual pocket inhalers are a special dosage form in a special package used for the treatment of bronchial asthma and chronic obstructive pulmonary disease. Inhalers are aerosol (contain the drug in the form of a micronized suspension) and powder.

The advantage of metered-dose aerosol inhalers is portability and a lower price, and the disadvantages are the need to coordinate inhalation and inhalation (complex inhalation technique), which is especially important in case of an exacerbation of the disease due to shortness of breath, difficulty in prescribing high doses of the drug, the possible irritating effect of propellants on the respiratory tract and high percentage of deposition of aerosol in the oropharynx.

This is the most commonly used form of drug release for inhalation by the population, although not the best and not optimal. It does not guarantee the correctness of the inhalation maneuver, despite the familiarity of almost every patient with it.

Even with the correct breathing maneuver (inhalation during a deep breath followed by holding the breath for a certain time) only 30–35 % of the medication penetrates inside the bronchi, and with a different breathing maneuver (supply of the substance before inhalation) — only about 15 %. Therefore, it is strongly recommended that medical personnel explain to the patient in detail how to handle the individual pocket inhaler, rather than relying solely on the instruction.

For effective inhalation, you must:

1. Remove the cap (fig. 2, *a*).
2. Shake the can (fig. 2, *b*).
3. Breathe out (fig. 2, *c*).
4. Grasp the mouthpiece with your lips without creating resistance with your teeth.
5. Press, coordinated with inhalation (fig. 2, *d*).
6. Hold your breath for a few seconds (5–6 seconds) (fig. 2, *e*).
7. Exhale calmly through the nose (fig. 2, *f*).

In part, the shortcomings in the use of individual inhalers (inaccuracies in the method of their use) can be corrected with the help of breathing «assistants» — spacers.

The spacer is a plastic volumetric chamber that connects the metered-dose aerosol inhaler and the patient's airway. The spacer slows down the speed of the aerosol jet.

The use of a spacer makes it possible to solve the problems associated with the need for accurate implementation of the inhalation technique, which is greatly simplified due to the fact that the patient does not need to coordinate the inhalation and the moment of spraying the medicine, because first spray into the spacer and then inhale from the spacer. It is only important that the time

between nebulization and inhalation does not exceed 1–2 seconds. In the spacer for 30 seconds, the dose of the drug remains unchanged, and the patient can take not one, but several breaths of the depth that his condition allows during the same time.

