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Basics of Nursing Practices and Interventions

Review:

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Introduction

Dear readers,

Welcome to the website "Basics of Nursing Practices and Interventions" which was created under the auspices of the Masaryk University Development Fund project.

This website provides an overview of basic nursing techniques. These techniques are essential professional skills for both medical and non-medical disciplines. This overview is intended for all students of the Faculty of Medicine of Masaryk University, as a part of your undergraduate training in theoretical and practical subjects related to clinical practice.

This extended edition of the electronic material offers an English version of the text in addition to the Czech version. Some terms in the English version refer to specific regulations, customs, equipment, or abbreviations used at healthcare institutions in the Czech Republic. For this reason, these terms might not always match the standard terms used in English-language publications.

The text is available online in a downloadable version. It offers subjective and succinct descriptions of nursing methods, procedures and interventions, accompanied by detailed photographs. An application is included for practising professional terminology.

We believe that the information given here will help you learn proper techniques for working with patients and increase confidence in your professional knowledge.

We hope you enjoy reading this guide, and we wish you success in your studies!
Natália Beharková and Dana Soldánová

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The English version was edited by Joseph Lennon, Ph.D. and Mgr. Veronika Dvořáčková, Ph.D., of the Masaryk University Language Centre, Faculty of Medicine Division.

Hygienic Hand Disinfection

- Bulletin of Ministry of Health of the Czech Republic No. 5/2012, Guidelines on Hand Hygiene in the providing of health care

Hand hygiene

- importance of preventing healthcare-associated infections
- techniques:
 - hygienic handwashing
 - hygienic hand disinfection (hygienic hand antisepsis)
 - surgical hand washing (washing hands before surgical hand disinfection)
 - surgical hand disinfection (surgical hand antisepsis)

Hygienic hand disinfection (HHD)

Purpose

- reduces the amount of transient microflora on the skin of the hand; interrupts microorganism transmission

Performed

- as a part of barrier nursing techniques
- as a part of hygiene filter
- after accidental contamination of the hands by a biological material
- in case of a rupture of the gloves during a procedure

Principles

- rub the alcohol disinfectant into the dry skin
- use approximately 3 mL of disinfectant
- rub for at least 30 seconds
- both hands should remain moist throughout the procedure
- let hands dry naturally in the air, do not rinse nor wipe them

Procedure for rubbing the disinfectant solution during hygienic hand disinfection

- alternate both hands



Procedure for rubbing the disinfectant solution during hygienic hand disinfection (Step 1)



Procedure for rubbing the disinfectant solution during hygienic hand disinfection (Step 2)



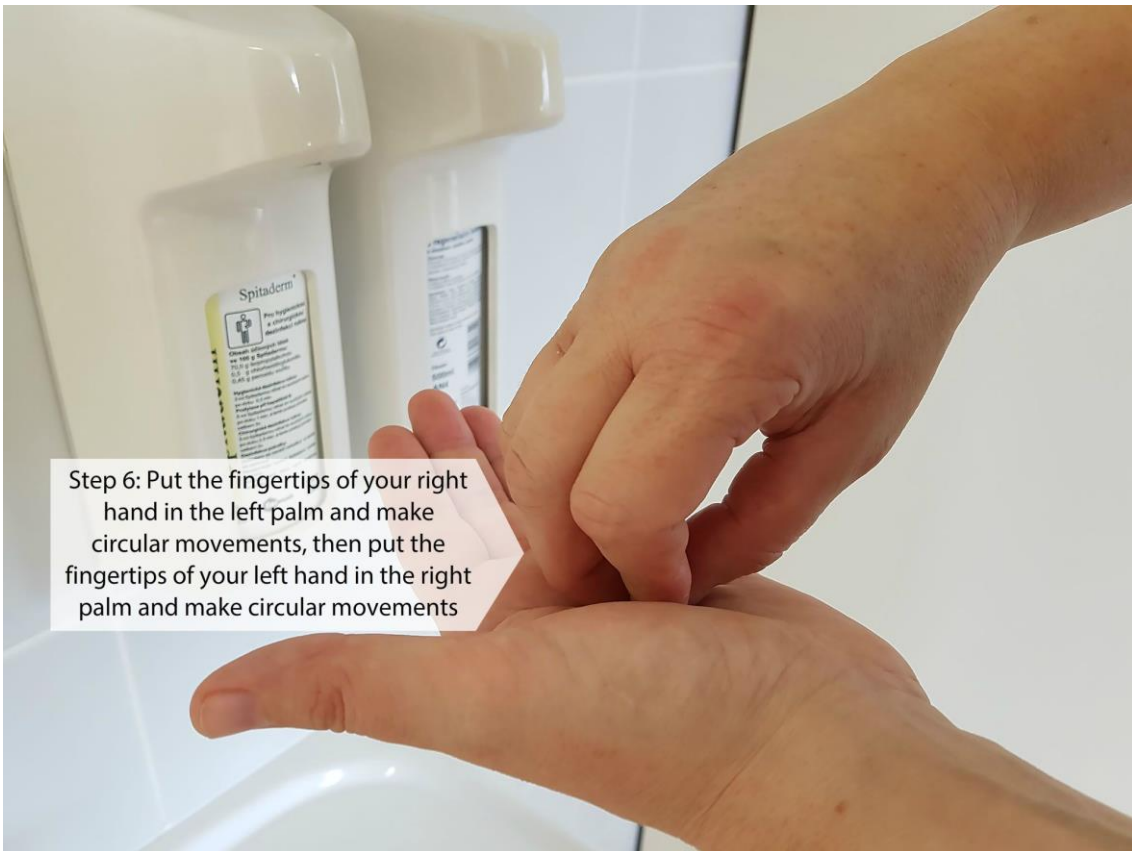
Procedure for rubbing the disinfectant solution during hygienic hand disinfection (Step 3)



Procedure for rubbing the disinfectant solution during hygienic hand disinfection (Step 4)



Procedure for rubbing the disinfectant solution during hygienic hand disinfection (Step 5)



Procedure for rubbing the disinfectant solution during hygienic hand disinfection (Step 6)



Insufficient performance of hand hygienic disinfection (testing under ultraviolet light source)

Literature

- Bulletin of Ministry of Health of the Czech Republic No. 5/2012 Guidelines on Hand Hygiene in Providing Health Care (pp. 15-21) https://www.mzcr.cz/Legislativa/dokumenty/vestnik-c5/2012_6452_2510_11.html Accessed July 9, 2018

Hygienic Care

Hygienic Care is a set of rules and methods aimed at strict observance of personal hygiene and prevention of infection

Hygiene for hospitalised patients

- is based on personal hygiene methods which an individual practice at home
- is influenced by the patient's state of health and his/her self-sufficiency

The need for hygiene

- **somatic/biological** – to support cleanliness, elimination of microbial load, removal of secretions and excretions from the body, prevention of infection, and the protective function of the skin
- **psychological** – to provide a refreshed and relaxed feeling
- **social** – to create a pleasant environment, promotes positive social contacts
- **economic** – to prevent complications caused by inadequate hygienic care, which increase healthcare costs and care requirements

Basic hygienic care

- daily treatment – washing hands according to the basic rules of hygiene; hygienic care when the patient is sweaty or soiled with secretions or excretions; exchange of personal and bed linen if needed; making an unoccupied bed
- morning/evening toilet – personal hygiene; skin care; hair care (combing hair); shaving, oral cavity care; exchange of personal and bed linen
- complete bath provided in the bathroom (using the trolley) or in bed. This includes whole body hygiene – hair care (washing); shaving; skin care; oral cavity care (exchange of personal and bed linen)

Organization of hygienic care (in patients with different levels of self-sufficiency, the care is provided as follows)

1. Fully self-sufficient (independent) patients (with movement modes A or B)
 - patients perform their own hygienic care. A nurse monitors the patient's performance, offering assistance, making the bed and exchanging bed linen if necessary
2. Partially self-sufficient patients (with movement mode C)
 - nurse prepares equipment, secures patient's safety (a stable sitting position), performs hygiene assistance, makes bed and exchanges bed linen
3. Dependent patients, bed-bound patients (with movement mode D)
 - nurse prepares equipment, performs hygienic care for bed-bound patients, makes bed and exchanges personal and bed linen

Bedside hygienic care for dependent patients

- properly organize hygienic care in patients with different levels of self-sufficiency
- carefully prepare all the necessary equipment (preferably the patient's own equipment, but if the patient doesn't have it, use disposable equipment)
- explain the purpose and procedure to the patient
- release the bed base
- ensure the patient's safety (use side rails, moving from side to side, sitting position)
- behave with dignity, assure the patient of privacy
- encourage self-sufficiency according to the patient's ability
- communicate appropriately, using expressions of empathy
- be careful and considerate, following the concept of basal stimulation
- provide warmth and comfort (dry and cover washed parts of the body, close the door, air the room only when finished with hygienic care, etc.)
- follow the right methods for hygienic care



Patient is ready to receive hygienic care

*Note: Colours of infectious waste bags: yellow – infectious waste, red – waste to be burned, black – pathological-anatomical waste, blue – other waste, green – decontamination waste, transparent – communal waste

Reference: Methodological instruction SZU

<http://www.szu.cz/uploads/documents/chzp/puda/priloha4Z.pdf>

Hygienic care equipment

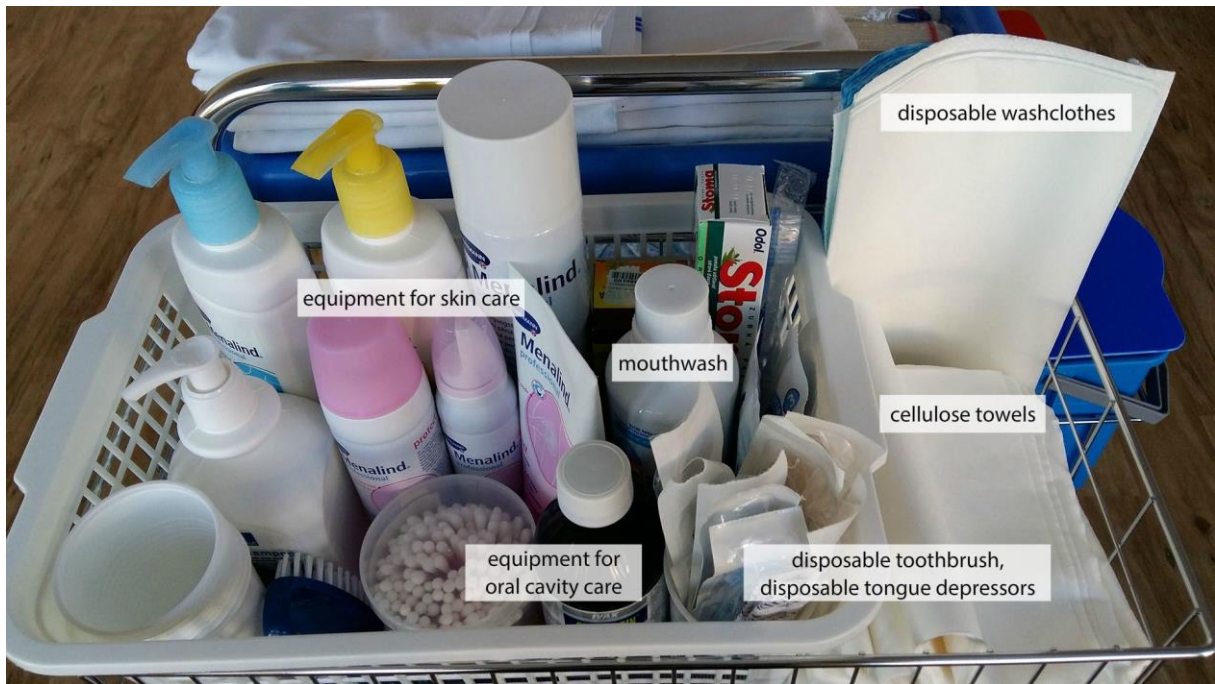
Preparation of hygienic care equipment



Trolley with hygienic care equipment



Trolley with hygienic care equipment – side view



Equipment for skin care and oral cavity care



Skin care products



Arrangement of clean bed linen on the tray

Oral Cavity Care



Equipment for oral cavity care



Requisites for oral cavity care (oral solution and oral swab sticks) – special oral care



Preparation for giving oral cavity care

Shaving a patient



Requisites for shaving



Literature

- Krišková, A. a kol. *Ošetrovateľské techniky – metodika sesterných činností*. Martin, Slovakia: Osveta, 2006. pp. 140-177. ISBN 80-8063-202-2
- Pokorná, A. a Komínková, A. *Ošetrovateľské postupy založené na dôkazoch*. Brno, Czechia: Masaryk University, 2013. pp. 19-31. ISBN 978-80-210-6331-0

Self-care and Self-sufficiency

Self-care

- independent performing of daily activities

Self-sufficiency

- various degrees of autonomy in self-care (dependency/independence in performing daily activities)
- a fundamental human need

Evaluation of self-care

- during the patient's admission to the health-care institution
- during hospitalisation, at least once per week
- evaluation based on – an interview with the patient/ relatives/ health professionals; patient observation; documentation tests which evaluate a patient's functioning (ADL, IADL, M. Gordon)

Barthel Index of Activities of Daily Living Scale (ADL)

Activity	Scoring	Total Score
Feeding	independent	10
	needs help	5
	unable to feed self	0
Dressing	independent	10
	needs help	5
	unable to dress self	0
Grooming	independent	5
	dependent	0
Bathing	independent	5
	dependent	0
Use of toilet	independent	10
	needs some help	5
	dependent	0
Bladder control	continent	10

Bowel control	occasional accidents	5
	incontinent	0
	continent	10
	occasional accidents	5
	incontinent	0
Transfer (bed to chair and back)	independent	15
	needs minor help	10
	needs major help (can sit)	5
	unable to sit, no sitting balance	0
Mobility (on level surface)	independent > 50 yards	15
	walks with help > 50 yards	10
	wheelchair dependent > 50 yards	5
	immobile < 50 yards	0
Stairs	independent	10
	needs help	5
	unable to climb stairs	0

Outcome

- 0–40 points: high dependency
- 45–60 points: medium dependency
- 65–95 points: low dependency
- 100 points: independence

Lawton-Brody Instrumental Activities of Daily Living Scale (IADL)

Activity	Scoring	Total Score
Ability to use telephone	operates telephone on own initiative – looks up and dials numbers, etc.	10
	answers telephone, dials a few well-known numbers	5
	does not use telephone at all	0
Transport	travels independently on public transportation or drives own car	10
	travels on public transportation when accompanied by another person	5
	traveling limited to taxi or car with assistance of another person or needs special modified car	0
Shopping	takes care of all shopping needs independently.	10
	needs to be accompanied on any shopping trip	5
	completely unable to shop	0
Housekeeping	maintains house alone or with occasional assistance (e.g. "heavy work domestic help")	10
	performs light daily tasks	5
	does not participate in any housekeeping tasks	0
Household	takes care of household independently	10
	needs some help	5
	unable to take care of household	0
Food preparation	plans, prepares and serves adequate meals independently	10
	heats and serves meals, but does not prepare meals	5
	needs to have meals prepared and served	0
Responsibility for own medications	is responsible for taking medication in correct dosages at correct time	10
	takes responsibility if medication is prepared in advance in separate dosage	5
	is not capable of dispensing own medication	0
Ability to handle finances	manages financial matters independently (keeps budgets, pays rent and bills, goes to bank), collects and keeps track of income	10
	manages day-to-day purchases, but needs help with banking, major purchases, etc.	5
	incapable of handling money	0

Outcome

- 0–40 points: dependent
- 45–75 points: semi-independent
- 80 points: independent

M. Gordon: Classification functional levels of the patient's self-care

1. Independent, self-sufficient patient
2. Patient needs minimal help (she/he is able to manage 75 % activities, she/he uses aids and equipment herself/himself)
3. Needs minor help (she/he is able to manage 50 % activities)
4. Needs major help (needs assistance, she/he is able to manage < 25 % of activities)
5. Dependent (needs permanent help)
6. Total self-care deficiency (no independent activity, needs complex care)

Patient category in institutional care

Decree No 467/2012 Coll., drawing up the list of health acts with point score, as amended.