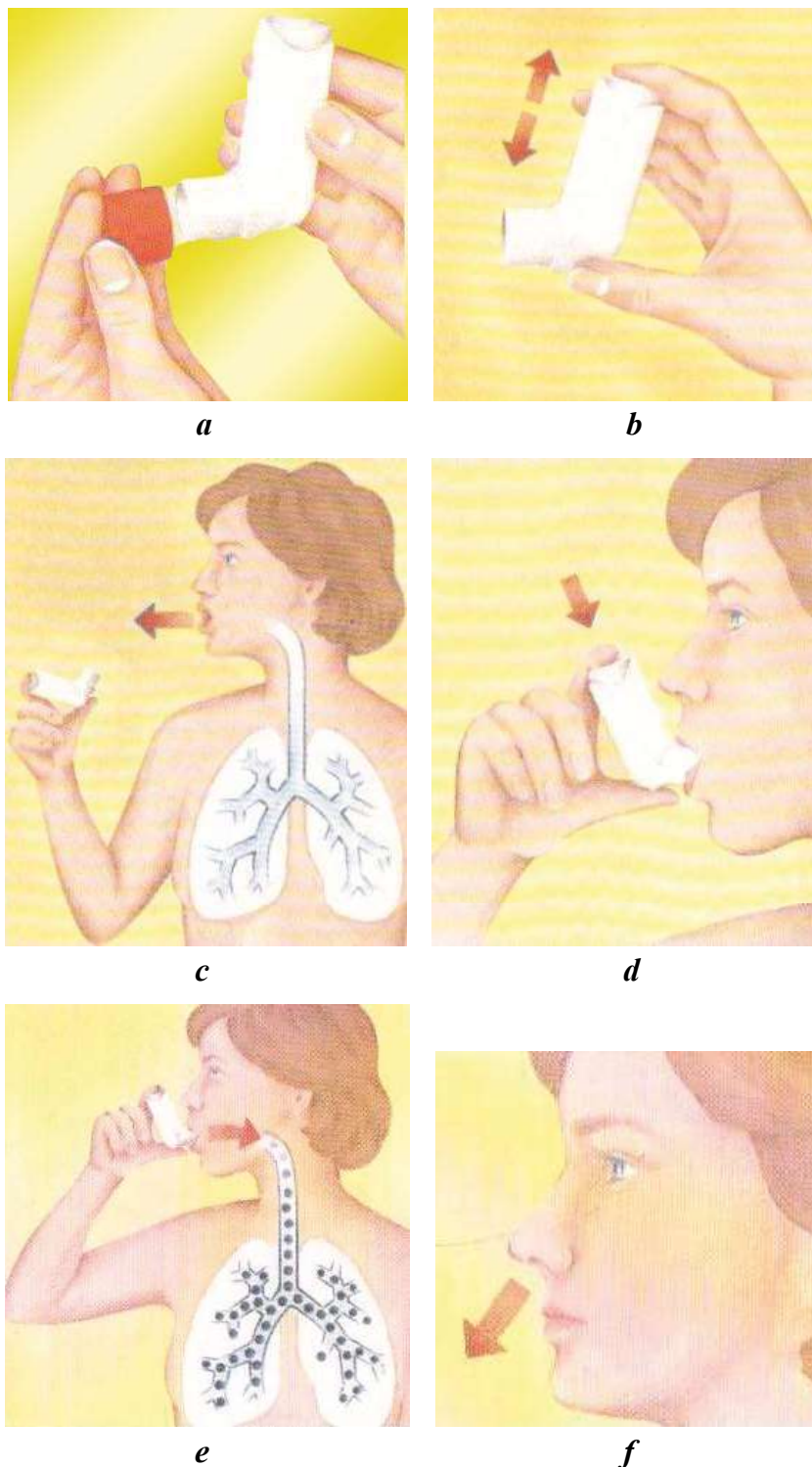


Fig. 2. Inhalation method

The criterion for selecting a suitable shape and size of the spacer is the size of the aerosol particles leaving the spacer and reaching the bronchi.

The use of a spacer increases the effectiveness of inhaled corticosteroid administration. This reduces the amount of aerosol deposited in the oral cavity and pharynx and, as a result, reduces the risk of developing unwanted local side effects, such as thrush, hoarseness. The inhalation process is facilitated and the amount of substance deposited in the bronchi increases.

Inhalation therapy using **an ultrasonic nebulizer** is widely used in the complex treatment of respiratory diseases, especially in hospitals. This is a device that converts a liquid drug into a respirable aerosol by forming fine particles that are delivered to the distal bronchi with a stream of inhaled air (fig. 3).



Fig. 3. Nebulizer

PARENTERAL ROUTE OF ADMINISTRATION OF MEDICINAL SUBSTANCES

Parenteral or injection is the introduction of drugs bypassing the digestive tract. The parenteral routes of administration include the administration of drugs:

1) in fabric:

- intradermally;
- subcutaneously;
- intramuscularly;
- intraosseous;

2) into vessels:

- intravenously;
- intra-arterial;
- into the lymphatic vessels;

3) in the cavity:

- pleural;
- abdominal;
- heart;
- articular;

4) into the subarachnoid space.

The advantage of using parenteral administration of medicinal substances in the treatment process is due to:

- the speed of action and the accuracy of the dosage of drugs;
- exclusion of the barrier function of the liver;
- exclusion of the influence of digestive enzymes on medicines;
- irreplaceable in the provision of emergency assistance.

Patients often experience a sense of dread of forthcoming injections. A friendly, calm conversation with the patient, which allows the patient to be prepared for the procedure, a comfortable position of the patient, and a precise implementation of the injection help to prevent and reduce both pain and a sense of fear.

Syringes and needles are used for injections. At present, in connection with the spread of AIDS, drug addiction, viral hepatitis and other especially dangerous diseases transmitted by a vector-borne route (with blood), the use of disposable syringes has been switched around the world. Plastic syringes are supplied either with needles already fitted or with needles in a separate plastic container. Disposable syringes and needles are factory sterilized and can only be used once!

Injections are performed in the treatment room, and for critically ill patients in bed.

In the treatment room there is a sterile table covered with sterile sheets, between the layers of which sterile syringes, needles, trays are laid. Special clamps are attached to the free edges of the sheet. The sterile table can only be opened for them. On the nurse's desk are iodine, alcohol, files for opening ampoules, box with sterile material, sterile tweezers. The syringe is collected on a sterile table with sterile forceps.

For injections, two needles are needed: one is taken with the drug, the other is injected. Two needles ensure sterility. The neck of the ampoule is also treated with alcohol before opening. Oil solutions are heated to a temperature of 38°C by lowering the ampoule into warm water.

To inject a seriously ill patient, a craft bag (sterile syringe) and sterile balls moistened with alcohol are placed in a sterile tray, covered with a sterile napkin.

In the treatment and diagnostic process, the most common use is intradermal, subcutaneous, intramuscular and intravenous administration of substances.

Intradermal injection is the most superficial, since the needle is inserted shallowly. Intradermal injection is used for diagnostic purposes (tuberculin test, detection of allergies to various substances, etc.), as well as for local anesthesia (0.1 to 1.0 ml of liquid is injected). The injection site is the anterior surface of the forearm.

Subcutaneous injection is deeper, to a depth of 15 mm. The subcutaneous tissue has a good blood supply, so the drugs are absorbed and act faster. The maximum effect of a subcutaneously injected drug usually occurs within 30 minutes. Subcutaneous injections are performed in the upper third of the shoulder, back (subscapularis), the anterolateral surface of the thigh, and the lateral surface of the abdominal wall.

Intramuscular injection perform in cases where the drug irritates the subcutaneous tissue, and also in order to increase the duration of its action. The injection site is the thigh (vastus lateral muscle), buttocks (gluteus medius and minimus), and shoulder (deltoid). The safest injection site is in the upper outer quadrant in the upper outer quadrant, approximately 5–8 cm below the iliac crest.

Intravenous injections and intravenous infusions — are performed more often on the superficial vein of the elbow, forearm, hand (rear), ankle and cranial vault.

Currently, intravenous drip infusion of medicinal substances using peripheral venous catheters is widely used in medical practice.

Peripheral venous catheter (PVC) makes intensive infusion therapy painless, reduces the frequency of psychological trauma associated with multiple punctures of peripheral veins.

In specialized departments, especially of a surgical profile, the introduction of medicinal substances into the cavity (pleural, abdominal, articular), as well as into the subarachnoid space, is widely used.

With the undeniable importance of parenteral administration of medicinal substances in the therapeutic and diagnostic process, one should remember about the possible complications of injections. These include: infiltration, abscess, needle breakage, air or oil embolism, damage to nerve trunks, thrombophlebitis, necrosis, hematoma, lipodystrophy, sepsis, AIDS, viral hepatitis, allergic reactions, erroneous drug administration.

Most post-injection complications arise from:

- violation of injection technique;
- violation by medical personnel of the rules of asepsis;
- wrong choice of injection site.

Only the professional actions of a nurse, her discipline and responsibility can reduce all complications to a minimum.

SELF-CONTROL OF MASTERING THE TOPIC

TESTS

1. Solid dosage forms:

- a) capsules, tablets, pills;
- b) candles, ointments;
- c) tinctures, decoctions.

2. Advantages of introducing medicinal substances through the mouth:

- a) speed of action;
- b) exclusion of the barrier role of the liver;
- c) simplicity and availability.