Category	Title	Legend
0	Patient on pass	records every day when the patient is on pass
1	Independent patient	patient is independent of fundamental nursing care activities; children over the age of 10 years
2	Semi – independent patient	patient is semi-independent, he/she is able to take care of himself/herself with assistance, he/she is able to move out of bed alone or with assistance, patient in a wheelchair; children aged between 6 and 10 years
3	Patient requiring enhanced surveillance	fully conscious patient, but non-ambulatory out of bed, neither alone nor with assistance, nor in a wheelchair. He/she requires enhanced surveillance. Psychically altered patient requiring enhanced surveillance with a temporary restriction of movement or pharmacological tranquillization if needed; children aged between 2 and 6 years
4	Immobile patient	fully conscious, but absolutely immobile patient, potentially incontinent, requiring nursing care in all activities; children up to the age of 2 years
5	Unconscious patient	patient is unconscious or in delirium

Patient's movement regime

- evaluation and documentation is the doctor's obligation – evaluated during the patient's admission to the health-care institution, then according to current health status, has to be evaluated daily

Term	Movement regime
A – 1	sufficient
B – 2	walking patient, free movement within department
C – 3	partly self-sufficient patient, self-sufficient within his/her bed, needs some help, doesn't leave bed
D – 4	not self-sufficient, dependent patient, confined to bed, doesn't leave bed

Literature

- Lawton M., Brody E. Assessment of Older People: Self-Maintaining and Instrumental Activities of Daily Living *The Gerontologist* Volume: 9 Issue 3 part 1 (Autum 1969, pp. 179-186) ISSN: 0016-9013 https://doi.org/10.1093/geront/9.3_Part_1.179 Accessed July 22, 2018
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Therapeutic Positions and Positioning

Positions according to the patient's activity

- active (patient has the ability to change their own position, they can move voluntarily)
 - natural – the patient can position themselves in whichever way suits them
 - forced – (the patient positions themselves in response to discomfort, they take a position which reduces their pain, or which enables easier breathing or easier digestion)
- passive (involuntary – medical staff puts the patient into position – mostly with partially mobile, immobile, or unconscious patients)

Positions according to purpose

- examination position (diagnostic)
- therapeutic position
- preventive position (to prevent negative physical and psychological changes)

Examination (diagnostic) positions

- short-term position, facilitating access to the examined part of the patient's body:
 - standing
 - sitting
 - lying in a horizontal position, on the back, with lower extremities extended or flexed (supine position)
 - lying in a horizontal position on the belly (prone position)
 - on the side
 - gynaecological
 - genupectoral (knee- chest)
 - genucubital (knee-elbow)

Therapeutic positions

- to support the healing process
 - dorsal – supine (horizontal, on the back), with head and shoulders slightly elevated by a pillow (rest and sleep), or without head and shoulders elevated, e.g. after lumbar puncture
 - the Trendelenburg position (bed is tilted 15–30°) – supine (horizontal, on the back), the lower half of the body is higher than the upper half (used as an anti-shock position, to improve cerebral blood flow), in gynaecology – in case of imminent abortion, in urological surgery, the position worsens pulmonary ventilation and increases intracranial pressure, attention – during the return back to an upright position there is a risk of orthostatic collapse and headache
 - anti-Trendelenburg position (bed is tilted 15–30°) – supine (horizontal, on the back), the upper half of the body is higher than the lower half
 - Fowler's and semi-Fowler's position – for common activities (feeding, reading, hygienic care), used in pulmonary and cardiovascular diseases, after thoracic and abdominal surgery

- orthopneic position (1, 2, 3) – assumed by patients with orthopnoea – relief position for pulmonary and cardiovascular diseases
- prone position (on the belly)
- lateral position (on the side)
- Simson's position (semi-prone) – in plegics, paraplegics and tetraplegics
- recovery – Rautek's position – for unconscious patients

Principles

- the position must fulfil the purpose (examination, therapeutic effect, prevention)
- it must ensure the patient's safety (prevent falls and complications, e.g. pressure sores, contractures, etc.)
- it must provide for the patient's comfort
- when changing a patient's position, perform a skin assessment (appearance, colour, swelling, pain, other changes)
- communicate with the patient
- make a record in the documentation

Positioning of patients in health care institutions

- most often used for unconscious patients, partially mobile and immobile patients

Purpose

- **preventive** – a passive form of rehabilitation (basal stimulation, preservation of functional capacity of tissues and organs, influencing of muscle tone, prevention of pressure sores, deformities and contractures, spasticities and ankyloses, prevention of immobilization syndrome)
- **relief** – for pain relief, elimination of dyspnoea – ensures better pulmonary ventilation, relieves nausea and feelings of abdominal distension (e.g. after eating)
- **corrective** – correction of complications, e.g. contractures

Principles

- Planning
 - assess beforehand the patient's overall state and the potential risks
- Implementation
 - individual approach, regularity, consistency, gentle handling; respect the physiological positions of the joints; use appropriate equipment (to provide safe and correct position to prevent formation of pressure sores); keep the skin clean and dry (do not massage or rub, apply protective products or prophylactic cover materials); maintain a clean and dry bed, be aware of and minimize internal risk factors (malnutrition, decompensation caused by other diseases, e.g. diabetes mellitus)
 - in case of skin redness (hyperaemia/erythema), avoid positions which might irritate the affected site
 - change the patient's position every two hours, or every three or four hours during the night (total change of position). Use "micro-positioning" (little changes in positions, i.e. moving the limbs and head during any interaction with the patient)

Literature

- Jirkovský D. a kol. *Ošetrovatelské postupy a intervence: učebnice pro bakalářské a magisterské studium*, Praha, Czech Republic: Motol University Hospital, 2012. pp. 65-81 ISBN: 978-80-87347-13-3
- Pokorná, A. a Komínková, A. *Ošetrovatelské postupy založené na důkazech*. Brno, Czech Republic: Masaryk University, 2013. pp. 15-18. ISBN 978-80-210-6331-0

Compression Therapy

- supports venous return of blood from the limbs, accelerates blood flow in veins (compression causes pressure on the wall of the superficial and deep veins), narrows extended veins, improves the functioning of the venous valves, and prevents blood stagnation
- used as a preventive, therapeutic and supportive method
- performed using an elastic bandage, along with compression roller bandages and compression stockings

Purpose

- prevention of thromboembolic disease (before and after surgery, in patients with long-term immobility)
- prevention of oedema and varices (varicose veins)
- thrombosis and post-thrombotic syndrome therapy (post-thrombotic syndrome = a set of symptoms and changes resulting from deep venous thrombosis)
- treatment of venous leg ulcer
- supportive treatment of chronic venous insufficiency and lymphedema
- supportive treatment of diseases of the musculoskeletal system
- after varices surgery, after sclerotherapy (an invasive procedure that treats varicose veins), and after liposuction (cosmetic procedure for removing fat)

Equipment

- rigid zinc-glue bandages with the highest working and the lowest resting pressure
- short-stretch roller bandages: slightly extendable, with high working and low resting pressure
- long-stretch roller bandages: highly extendable, with low working and high resting pressure
- compression stockings
- multilayer bandages

ELASTIC/COMPRESSION BANDAGES	COMPRESSION STOCKINGS
Advantages	
<ul style="list-style-type: none"> • can be used in the acute phase of the disease • easy handling for healthcare professionals 	<ul style="list-style-type: none"> • can be used in chronic diseases with stable state • provides constant pressure, independent of the application technique • long lifetime if manufacturer's recommendations are followed • various design options • modern appearance • colourful • easier to put underneath footwear
Disadvantages	
<ul style="list-style-type: none"> • causes irregular pressure on the lower limb • slipping 	<ul style="list-style-type: none"> • more difficult to put on the lower limb • dry skin, eczema

- loss of elasticity, wear and tear after multiple uses
- dry skin, eczema

Principles

- select a compression aid (bandage, stockings) with regard to the purpose (prevention, treatment, supportive treatment), the state of the disease (acute/chronic phase), and the ability of the individual to use the aid
- select functional (unused) material
- select the correct width of the bandage and the size of the stocking (the larger the bandaged part of the body, the wider the bandage and the larger the stocking needed)
- apply the compression before getting up from bed (before lowering legs)
- use the proper technique (apply first on the metatarsal bones, then moving from the heel and ankle to below the knee (for a low bandage) or to the groin (for a high bandage)
- unfold the bandage directly onto the skin, not starting too far from the leg; compress the bandage most strongly at the foot, the ankle, and the lower part of the calf (on the lower limb), or (on the upper limb), at the palm, the wrist, and the forearm. As you move towards the heart, apply less pressure
- make sure you do not create folds in the compression bandage or roll it down
- if overlapping is necessary (when making turns), overlap the bandages by two-thirds
- monitor the patient for pain, tingling, numbness, swelling, blue fingers, cold acral parts, skin irritation
- explain the process to the patient

Short-stretch roller bandage (short-stretch, elasticity 60–90%)

- has a significant compression effect, high working and low resting pressure
- when applied correctly, it may be left in place for three days, including overnight during intensive treatment (cannot be used on extremities with significant swelling)
- use for: lymphatic oedema, venous insufficiency, leg ulcers
- advantages: better healing effect; provides compression all day long; does not unroll

Long-stretch roller bandage (long-stretch, elasticity 100% and higher)

- low working and high resting pressure
- use for: after-treatment of venous diseases and maintenance of wellness, treatment of sprains, short-term bandage in mobile patient
- when walking, the bandages stretch and adapt; they should not be used overnight
- advantages: may be used in both acute and chronic disorders, and in walking patients
- disadvantages: fast loss of tensile strength; it must be repeatedly tied up

Compression stockings

Compression stockings are made using elastic fibres or rubber. These fibres help compress the limb, aiding circulation. Compression stockings are offered at different levels of compression

- low working and high resting pressure (long-stretch)

- use for: maintenance phase in stabilized chronic venous disease requiring compression therapy; varices and swelling during pregnancy; after venous surgery; not to be used when sleeping
- choose size correctly: measure the length and circumferences of the patient's limbs
- choose compressive class correctly: there are four classes, named according to the pressure that the stocking exerts on the ankle area
 - **1st compressive class** (18–21 mmHg): slight compression (used: to prevent varices formation in genetically predisposed women during pregnancy; to relieve swelling from congestion caused by prolonged standing)
 - **2nd compressive class** (23–32 mmHg): moderate compression (use for: varices; after varices surgery; chronic venous disease; swelling)
 - **3rd compressive class** (34–46 mm Hg): strong compression (use for: thrombosis; post-thrombotic syndrome; venous insufficiency with tendency toward swelling; prevention of leg ulcer recurrence after successful healing)
 - **4th compressive class** (over 60 mm Hg): extra strong compression (use for: significant persistent swelling of the lymphatic origin (lymphedema))



Technique for bandaging the lower limb with a short-stretch roller bandage 1



Technique for bandaging the lower limb with a short-stretch roller bandage 2 – Basic turn, a so-called "lock"



Technique for bandaging the lower limb with a short-stretch roller bandage 3 – Securing the lock using a circular turn



Technique for bandaging the lower limb with a short-stretch roller bandage 4 – "Figure eight" turns over the ankle



Technique for bandaging the lower limb with a short-stretch roller bandage 5



Technique for bandaging the lower limb with a short-stretch roller bandage 6 – Oblique overlapping turns, alternately ascending and descending over heel; each turn crossing the previous one to form a figure eight



Technique for bandaging the lower limb with a short-stretch roller bandage 7 – Continuing with another piece of roller bandage



Technique for bandaging the lower limb with a short-stretch roller bandage 8 – High bandage – spiral turns



Technique for bandaging the lower limb with a short-stretch roller bandage 9 – Low bandage – spiral turns



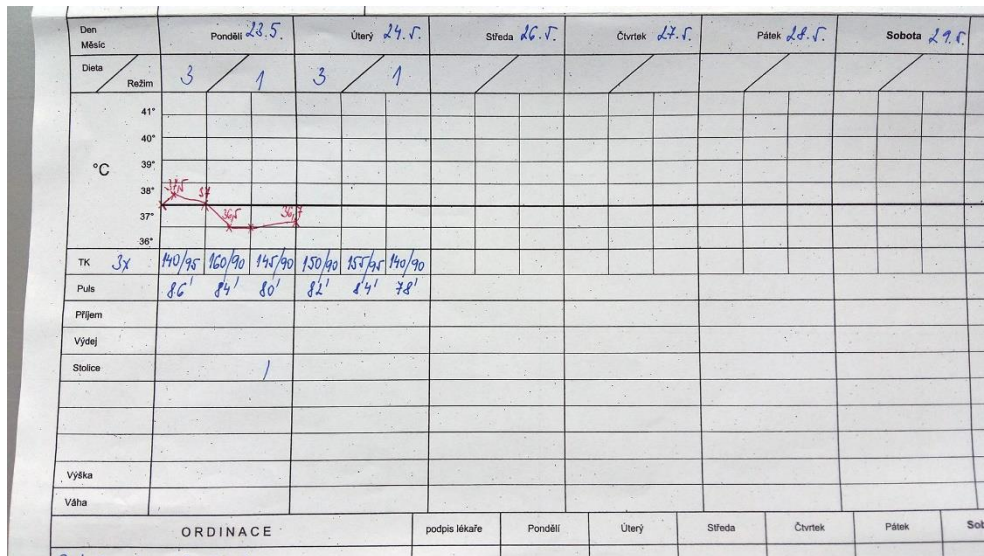
Technique for bandaging the lower limb with a short-stretch roller bandage 10 – Low bandage – spiral – reverse turns

Literature

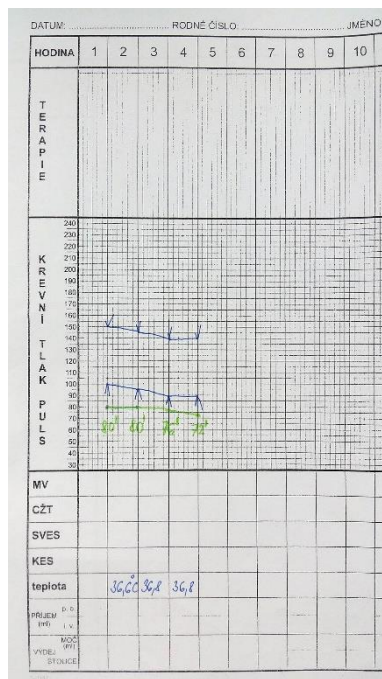
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Non-invasive Measurement of Vital Signs

- during basic examination on a patient's admission to a healthcare facility
- when a patient's general health status changes (troubles, acute deterioration of health status, pain, rehabilitation load, etc.)
- before/during/after a surgical or an invasive diagnostic procedure
- before/during/after the administration of medications which affect the cardiovascular and respiratory systems
- before/after change of treatment regimen
- based on doctor's orders



Record of BP on a patient's medical chart



Record of BP on a patient's medical chart

Blood Pressure (BP)

- is the pressure of the bloodstream against the vessel walls

Non-invasive (Indirect) measurement of BP

- the measurement of peripheral blood pressure on the radial or brachial artery by an auscultatory (stethoscope – Korotkoff's sounds) or palpatory method
 - **upper limb** (arm)
 - **lower limb** (thigh)

Guidelines

- Gain basic information about the patient – medical chart, diagnosis, treatment (drugs influencing BP), restrictions (oedema, paralytic limb, arteriovenous shunt installed, lymphoedema after mastectomy, peripheral venous catheter).
- Provide a quiet environment, comfortable room temperature, arrangement of equipment (properly working tonometer, appropriately-sized blood pressure cuff, stethoscope, medical chart).
- Inform the patient about the process. Tell them that they should not speak during measuring, they should be relaxed (not immediately after physical exercise), they should be positioned properly. If sitting, instruct patient to keep feet flat on floor without legs crossed. If lying, patient should not have legs crossed, mechanical blood pressure tonometer should be at heart level), their limbs should be in a comfortable position, they should wear loose clothing (remove constricting clothing), the cuff should be placed 2–2.5 cm (1 inch) above elbow pit (in the cubital or popliteal space).
- Inflate blood pressure cuff not more than 30 mmHg above patient's estimated systolic pressure.
- When gauging BP, automatically measure pulse as well.

Record of BP on the patient's medical chart

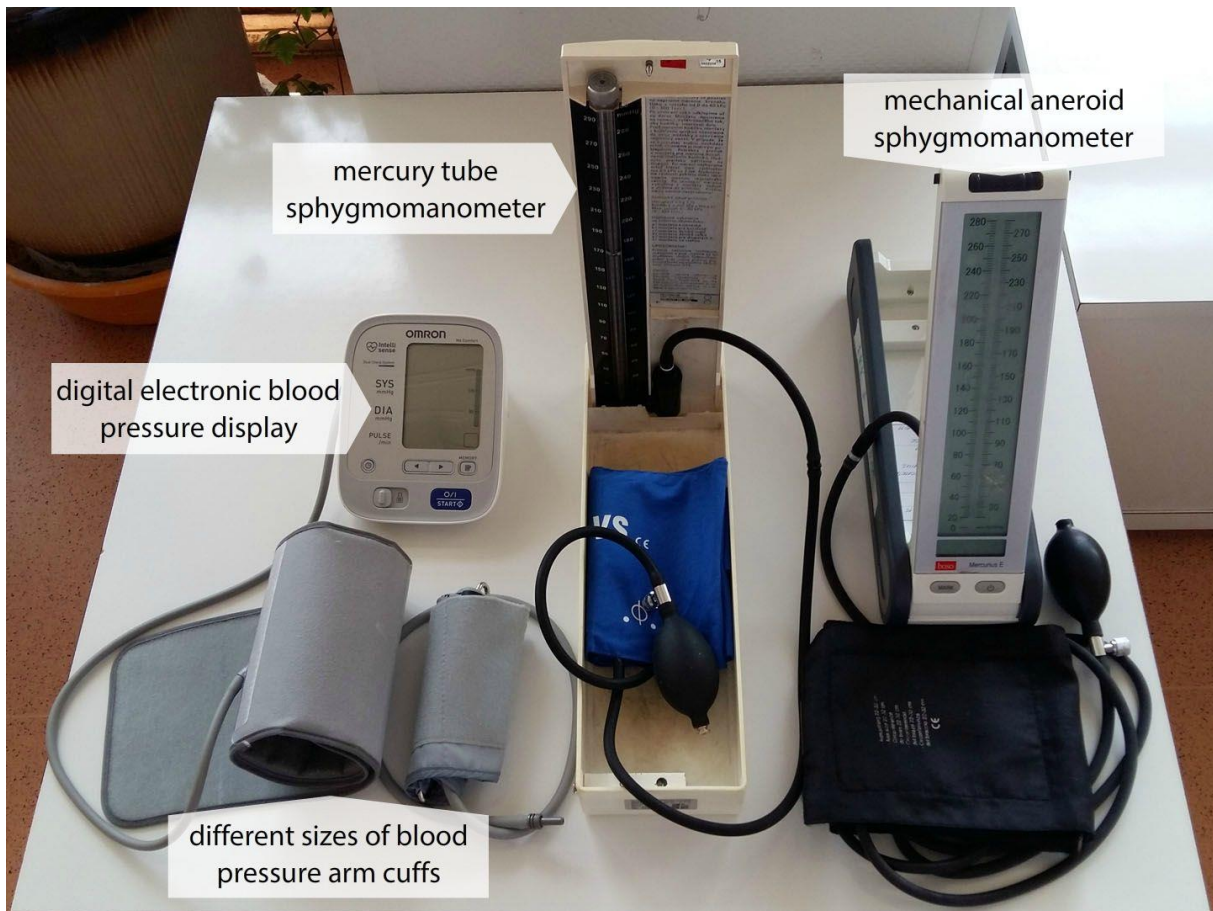
120/80 mmHg (BP systolic/ diastolic in millimetres of mercury column height)

Category and values of the BP

- systole = contraction of the heart
- diastole = dilatation of the chambers of the heart

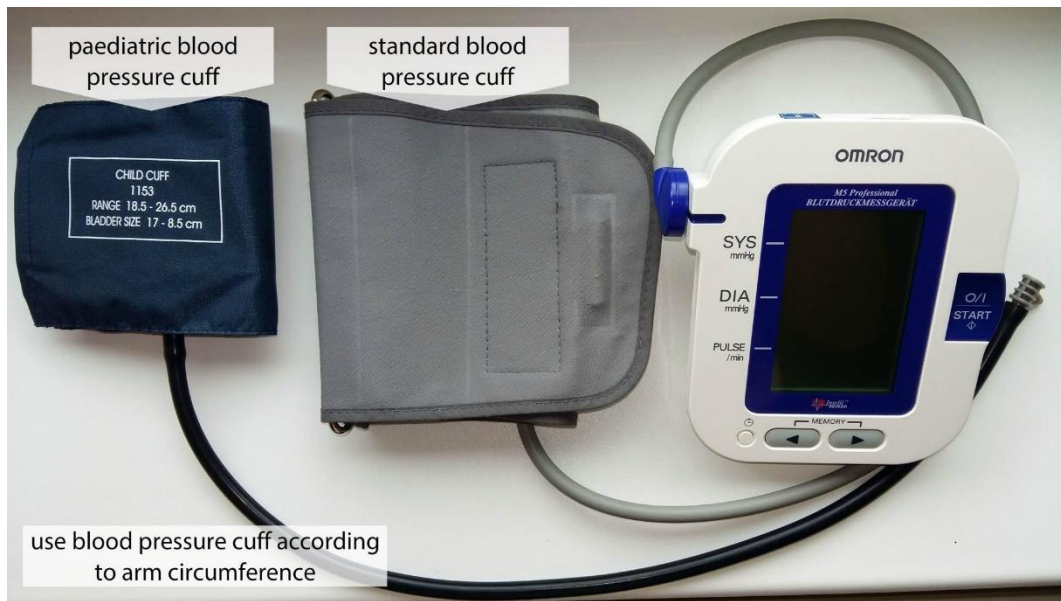
CATEGORY		SYSTOLIC VALUE mmHg
Hypotension	low BP	< 100
Normal	normal physiological value	100–129
Hypertension (high BP)	stage 1 hypertension (mild hypertension)	140–159
	stage 2 hypertension (medium hypertension)	160–179
	stage 3 hypertension (severe hypertension)	≥ 180
	isolated systolic hypertension	≥ 140
	prehypertension	130–139
Hypertensive urgency (malignant hypertension)	long-lasting high blood pressure (life-threatening)	> 210

Types of Tonometers



Types of Tonometers

Sizes of Blood Pressure Cuffs



Sizes of Blood Pressure Cuffs

Correct Blood Pressure Cuff and Stethoscope Application



Correct Blood Pressure Cuff and Stethoscope Application

Pulse

- pulse (heartbeat) is created by blood striking the artery wall during systole
- peripheral and apical (central)
- methods of measuring – palpation, auscultation, electrocardiography, oximeter, digital electronic blood pressure display
- places of measurement – radial artery, brachial artery, temporal artery, carotid artery, femoral artery, popliteal artery, posterior tibial artery, dorsalis pedis artery, apex cordis (auscultation)

Pulse monitoring

- Frequency (rate)
 - normocardia – physiological pulse rate
 - tachycardia – accelerated pulse rate
 - bradycardia – slowed pulse rate

AGE	PHYSIOLOGICAL VALUE
Newborn	110–140´
6 years	75–115´
12 years boys	65–105´
12 years girls	70–110´
Adult (man)	60–80´
Adult (woman)	65–85´

- Periodicity (rhythm)
 - regular – rhythmic (Latin *pulsus regularis*)
 - irregular – arrhythmic (Latin *pulsus irregularis*)
- Quality (intensity)
 - normal – full, easily palpable
 - high tension pulse – Latin *pulsus durus*, strong beats (in hypertension)
 - low tension pulse – Latin *pulsus mollis*, not easily palpable (in hypotension)
 - thread-like/filiform – Latin *pulsus filiformis*, not easily palpable, weak (in shock, bleeding)

Pulse measurement sites

- temporal, carotid, apical, brachial, radial, ulnar, femoral, popliteal, posterior tibial, dorsalis pedis

Guidelines

- Make slight pressure on the artery with the tips of three fingers.
- Count rate for 1 minute (if pulse is regular, count rate for 30 seconds and multiply total by 2).
- Record the pulse rate on the patient record form/medical chart/ vital sign flow sheet: P 78', *regularis*.



Pulse measurement on the radial artery

Respiration

Assessing respiration

- Frequency (rate) – respiratory rate per minute
 - eupnoea – normal, physiological breathing
 - tachypnoea – accelerated breathing
 - bradypnoea – slowed breathing
 - apnoea – suspension of breathing

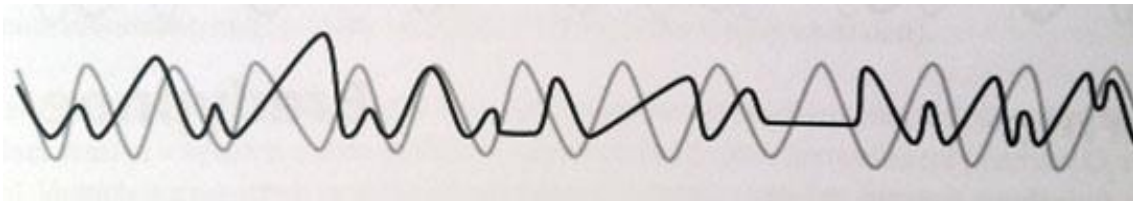
AGE	PHYSIOLOGICAL VALUES
Newborn	40–60'
Infants	25–30'
Children (under 10 years)	cca 20'
Adults	16–18'

- *Periodicity (rhythm)*
 - regular
 - irregular
- *Quality (depth)*
 - hyperventilation (a.k.a. over breathing) – deep breathing, respiratory minute volume is increased
 - hypoventilation – shallow breathing, respiratory minute volume is decreased
- *Alterations in breathing pattern*
 - dyspnoea (breathlessness)
 - respiratory phenomena (wheezing, crepitation, cough, stridor)

Pathological types of respiration

Biot's respiration

Irregular respiration varying in depth, interrupted by periods of apnoea, particularly shallow breathing (e.g. respiratory centre disorders, meningitis, encephalitis and others)

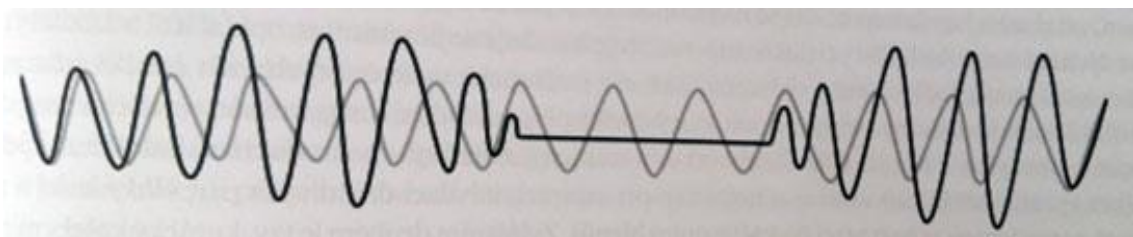


Pathological Biot's respiration (dark) and physiological respiration (light)

Figure taken from the university textbook *Pokorná, A., Komínková, A. Ošetřovatelské postupy založené na důkazech*. Masarykova univerzita, 2013. s. 78. ISBN 978-80-210-6331-0

Cheyne-Stokes' respiration

Respiratory rate and depth are irregular, characterized by alternating periods of apnoea and hyperventilation, respiratory cycle begins with slow, shallow breaths that gradually increase to abnormal rate and depth (e.g. patients with heart failure, uraemia, serious pneumonia, stroke and others)

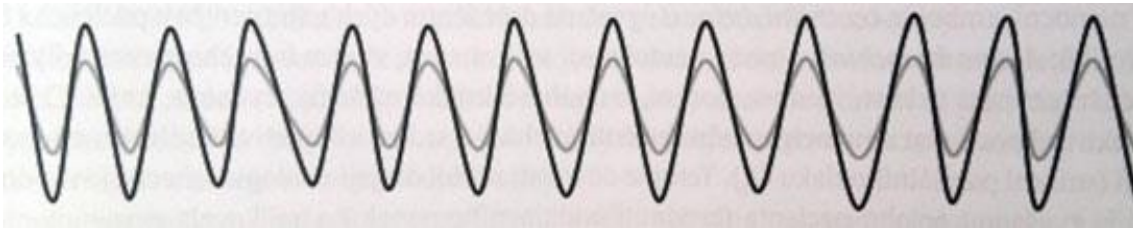


Pathological Cheyne-Stokes respiration (dark) and physiological respiration (light)