3. Rectally inject:

- a) powders;
- b) suppositories;
- c) aerosols.

4. Set the correspondence:

Routes of administration	Place of introduction
1) enteral	a) through the mouth
2) parenteral	b) into the muscle
	c) through the rectum

5. The sublingual route of drug administration refers to:

- a) enteral route;
- b) parenteral route;
- c) outward path.

6. The introduction of medicinal substances into the eyes and ears refers to:

- a) enteral route;
- b) parenteral route;
- c) outward path.

7. Inhalation route of administration of drugs is the introduction:

- a) through the respiratory tract;
- b) intranasally;
- c) sublingually.

8. For inhalation administration of drugs use:

- a) aerosol inhalers;
- b) electrophoresis;
- c) nebulizers.

9. The external route of drug administration is carried out:

- a) rubbing in and lubricating;
- b) electrophoresis;
- c) in the form of medicinal enemas.

10. The advantages of parenteral administration of drugs include:

- a) dosage accuracy and speed of drug action;
- b) exclusion of the liver barrier function;
- c) irreplaceable in the provision of emergency assistance.

Answers: 1 — a; 2 — c; 3 — b; 4 — 1a,c, 2b; 5 — a; 6 — c; 7 — a, b; 8 — c; 9 — a, b; 10 — a, b, c.

SITUATIONAL TASKS

1. The nurse gave out medicines in the morning for the whole day (morning, afternoon, evening). Evaluate the nurse's action.

2. The nurse took the eye drops out of the refrigerator and applied them to the patient. Evaluate the nurse's actions.

3. When distributing drugs, the nurse mixed up seemingly similar vials and gave the patient prednisone instead of panangin. Evaluate the nurse's actions.

4. There are two nitroxoline tablets in the bottle. The nurse put them in another bottle of nitroxoline. Evaluate the nurse's actions.

5. During the injection, the nurse found an unsigned ampoule in the gentamicin package. Nurse action?

Answers:

1. Medicines are dispensed only for one appointment.

2. The nurse had to warm up the drops to 37.0 °C, and then instill.

3. Before dispensing drugs, the nurse should carefully read the name on the label. It is necessary to urgently inform the attending physician about the erroneous dispensing of the medication.

4. It is impossible to transfer medicines from one bottle to another.

5. Medicines without a signature cannot be used.

REFERENCES

1. *Пронько, Т. П.* Основы ухода за больными = The basics of patient care : the manual for students of the faculty of foreign students / Т. П. Пронько, К. Н. Соколов, М. А. Лис. 4-е изд. Гродно : ГрГМУ, 2018. 214 с.
2. *Kovalyova, O. M.* Patient care (Practical Course) : textbook / О. М. Kovalyova, V. M. Lisovyi, S. I. Shevchenko. 2nd ed., corrected. Kyiv : AUS Medicine Publishing, 2018. 320 p.
3. *Основы сестринского дела* : в 2 т. Т. 1 : Учебник и практикум для академического бакалавриата / под ред. Г. И. Чувакова. 2-е изд., испр. и доп. Москва : Юрайт, 2017. 374 с.

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Учебное издание

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**ПРИМЕНЕНИЕ ЛЕКАРСТВЕННЫХ СРЕДСТВ.
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Ответственный за выпуск Э. А. Доценко
Переводчик Т. Т. Копать
Компьютерная вёрстка О. В. Лавникович

Подписано в печать 02.02.22. Формат 60×84/16. Бумага писчая «Херох office».
Ризография. Гарнитура «Times».
Усл. печ. л. 1,39. Уч.-изд. л. 1,14. Тираж 99 экз. Заказ 53.

Издатель и полиграфическое исполнение: учреждение образования
«Белорусский государственный медицинский университет».
Свидетельство о государственной регистрации издателя, изготовителя,
распространителя печатных изданий № 1/187 от 18.02.2014.
Ул. Ленинградская, 6, 220006, Минск.