Figure taken from the university textbook *Pokorná, A., Komínková, A. Ošetřovatelské postupy založené na důkazech*. Masarykova univerzita, 2013. s. 78. ISBN 978-80-210-6331-0

Kussmaul's respiration

Respiration is abnormally rapid and deep but regular (hyperventilation), common in diabetic ketoacidosis (decompensated diabetes mellitus)



Pathological Kussmaul's respiration (dark) and physiological respiration (light)

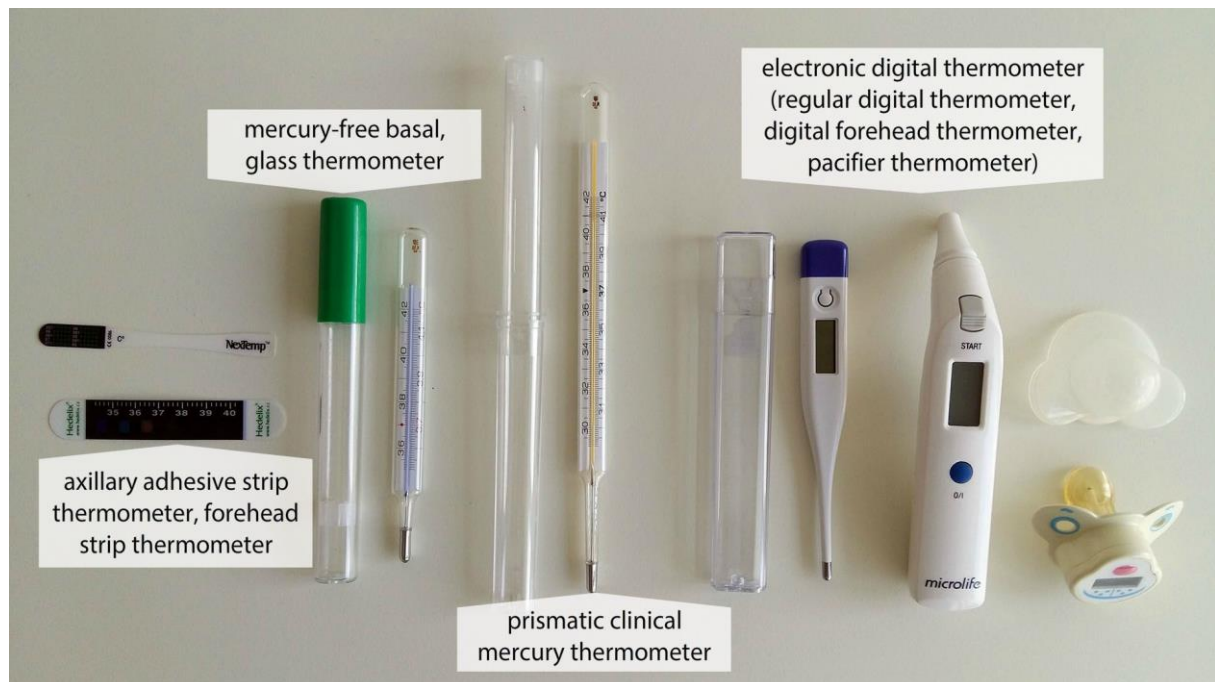
Figure taken from the university textbook *Pokorná, A., Komínková, A. Ošetřovatelské postupy založené na důkazech*. Masarykova univerzita, 2013. s. 78. ISBN 978-80-210-6331-0

Guidelines

- Do not tell patient that you are observing respiration (it may be influenced by patient's will), note chest wall movements while counting pulse (assess rate, rhythm, depth and alterations in breathing pattern).

Body Temperature

Types of Thermometers



Types of Thermometers

Místa měření

- axillary – under the arm
- oral – in the mouth (subtract 0.3 °C, not to be measured after consumption of hot or cold beverages)
- rectal – in the anus (subtract 0.5 °C)
- tympanic – in the ear
- in the groin
- basal temperature in the vagina
- on the skin (contact and non-contact thermometers)
- in the body cavities (inside urinary bladder – urinary catheter with thermal sensor)

TERMINOLOGY	VALUE
Hyperpyrexia (risk of death)	40,1 °C and more
Pyrexia (fever)	38,0–40,0 °C
Subpyrexia (slightly increased temperature)	37–37,9 °C
Normothermia	36–36,9 °C
Hypothermia	below 35,9 °C

Consciousness

- the condition of being awake and able to understand what is happening
- wakefulness – vigilance

Alteration of the consciousness

- qualitative – consciousness is affected in the aspect of content (quality): woozy consciousness (delirium, disorientation), faint/swoon (somnambulism, agony)
- quantitative – disturbed vigilance, consciousness is affected in the aspect of amount and depth (quantity): somnolence, sopor, coma

Consciousness assessment

AVPU Scale (alert, voice, pain, unresponsive), Glasgow Coma Scale (eyes, voice, motor skills)

Consciousness Assessment Scale AVPU (fast approximate evaluation)

Alert	Voice	Pain	Unconscious
awake	responds to voice stimuli	responds to painful stimuli	no response

Assess level of consciousness by choosing one of the following four categories.

Alert	
10	patient is fully awake, with spontaneously opened eyes
5	patient responds to voice and other environmental stimuli with or without confusion
0	patient is disoriented completely or to some degree
Voice responsive	
6	patient gives appropriate answers
4	patient gives either appropriate or inappropriate answers
2	verbal orientation to normal voice stimuli and/or loud voice stimuli
0	patient only reacts to verbal stimulation, might not appear aware or fully awake beforehand
Pain responsive	
4	reaction is either voluntary or involuntary with flexion or extension of a limb
3	either voluntary or involuntary reactions exhibited: eyes, voice, movement
1	moaning or withdrawal from painful stimuli
0	patient responds only to pain stimuli
Unconscious	
2	reaction is either voluntary or involuntary with flexion or extension of a limb
1	patient may be unconscious with some response to stimuli
0	patient is fully unresponsive

When compared to the Glasgow Coma Scale (GCS), the AVPU classification of alertness corresponds in the following manner: Alert = 15 GCS, Voice Responsive = 12 GCS, Pain Responsive = 8 GCS, Unconscious = 3 GCS

Glasgow Coma Scale (GCS)

Eye	Adults and children	Infants
1	no eye opening	no eye opening
2	eye opening in response to pain stimuli	eye opening in response to pain stimuli
3	eye opening to speech	eye opening to speech
4	eyes opening spontaneously	eyes opening spontaneously
Verbal		
1	no verbal response	no verbal response
2	incomprehensible sounds in response to pain stimuli	moaning in response to pain stimuli
3	inappropriate words	screaming or crying in response to pain stimuli
4	inadequate verbal response	screaming or crying spontaneously, inadequate response
5	oriented in response to pain stimuli	crooning, babbling, watching environment, turning around to a sound
Motor		
1	none	none
2	extension to painful stimuli (decerebrate response)	extension to painful stimuli (decerebrate response)
3	abnormal flexion to painful stimuli (decorticate response)	abnormal flexion to painful stimuli (decorticate response)
4	withdrawal from pain	withdrawal from pain
5	localizes to painful stimuli	localizes to painful stimuli
6	obeys command	normal spontaneous mobility

Interpretation

- GCS \geq 13 – no or minor malfunction
- GCS 9–12 – moderate malfunction
- GCS $<$ 8 – severe malfunction

Electrocardiography

Examination Process

- basic, non-invasive cardiological examination
- monitoring electrical cardiac activity with an electrocardiograph; the record (called an electrocardiogram) is made on millimetre paper

Position of electrodes

Limb electrodes

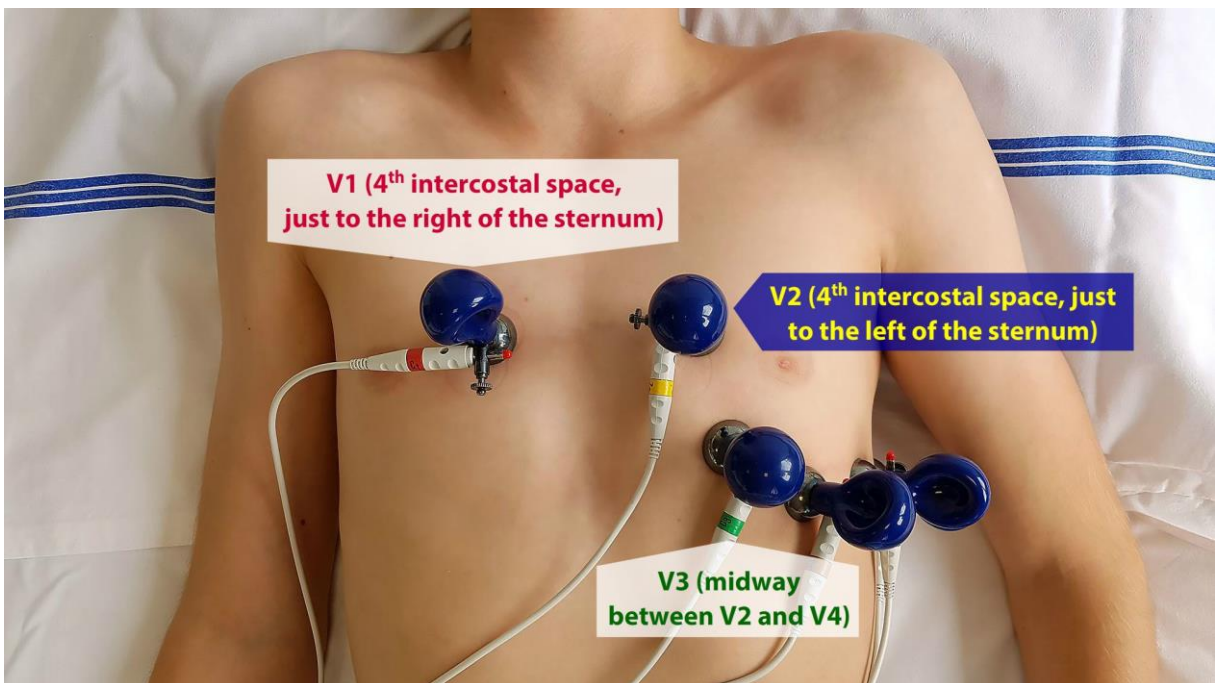
- red limb clamp – right upper limb
- yellow limb clamp – left upper limb
- green limb clamp – left lower limb
- black limb clamp – right lower limb

Chest electrodes

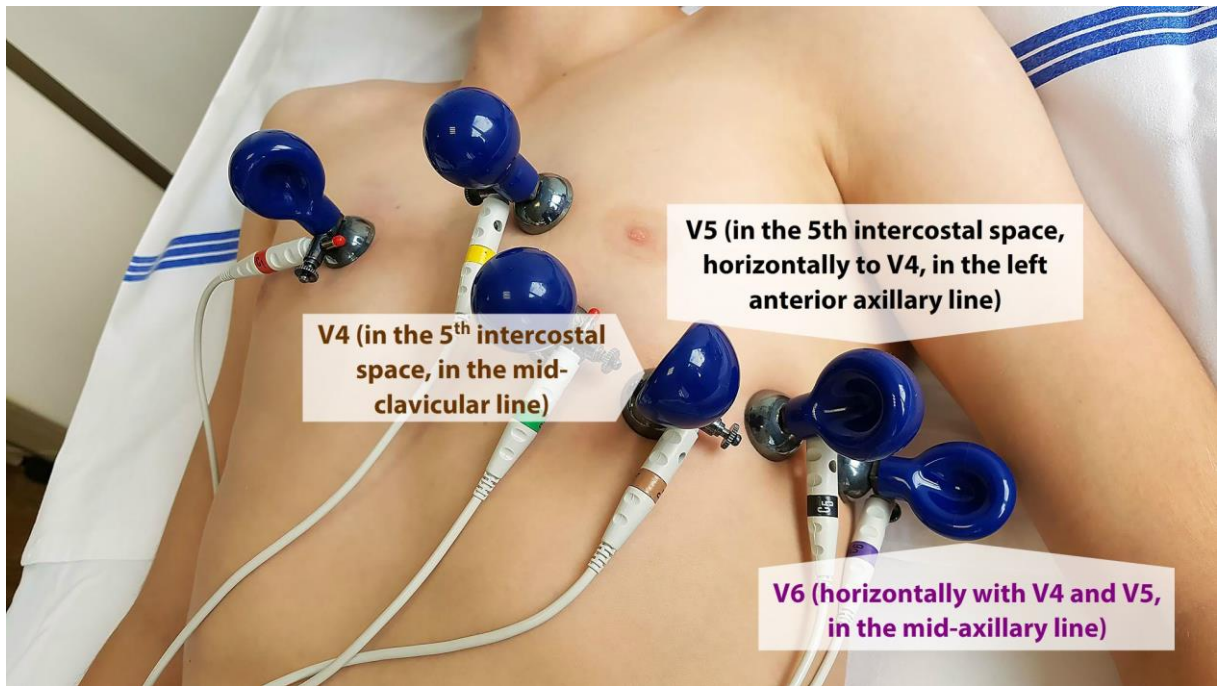
- V1 to the 4th intercostal space (between ribs 4 and 5), just to the right edge of the sternum
- V2 to the 4th intercostal space, to the left of the sternum
- V4 to the 5th intercostal space, in the mid-clavicular line
- V3 midway between V2 and V4
- V5 to the 5th intercostal space, horizontally to V4, in the left anterior axillary line
- V6 horizontally with V4 and V5, in the left mid-axillary line



Preparation of equipment and electrocardiograph



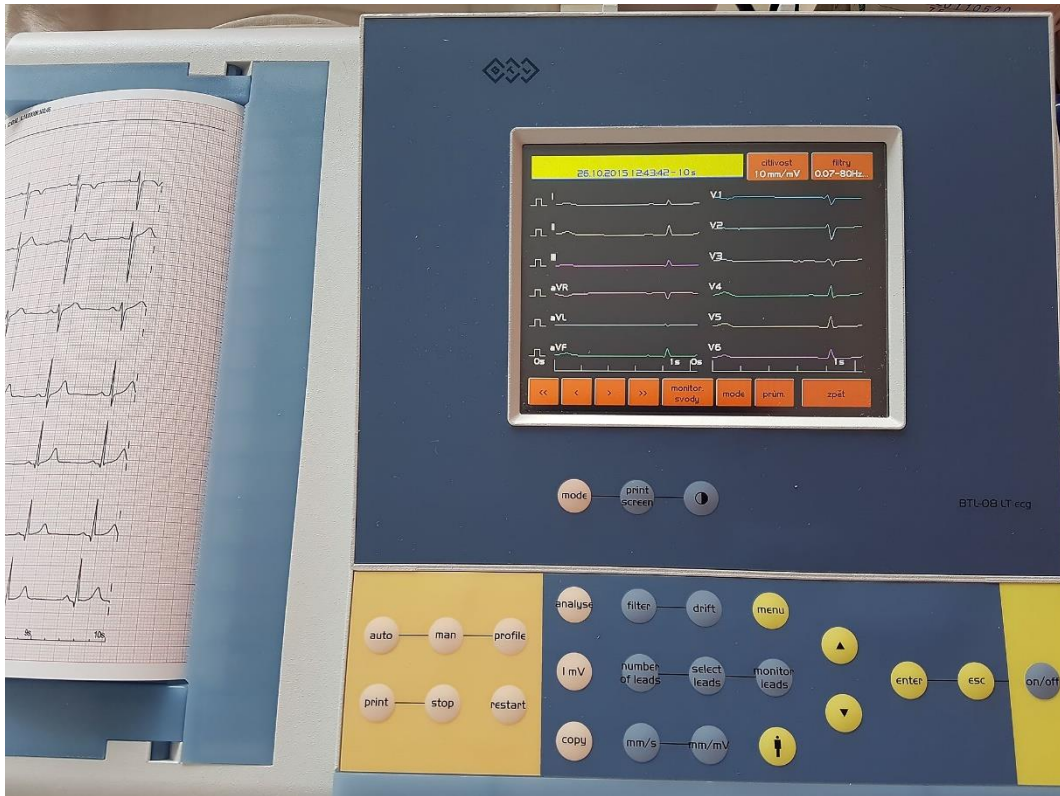
Placement of chest electrodes 1



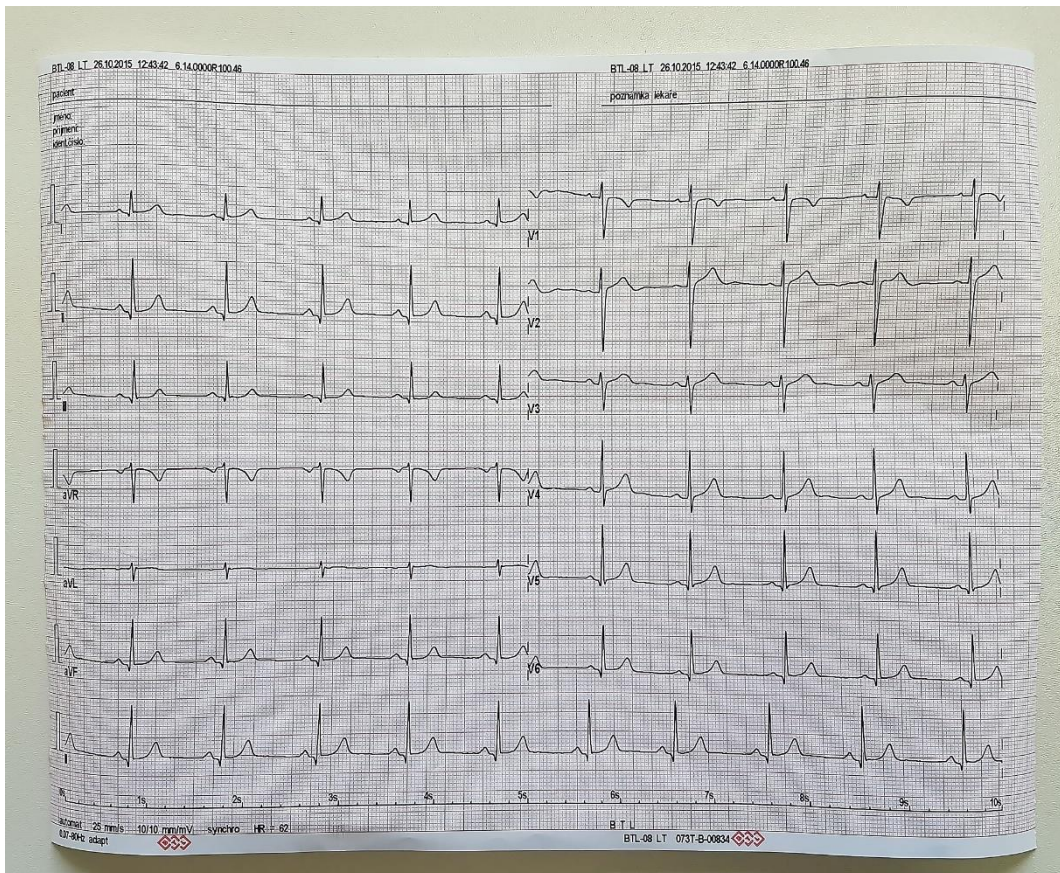
Placement of chest electrodes 2



Monitoring the electrical activity of the heart – horizontal position, physical calmness, relaxed breathing



The electrocardiograph detects heart activity and prints a record (electrocardiogram)



Electrocardiogram

Pulse Oximetry (oxygen saturation measurement, SaO_2/SpO_2)

- non-invasive method of measuring blood oxygen saturation
- indicates the percentage of oxygenated haemoglobin in arterial blood
- device sensors measure tissue permeability for a selected wavelength of light, from the measured values the pulse oximeter detects saturation of haemoglobin with oxygen
- the average physiological value in an adult is between 95–98 %

Principles

- a sensor device is placed on a fingertip or earlobe
- regular changes of position are necessary (to prevent decubitus)
- the measured values can be influenced by
 - incorrect placement of the sensor
 - increased light intensity of the environment
 - polished nails
 - reduced tissue perfusion at the site of measurement (e.g. hypothermia, hypotension)
 - anaemia (false-high value due to erythrocytopenia)
 - carbon monoxide poisoning (false-high value, since carbon monoxide has the same ability to absorb light as oxygen)



Measurement of blood oxygen saturation using a pulse oximeter

Literature

- Melechovsky D. *Pulse Oximeter: Chapters from Medical Medicine*. Aviation Physician <http://www.leteckylekar.cz/kapitoly-z-letecke-mediciny/72-pulzni-oxymetr.html>, Accessed July 22 2018
- Pokorná, A. a Komínková, A. *Ošetrovatelské postupy založené na důkazech*. Brno, Czechia: Masaryk University, 2013. pp. 66-83. ISBN 978-80-210-6331-0

Specimen Collection

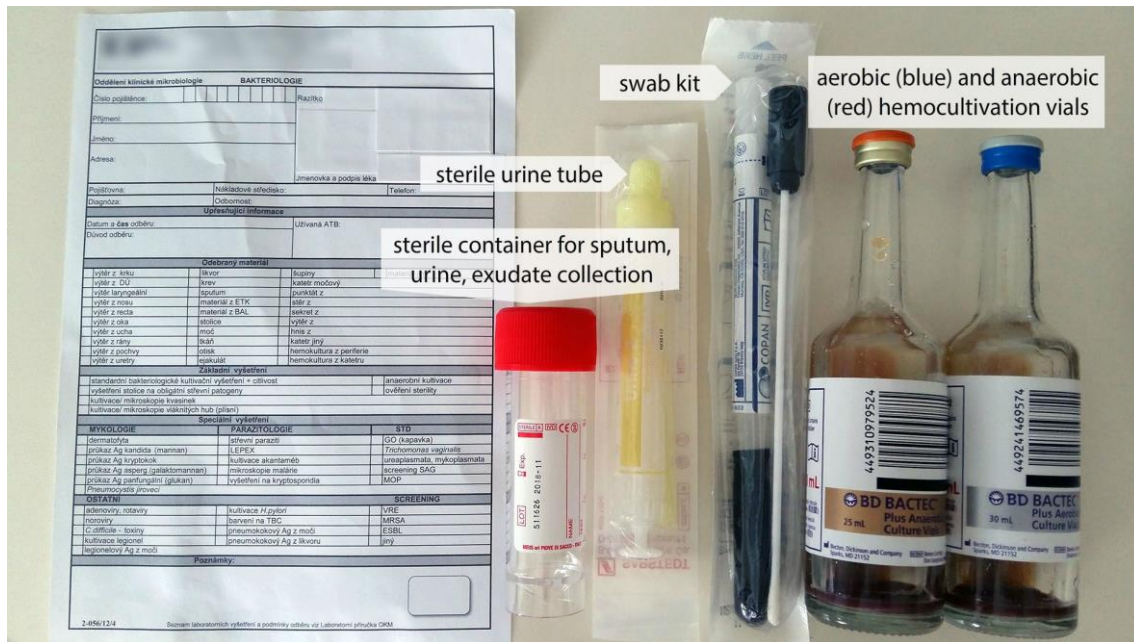
Guidelines

- indication of biological material collection is the doctor's competence
- specimen collection is the nursing responsibility (except material obtained by biopsy, puncture, excision, etc.)
- patient is informed of the purpose and course of the procedure
- specimen collection is a basic professional skill of nursing practice
- Specimen collection is based on nursing and laboratory standards and has to meet the following requirements
 - correct sampling technique.
 - use of a suitable sampling tube, cup, specimen collection kit, etc.
 - correct identification of the sampling tube – label tube with – patient's initials (before sampling); type of collected material (e.g. sputum, urine, etc.); date and time of collection
 - correct completion of the request form
 - correct way of storage of the sampling tube with collected material before and during transport to the laboratory
- take care during specimen collection and other manipulation to prevent external contamination of the sampling tube or container or sampling kit with biological material
- take care to avoid damaging body tissue or other biological material
- patient safety – sterile and disposable equipment, aseptic techniques, safe position
- strict patient identification, using two identifiers (i.e. “What's your name?”, birthday, identification bracelet, etc.)
- nurse safety – use of protective aids (disposable gloves), correct sampling techniques, correct handling of sharp objects (e.g. used needles must never be put back into the plastic cover, but dumped into the sharp disposal container or a separate kidney dish)
- safe handling of obtained samples and used equipment

Sampling phases

- **preanalytical** – sample collection and transport
- **analytical** – sample analysis at the laboratory
- **postanalytical** – doctor's evaluation of the results

The following are examples of illustrative request form and specific sampling tube.



Types of tubes for bacteriological examination

Literature

- Pokorná, A. a Komínková, A. *Ošetrovatelské postupy založené na důkazech*. Brno, Czechia: Masaryk University, 2013. pp. 84-120. ISBN 978-80-210-6331-0

Urine Specimen Collection

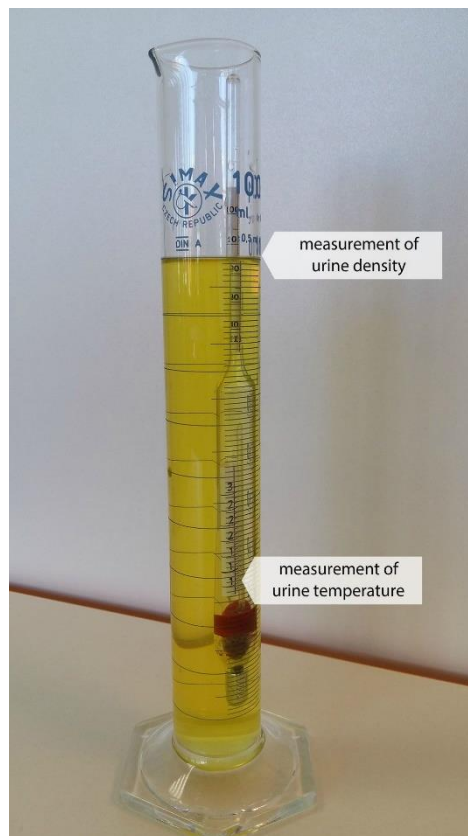
Physical macroscopic analysis – colour, odour, froth, turbidity, pH, urine density (gravity) and osmolality.

Specific urine density

- **weight concentration of dissolved substances** excreted in the urine, normal value 1015–1025 kg/m³
- measurement according to the doctor's orders, e.g. once a day, measurement during urine examination, or during urine collection



Equipment for measuring specific urine density



Measurement of specific urine density



Measured specific urine density (gravity) value is 1015

Biochemical urine examination

Guidelines

- collect the patient's first morning urination in the vial (urine cup, tube, vial); before collection provide genital hygiene, collect midstream urine
- specimen collection from the permanent urinary catheter through the port. It is necessary to clamp (close) the catheter about 20–30 minutes prior to collection

Chemical urine examination with parallel examination of urinary sediment

- doctor's orders in patient documentation – urine + sediment, (in Czech designation M+S)

Methods of sampling

- basic urinalysis – diagnostic strips
- sampling tubes



Urine collection (equipment: urine tube, urine cup, disposable gloves)

Urine sediment according to Hamburger

- determines the amount of various particles in the urine
- collection period takes 3 hours (± 0.5 hour).

Principles

- mark down the exact times of the beginning and the end of urine collection in the request form and record the exact amount of urine excreted during that time
- the total volume of urine collected must be at least 100 mL
- transport the collecting container with the whole volume of urine + carefully filled request form

Procedure

- beginning of collection – at 6 o'clock the patient micturates OUTSIDE the collecting container, performs genital hygiene, then collects urine into a collecting container, he/she is allowed to have breakfast and 250 mL of tea (any more than this invalidates the examination)
- after 3 hours of collection, he/she micturates into the collecting container for the last time (usually only one micturition into the collecting container)

Urine collection for creatinine clearance

- name comes from English clear or clean
- a functional renal test, determines the amount of creatinine removed from the blood over a given time, the amount of “kidney-treated” plasma from creatinine per 24 hours
- clearance of endogenous creatinine is determined on the basis of its concentration in urine and plasma

Procedure

- urine collection over 24 hours, 10 mL sample of all collected and mixed urine + blood collection (5–7 mL coagulable blood)
- Write down on request form the total amount of collected urine, the specific urine weight, and the patient's height and weight.

Balance urine collection

- quantitative examination
- sample is obtained within a given time (urine collection over 24 hours)
- urine, urea, creatinine, proteins, etc. can be measured in the urine

Procedure

- beginning of collection – at 6 o'clock the patient micturates OUTSIDE the collecting container, performs genital hygiene, then collects urine into a collecting container (clean and dry closable container)
- urine collection lasts 24 hours, 10 mL sample of urine from collected and mixed volume of urine + blood (5–7 mL coagulable blood)
- Record the total amount of urine, specific urine weight, fluid input and output, and patient's height and weight on request form.

Microbiological urine examination

Bacteriological urine examination

- in documentation we find the record such as BV, urine B + C, urine C + K, urine K + C

Principles

- strict patient education
- careful genital hygiene.
- genital disinfection (according to the practice of the department and the laboratory's requirements)
- aseptic collection of urine midstream
- before starting ATB treatment, or 2–3 weeks after ATB treatment. In case of antibiotics administration, the type, strength, frequency and date of administration should be indicated on request form
- the sample needs to be transported to the laboratory within 2 hours

Procedure

- collection of midstream of urine into a sterile tube – strict, thorough education and maintenance of sterility of collecting container, preferably morning urine (accumulation of microorganisms), prior to collection – thorough genital hygiene, then genital disinfection; men – retract foreskin for effective cleaning of urinary meatus, women – spread labia, hold labia apart (urine collection not during menstruation)
- single catheterization

- suprapubic puncture – doctor's intervention, 1–2 cm above the symphysis – puncture needle in urinary bladder – urine collection
- collection from the permanent urinary catheter through the port. Write down the permanent urinary catheter introduction on the request form

Toxicological urine examination

- urine sampling for intoxication – toxicological analysis
- for workers in hazardous workplaces in a chemical environment – urine sample taken at the end of working hours in the second half of the week
- collection into the vial – about 100 mL of urine



Sterile urine specimen container – toxicological examination

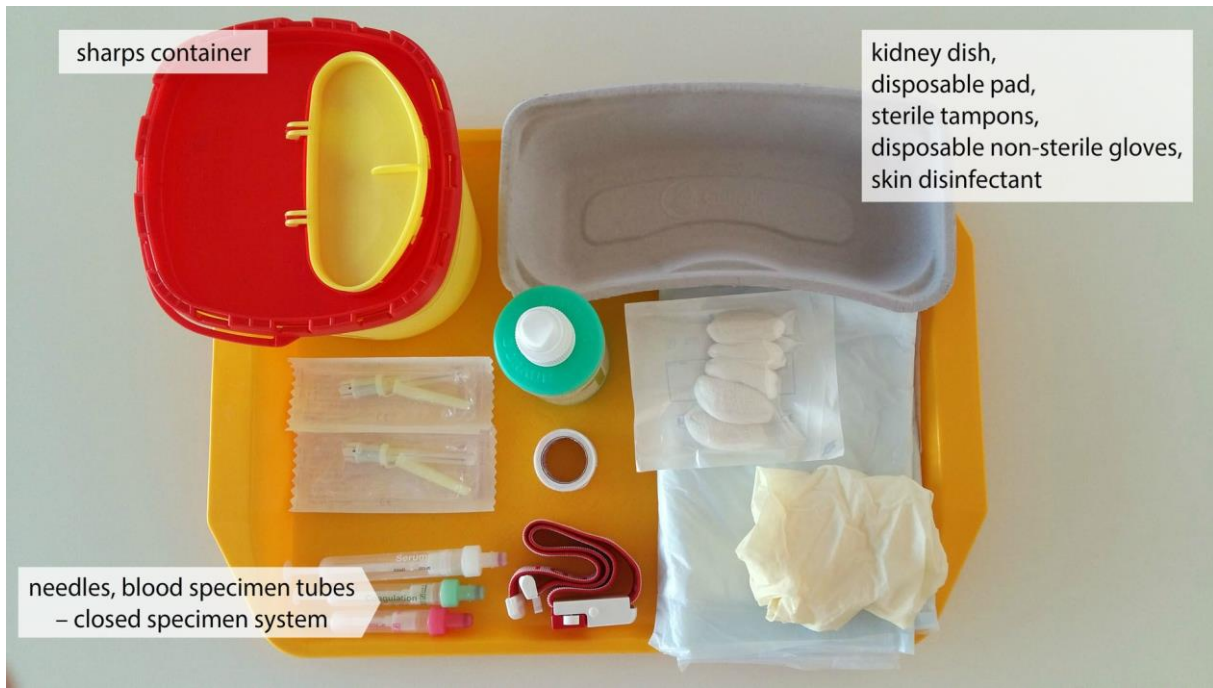
Blood Specimen Collection

- venous, capillary, arterial
- coagulated and non-coagulated blood
- venepuncture – frequently requested method of obtaining blood specimens from vein, “closed” systems are preferred (e.g. SARSTEDT, VACUTAINER, etc.)
- venous blood collection from central venous catheter (jugular vein, subclavian vein) – turn off all infusions and intravenous pumps, use strictly aseptic technique, use correct adapter, gently aspirate 10 mL of blood and then aspirate desired amount of blood, reclamp catheter
- skin puncture (capillary puncture) – the least traumatic method of obtaining a blood specimen – puncture a vascular area on the finger or earlobe or heel (little children), frequently requested methods: blood glucose monitoring, ABGs (arterial blood gases), blood count
- arterial puncture – radial artery, femoral artery

Principles

- prepare equipment + blood tubes

- inform the patient about purpose of the procedure
- respect security principles and standards – use disposable gloves, aseptic technique
- identify the patient using two identifiers (name, birthday – “What's your name?” “When were you born?”, check identity wristband
- commonly recommended orders: serology, biochemistry, coagulation, haematology, erythrocyte sedimentation



Equipment for blood collection



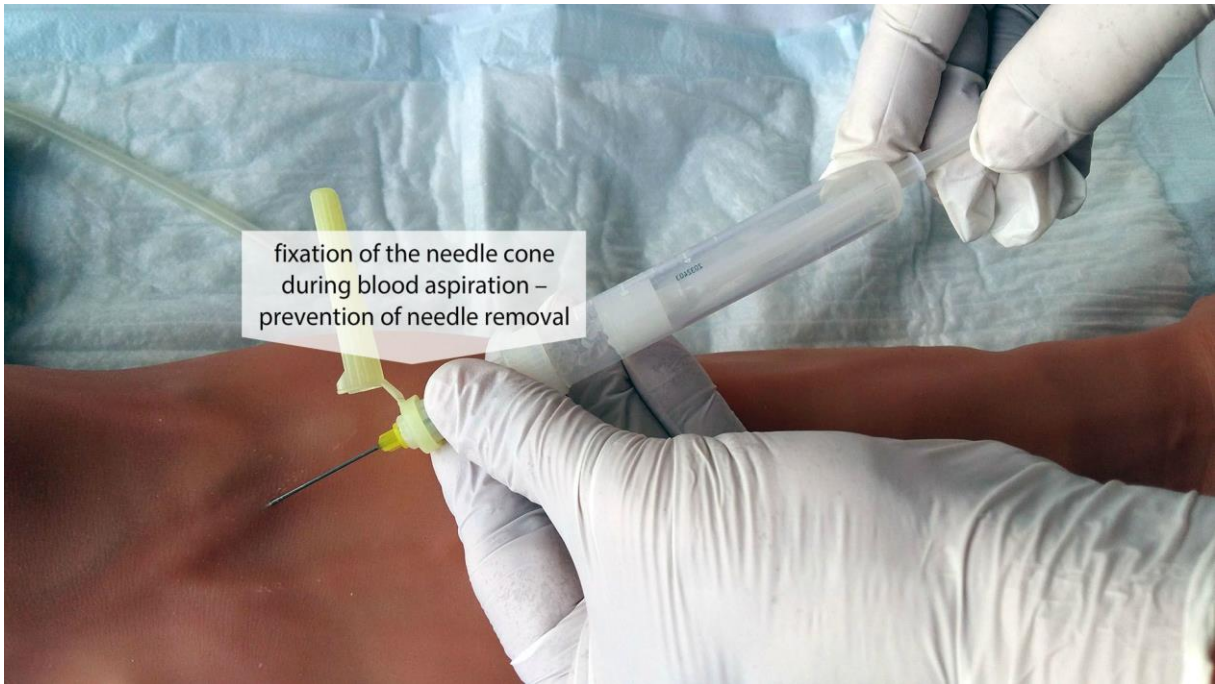
Blood collection kit



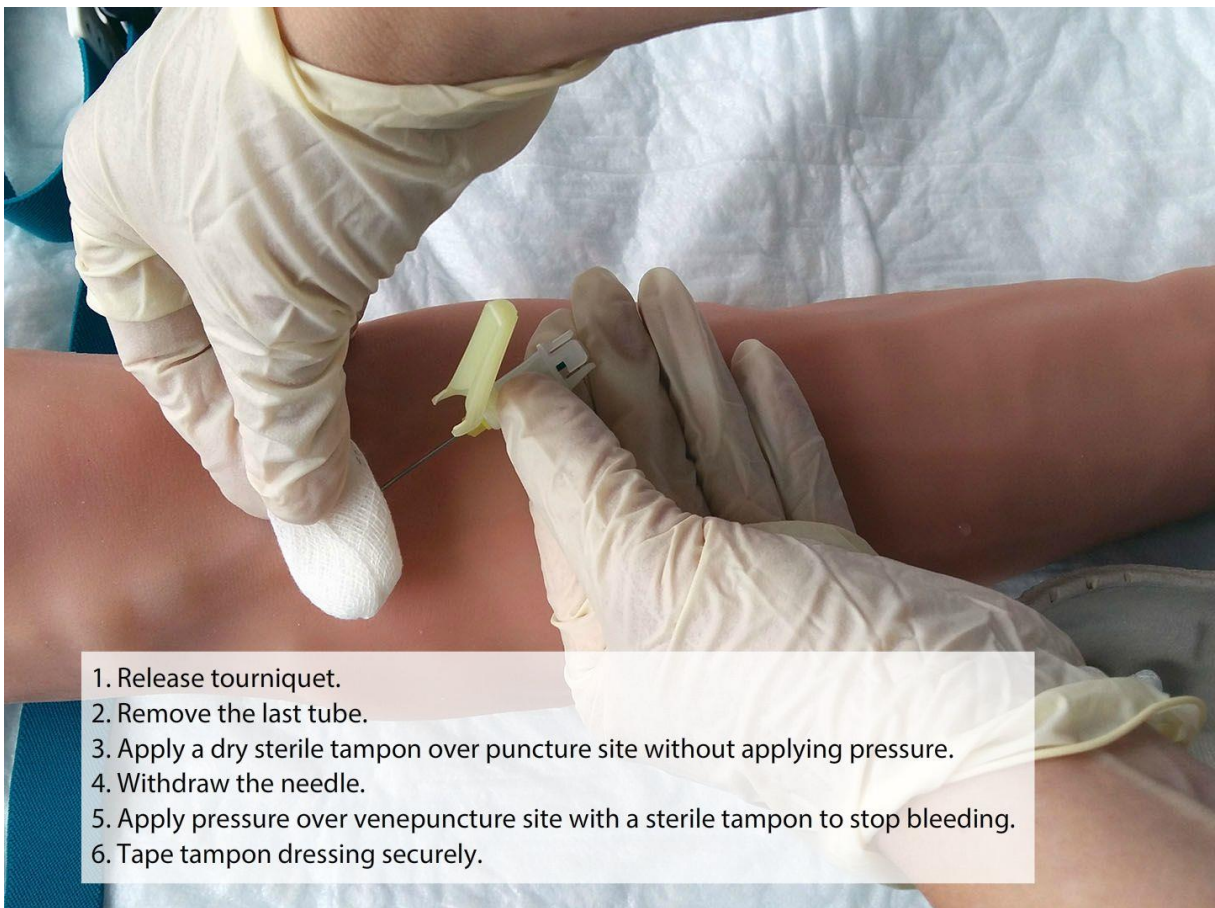
Inserting the needle into a vein (1)



Inserting the needle into a vein (2)



Aspiration of blood into vacuum tubes



Withdrawing the needle

*taping the venepuncture site with sticking plaster after the blood collection is not generally recommended – moving and self-sufficient patients compress the venepuncture site with sterile tampon themselves

Venous blood collection

Biochemical examination of venous blood

- **coagulable venous blood**
- routine blood collection – standard analysis period, brown designation of the blood tube (Sarstedt monovette 4,9 mL)
- STATIM examination – results are available within 2 hours of specimen's admission to the laboratory, orange designation of the blood tube (Sarstedt monovette 4,9 mL)

Oddělení klinické biochemie - BIOCHEMICKÉ VYŠETŘENÍ

Nákladové středisko: Datum: Razítko (ICP), podpis lékaře:

Telefon: Cas odběru:

Č. ZP: Jméno: Odbornost lékaře:

Diagnóza: Další dg.: Počet frakcí: Odebral:

KREV

Na, K, Cl	ALT	lipase	LDH	z - mikroglob	(Elev. v glykémii)
Ca	AsAT	lipoliz	FFA	AFP	
Profil anorg.	GGT	Prothrombin	TT3	CA	
Mg	ALP	Transferrin	Anti-TG	CA 19-9	TPP - vyšetř. do poz.
Cr	LD	CRP	Anti-TPO	CA 15-3	Biopsie
Zr	CK	Prokalcitonin	Anti-recept. TSH	CA 125	Diagnost.
hemoc.	Cholesterol	lyg	Koloid*	CA 17-4	LD
Cholesterol	Amylaza	lyg	Parabornon*	TPS	Amylaza
Urea	Laktat	lyg	lyg	CA 15-3	Biopsie
Kreatinin	Amylaza pankr.	lyg	C - reakti*	SCCA	Kreatinin
Výsled. test. (SERO)			Ca	PSA, free PSA	lyg. močová
Křiv. močová	Trypsin	Oronoxonolid	GTB**	NSE*	Na, K, Cl
Bilirubin celkový	Mangán	cy - antitypn	ACTH*	tyroglobulin	Cholesterol
Bilirubin přímý	Vanadín	Vanadín	Adrenalin	Kalcitonin	Diagnost.
Glukóza	lyg*	za - makroglo.	Revit*	Digoxin	Ca
Urobilinogen. HDL*	Fe	Ca - kationem	Vz - cit - sprg	Tyrosin	Albumin
Cholesterol	Sekur. transferrin	Ca - kationem	SHGA-S	Karbohydrati	lyg
Urgentní	Vitamin B12	Ca	Antinukleární	Paraglob	TESTY
HDL - cholesterol	Folate	AMF	REG	lyg	GGT*
LDL - cholesterol	Folate	RF	lyg	lyg	Ca - křivka
AP0 B	Erytrocyty	Anti - CCP	lyg	lyg	Diagnostický test
LDH	Von Willeb.	Oronox C	RFI	lyg	Diagnostický test
Hemoglobin*	lyg	CDT	Erykita	Diagnostika*	Diagnostický test
Laktat*	Vitamin D3 (OH-D3)	ACE	Prokalcitonin	lyg	Diagnostický test
Amoniak*	AlP - aktivní	1,25(OH)2 vitamin	Tyrosin	Amilaza	Diagnostický test
Etanol*	Dipeptidyl	ELF2 zbytky	SHBG	Serotonin	STOLICE
Biopsie	Prokalcitonin	Prokalcitonin	lyg	lyg	Ca - křivka
Ca ionizované	CTx - Orend. lyg	lyg	lyg	lyg	lyg

MOČ SBÍRANÁ

Uvědomte: GP

Diagnóza: ml / hod	Uvědomte: GP	Na, K, Cl	Albuminurie*	Serodiagnostics
Na, K, Cl	Ca	Ca	Typ proteinurie	Bilirubinurie
Ca	Zr	Různá l. křivka	lyg	Diagnostický test
Mg	Profil anorg.	Různá l. křivka - moč*	lyg	Amilazurie
Profil anorg.	Trypsin	lyg	lyg	Diagnostický test
Cholesterol	Cholesterol	lyg	lyg	Diagnostický test
Urea, kreatinin	Kreatinin	lyg	lyg	lyg
Kreatinin	Kreatinin	lyg	lyg	lyg
Křiv. močová	Křiv. močová	lyg	lyg	lyg
Amylaza	Amylaza	lyg	lyg	lyg
Biopsie	Biopsie	lyg	lyg	lyg
Albuminurie*	Albuminurie*	lyg	lyg	lyg

MOČ JEDNORÁZOVÁ

Uvědomte: GP

Diagnóza: ml / hod	Uvědomte: GP	Na, K, Cl	Albuminurie*	Serodiagnostics
Na, K, Cl	Ca	Ca	Typ proteinurie	Bilirubinurie
Ca	Zr	Různá l. křivka	lyg	Diagnostický test
Mg	Profil anorg.	Různá l. křivka - moč*	lyg	Amilazurie
Profil anorg.	Trypsin	lyg	lyg	Diagnostický test
Cholesterol	Cholesterol	lyg	lyg	Diagnostický test
Urea, kreatinin	Kreatinin	lyg	lyg	lyg
Kreatinin	Kreatinin	lyg	lyg	lyg
Křiv. močová	Křiv. močová	lyg	lyg	lyg
Amylaza	Amylaza	lyg	lyg	lyg
Biopsie	Biopsie	lyg	lyg	lyg
Albuminurie*	Albuminurie*	lyg	lyg	lyg

Průběh a hlavní léky a biologické údaje medikace, hodnosti pacienta, dle vyšetření:

© 2008/11/10

Standard biochemical venous blood examination

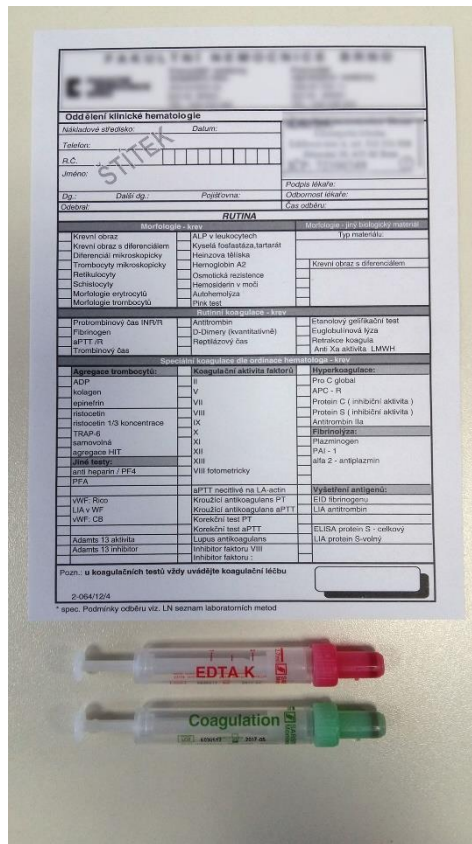
The image shows a STATIM biochemical venous blood examination form. The form is titled "Oddělení klinické biochemie a hematologie" and "STATIM". It contains fields for patient information (Name, Date, Room/No), and a grid for test results. The tests are categorized into "KREV" (Blood), "ANALYZOVANÉ ČASŮVÉ" (Analyzed Time), "PUNKTATY" (Points), "MOČ SBÍRANÁ" (Urine Collection), "MOČ JEDNODRÁŽOVÁ" (Single Urine), and "DRUGY SCREENING" (Drug Screening). A Li-Hep-Gel tube is visible in the foreground.

STATIM biochemical venous blood examination

Haematologic examination of venous blood

- **non-coagulable venous blood**
- morphology – form and quantity of blood elements
 - complete blood count – red designation of the blood tube (Sarstedt monovette 2,7 mL)
 - frequently requested blood examinations: blood count (BC) – also known as a complete blood cell count (CBC); full blood count (FBC); or full blood exam (FBE) – in Czech use designation “KO” in patient medical chart (record form). BC gives information about blood cells: leukocytes, erythrocytes, thrombocytes, haemoglobin, haematocrit
 - differential blood count – use designation KO + diff. in record form; examination of blood count and differentiation of leukocytes
- haemoocoagulation – coagulation of blood (blood clotting)
 - haemoocoagulation examination – green designation of the blood tube (Sarstedt monovette 3 mL).
 - indicate the dose and time of anticoagulant, antiplatelet, LMWH therapy in request form
 - the most common coagulation tests are
 - *Prothrombin time test* (PT – velocity of passage of extrinsic blood coagulation; result in INR (international normalized ratio) – in patients taking Warfarin
 - *APTT* (activated partial thromboplastin time – velocity of passage of intrinsic coagulation pathway; result expressed in seconds

- Xa factor – monitoring of anticoagulation therapy Heparin, fibrinogen (factor I – blood protein produced in liver that is changed into fibrin to clot the blood when body tissue is damaged)



Standard haematological venous blood examination

Oddělení klinické hematologie			STATIM
Náhodové středisko:	Datum:	Kózního (ICF):	
Telefon: _____ Čís.:			
R.Č.:			
Jméno:		Podpis lékaře:	
Obj.:	Číslo obj.:	Průřezová:	Ordinace lékaře:
STATIM			
Morfologie			
<input type="checkbox"/> Krevní obraz			
<input type="checkbox"/> Diferenciál			
<input type="checkbox"/> Diferenciál mikroskopicky			
<input type="checkbox"/> Retikulocyty			
Koagulace			
<input type="checkbox"/> Protrombinový čas INRR	<input type="checkbox"/> Antitrombin III		
<input type="checkbox"/> Fibrinogen	<input type="checkbox"/> D-Dimery (kvantitativní)		
<input type="checkbox"/> aPTT	<input type="checkbox"/> Etanový gelifikační test		
<input type="checkbox"/> Trombinový čas	<input type="checkbox"/> Anti Xa aktivita LMWH		
<input type="checkbox"/> Reptilazový čas			
Testy pouze dle ordinace hematologa			
<input type="checkbox"/> Euglobulinová lyza	<input type="checkbox"/> II	<input type="checkbox"/> Diferenciál mikroskopicky	
<input type="checkbox"/> aPTT citlivé LA	<input type="checkbox"/> V	<input type="checkbox"/> Schistocyty	
<input type="checkbox"/> aPTT specifické LA-actin	<input type="checkbox"/> VII	<input type="checkbox"/> PLT mikroskopicky	
<input type="checkbox"/> Kroužecí antikoaagulans PT	<input type="checkbox"/> VIII	<input type="checkbox"/> Retikulocyty mikroskopicky	
<input type="checkbox"/> Kroužecí antikoaag. aPTT	<input type="checkbox"/> IX		
<input type="checkbox"/> Konekční test PT	<input type="checkbox"/> X		
<input type="checkbox"/> Konekční test aPTT	<input type="checkbox"/> XI		
	<input type="checkbox"/> XII		
Pozn.: u koagulačních testů vždy uvádějte koagulační léčbu			
2-4934072			

STATIM haematological venous blood examination

Blood bank

- **non-coagulable venous blood**
- blood group and Rh factor examination; ordering of transfusion products
- Sarstedt monovette 4,9 mL or 5 mL – red or green designation of blood tube (according to the practice of the workplace)

ŽÁDANKA O IMUNOHEMATOLOGICKÉ VYŠETŘENÍ A ERYTROCYTOVÉ PŘÍPRAVKY

Jméno, příjmení, rodné číslo pojistěnce: _____ **Zdravotní pojišťovna:** _____ **Požaduje (IČP, telefon, adresa, NSJ):** _____

ŠTĚTKA **Diagnóza:** _____ **BAZILINKA**

Datum narození: _____

Pohlaví: M Ž

Materiál k vyšetření: periferní krev nesrážlivá
 krev pupečnicková
 periferní krev srážlivá *

*pro vyšetření chladových protilátek vzorek transportujte při teplotě +37°C

Naléhavost požadavku: RUTINA STATIM VITAL

Datum a čas odběru vzorku: _____ **Podpis odebírající osoby:** _____

Vyplní LETTO: _____
Datum a čas příjmu vzorku: _____

Příjímá (podpis): _____

Imunohematologická anamnéza:

Předchozí transfuze: ANO (kdy): _____ **Gravidita (týden):** _____

Reakce po transfuzi: ANO (kdy): _____ **Porody (počet):** _____

Zjištěné protilátky (jaké, kdy): _____ **Anti-D profylaxe (datum podání):** _____

_____ **Jiné nálezy (KS matky novorozence apod.):** _____

Pacient po transplantaci krevtvočných buněk: ANO

Datum transplantace: _____ **Krevní skupina pacienta (uveďte, je-li známa):**

Krevní skupina dárce transplantátu: _____

Požadované služby (vyšetření označte):	Metoda	Množství a typ odběru, další informace
<input type="checkbox"/> Předtransfuzní vyšetření	aglutinační	6ml periferní krev nesrážlivá
<input type="checkbox"/> Vyšetření krevní skupiny	aglutinační	6ml periferní krev nesrážlivá, krev pupečnicková
<input type="checkbox"/> Opis krevní skupiny	-	-
<input type="checkbox"/> Vyšetření antigenů Rh a Kell	aglutinační	6ml periferní krev nesrážlivá
<input type="checkbox"/> Vyšetření nepravidelných protilátek proti erys	aglutinační	6ml periferní krev nesrážlivá
<input type="checkbox"/> Identifikace protilátek	aglutinační	6ml periferní krev nesrážlivá
<input type="checkbox"/> Vyšetření chladové protilátky	aglutinační	6ml periferní krev srážlivá / transport vzorku při +37°C
<input type="checkbox"/> Příjem antiglobulinový test (PAT)	aglutinační	6ml periferní krev nesrážlivá
<input type="checkbox"/> Jiné vyšetření (uveďte):	dle požadovaného vyšetření	Vyplní LETTO (číslo vyšetření/žádky):

Požadavky na erytrocytové transfuzní přípravky (uveďte):

Počet TU	Deleukotizace	Ozaření	Datum a čas požadovaného výdeje přípravku (nebo uveďte deponování):
	<input type="checkbox"/> ANO	<input type="checkbox"/> ANO	
	<input type="checkbox"/> ANO	<input type="checkbox"/> ANO	
Pediatrická TU	Objem (ml):	<input type="checkbox"/> ANO	


Vyšetření označeno nutno předem telefonicky objednat

Výšeřtky: K⁺ - identifikační číslo pracoviště
K⁻ - krevní skupina
PAT - příjem antiglobulinového testu

M 2 - muž / žena
LETTO - laboratorik a exekutor TTD
TTC - Transfuzní a krevní oddělení

TU - Transfuzní oddělení
NS - náhodné předělení
Č. p. - číslo pacientovy

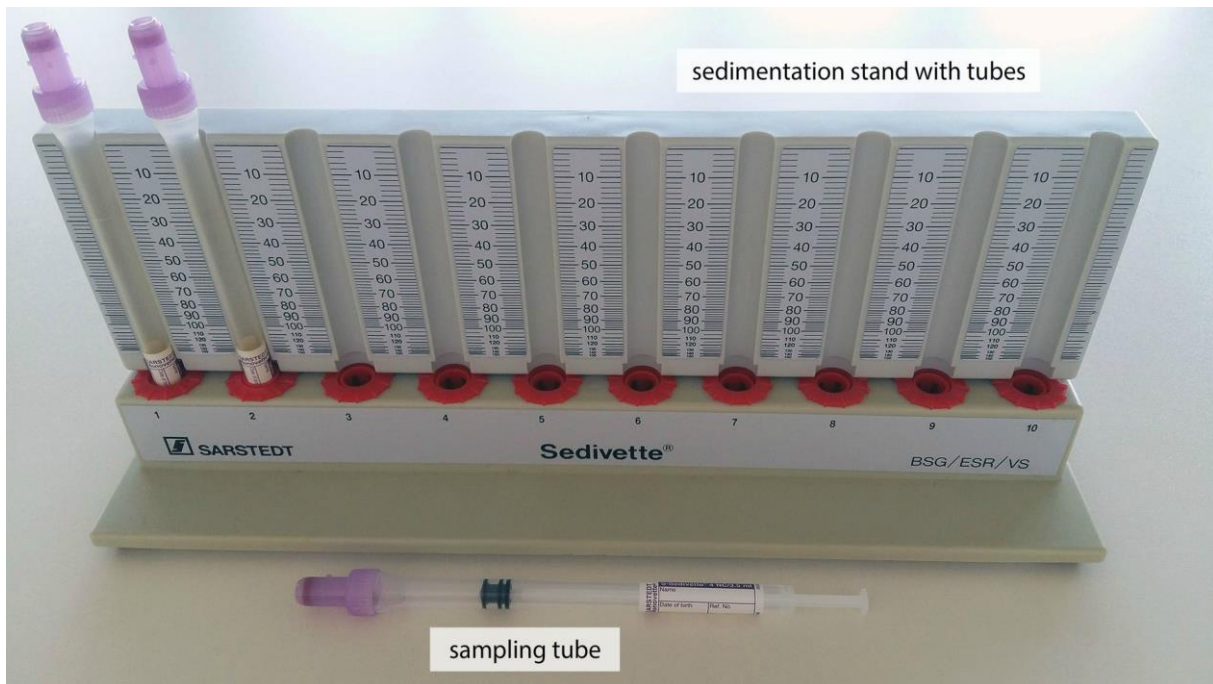
2-0771/5/5



Blood bank

Erythrocyte sedimentation rate ESR (FW = Fåhræus-Westergren)

- **non-coagulable blood from vein**
- Sarstedt monovette violet designation
- examination can be done at a department or outpatient office, or can be sent to a biochemical laboratory
- Subtract the value after one and two hours (female reference range 8/12, male reference range 5/8).



Erythrocyte sedimentation rate

Serological examination

- **coagulable venous blood**
- Sarstedt monovette 4,5 mL (white designation)
- serum antibody level analysis
- examination
 - BWR – Bordet-Wassermann test (antibody test for syphilis)
 - WR – Widal test (for typhoid fever)
 - PBR – Paul-Bunnell test (antibody test for mononucleosis)
 - Rheumatoid factors: ASLO – anti-streptolysin O (streptococcal infections, autoimmune diseases); LATEX – latex fixation test (latex agglutination – tests antibodies for rheumatism)
 - anti-HIV (tests antibodies for HIV)
 - HBsAg – “Australian antigen” (surface antigen of the hepatitis B virus – tests for hepatitis B positivity)

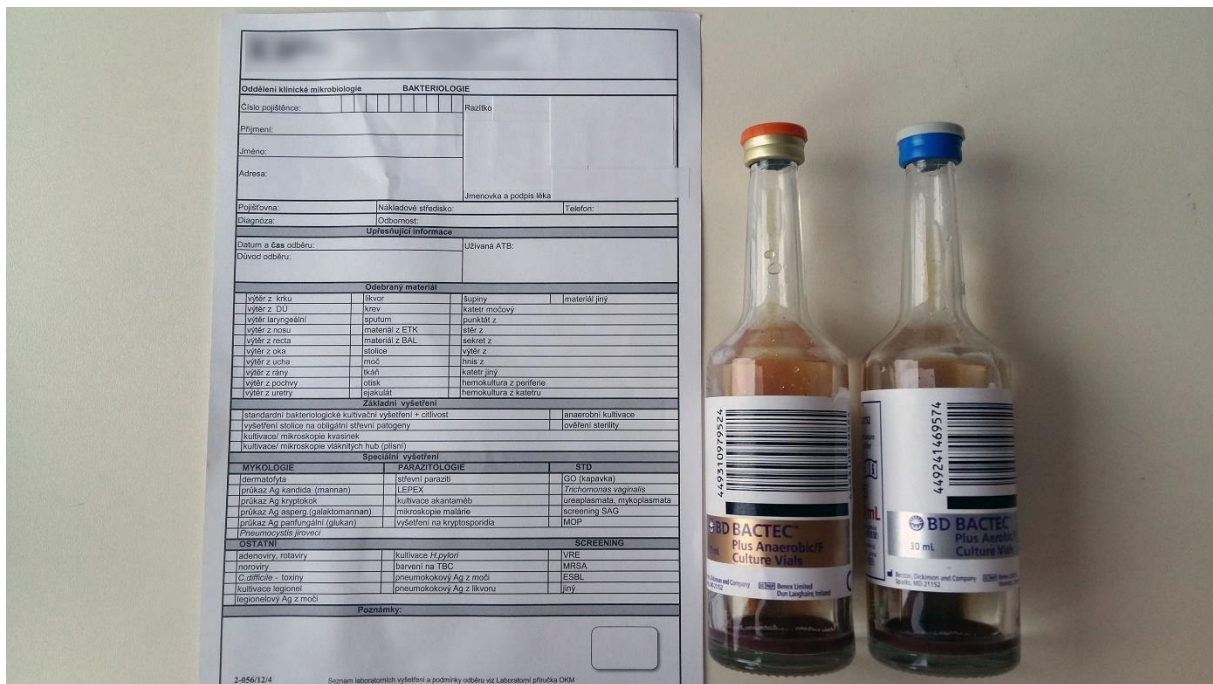
The image shows a Sarstedt monovette serum tube (4.5 mL) and a laboratory request form. The form is for the department of clinical microbiology and includes fields for patient information, insurance, and specific test requests.

Oddělení klinické mikrobiologie		
Nákladové středisko:	Datum:	
Telefon:	Čas:	
R.Č.:		
Jméno:	Podpis lékaře:	
Dg.:	Další dg.:	Pojišťovna:
		Odbornost lékaře: MUDr. Lumír
Upravení informace:		
Začátek prvních příznaků:	U cizinců: datum nar.:	
Gravidní:	pohlaví:	
Jiné:		
Materiál (zaškrtnout):		
<input type="checkbox"/> Srážlivá krev	<input type="checkbox"/> Moč	<input type="checkbox"/> Punkčát z
<input type="checkbox"/> Krev v EDTA	<input type="checkbox"/> Sliny	<input type="checkbox"/> Výtěr z
<input type="checkbox"/> Likvor	<input type="checkbox"/> BAL	<input type="checkbox"/> Stěr z
<input type="checkbox"/> Plodová voda	<input type="checkbox"/> Stolica	<input type="checkbox"/> Jiný
Požadované vyšetření:		
Poznámky:		
Podmínky odběru viz LN Seznam lab. metod 2.137.04/0		

Serological examination

Microbiological blood examination – blood culture (haemoculture)

- **coagulable venous blood**
- open blood collection system – blood collection into a 20 mL syringe, application of collected blood into aerobic and anaerobic haemocultivation vials with specific medium, or into a special vial for antibiotic therapy; exchange needle before application into the bottle, 1 vial = approx. 8–10 mL of blood
- blood is collected using aseptic technique, thorough disinfection of the injection site (according to the practice of the workplace); according to the doctor's orders, make skin swab after disinfection (negative result of the swab = proof of sufficient disinfection)
- prevention of contamination of the sample to prevent false positivity
- request form for bacteriological examination



Microbiological blood examination

Capillary blood collection

Blood glucose monitoring

- **non-coagulable capillary blood**
- blood glucose detection
- glycaemic reference values of 3.6–5.6 mmol/L (possible deviations according to glucometer or laboratory settings.)
- pre-meal collection – preprandial blood glucose; post-meal collection – postprandial blood glucose.
- Glycaemic profile
 - **Small glycaemic profile** – 4x blood collection: 30 minutes before eating (breakfast, lunch, dinner) + at 10 p.m. (according to the practice of the workplace)
 - **Large glycaemic profile** – 7–9x blood collection – 30 minutes before eating (breakfast, lunch, dinner) + one hour after meal + at 10 p.m. + at 2 a.m.+ 4 a.m. (according to the practice of the workplace)

Methods of taking blood glucose

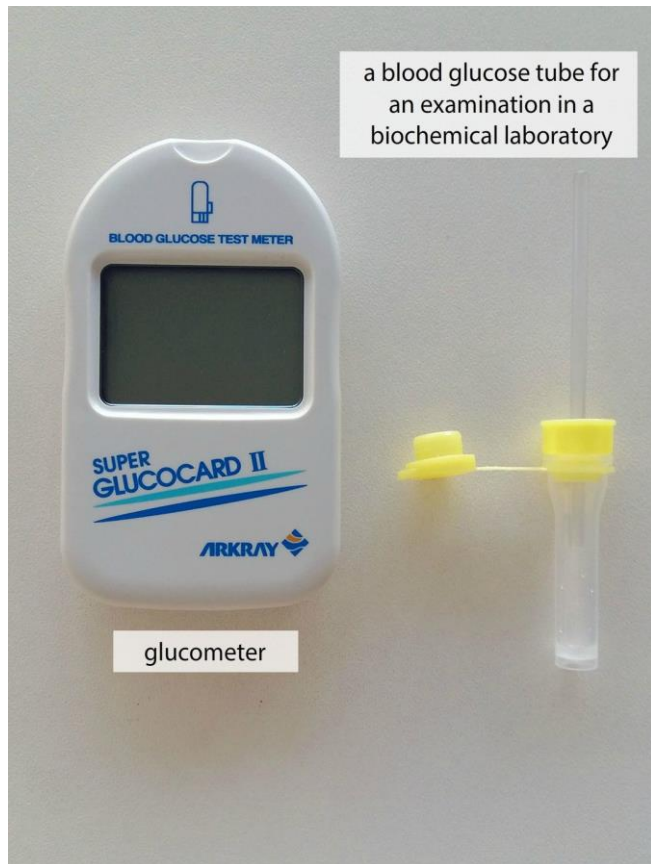
- glucose meter – professionally recommended devices such as ACCU-CHEK (designed for POCT = **P**oint **O**f **C**are **T**esting = bed side test); personal glucose meters are primarily designed for self-monitoring in patients with diabetes mellitus
- yellow Eppendorf tube = examination in biochemical laboratory

Principles of blood glucose collection

- puncture sites – lateral side of finger (index finger, middle finger, little finger), well vascularized area, warm, do not massage or press the puncture site, instead apply a “sliding press” on the entire finger from the palm towards the puncture site
- disinfect the puncture site
- use a lancet if possible; avoid using standard needles (cannot estimate penetration depth)
- wipe off the first drop, take the next drop to the test strip or to the sampling tube (haemolysis of the sample causes false value of the blood glucose)
- record glycaemia in the documentation; the ACCU-CHEK glucometer stores information automatically in electronic documentation



Glucometer ACCU-CHEK



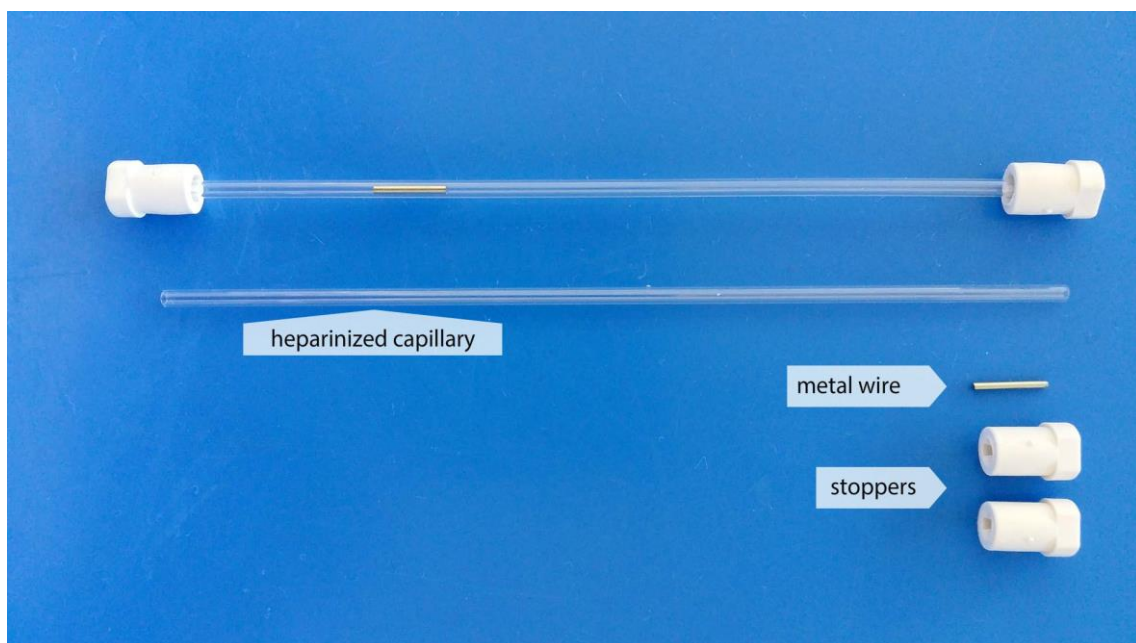
Other variants of capillary glycaemia examination



Equipment for blood glucose examination – capillary blood collection

Examination of capillary blood gases (CBGs)

- **non-coagulable arterial blood**
- examination of oxygenation and ventilation by measuring arterial blood gases, examination of acid-base balance
- collection into a heparinized capillaries
- principles: sucking in blood without air bubbles, inserting the metal wire and capillary closure, moving the magnet over the outer wall of the capillary (mixing of the sample material with the anticoagulant).



Capillary for blood gas collection (CBG) – capillary blood collection



Equipment for capillary blood gas collection (CBG)

Arterial blood collection

Arterial blood gas test (ABG)

- **non-coagulable arterial blood**
- most common sampling points – radial artery, femoral artery
- examination of arterial blood gases provides valuable information about patient's respiratory and metabolic disturbances
- In Czech, you will find ABR or Astrup designation in patient's record
- Arterial blood collection into a heparinized tube – Sarstedt monovette – white tube with orange designation 2 mL.

Principles

- physician performs the collection
- cover the collection site with sterile dressing and compress for 10–15 minutes
- if the sample is taken from femoral artery, ensure compression by using a sachet with sand
- if the sample is taken from radial artery, perform compression by palpation, or a TR Band radial compression aid may be used, after approx. 30 minutes check sterile coverage, check whether the puncture site is bleeding
- collection must be processed in the laboratory within 15 minutes



Blood gas tube – arterial blood collection



Blood gas tube – arterial blood collection *safePICO*



Equipment for arterial blood collection (*safePICO*)

Stool Specimen Collection

- stool emptying – defecation, daily amount of 100–250 grams
- assessment of the stool
 - consistency, shape, odour
 - frequency of emptying
 - pH, normal 7–8
 - steatorrhea – voluminous, greasy, malodorous, with insufficient fat digestion
 - copious stool – voluminous with remnants; pancreatitis
 - acholic stool – light, grey-white; biliary tract diseases
 - enterorrhagia – bright red blood in stool
 - melaena – dark, black digested blood in stool
 - dark stool – use of medications containing iron
 - admixtures – mucus, pus, parasites

Qualitative stool examination

Occult blood in stool (haemoccult test)

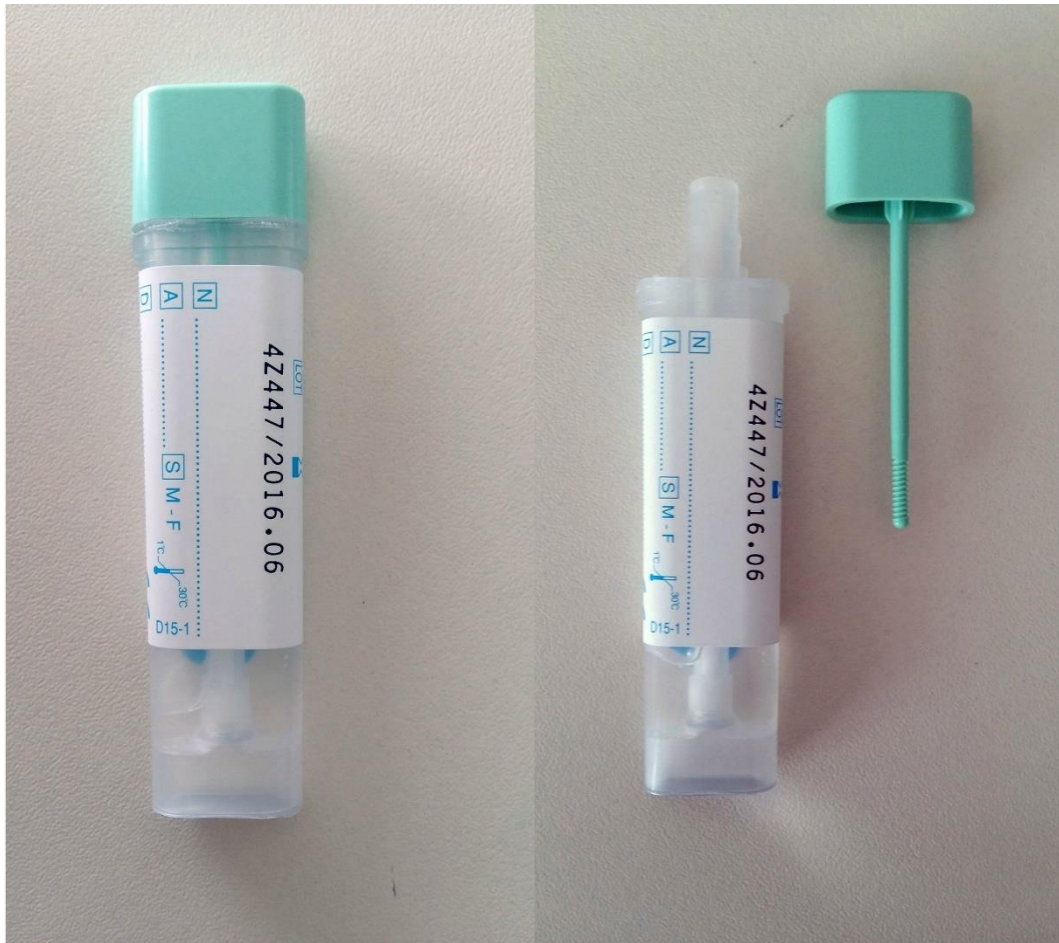
- not a “cancer test,” in case of a positive result, colonoscopic screening is recommended
- false-positive results may occur in case of diarrhoea, bleeding haemorrhoids, gum bleeding, gastric and duodenal ulcer bleeding

Procedure

- without diet – HAEMOCCULT once a year from age 50 to 55, every other year from 55 onward
- after diet – 3 days before stool collection patient follows a diet without meat, fruit, or vegetables, takes medications containing iron, mineral water, vitamin C

Principles

- test cannot be done on women who are menstruating
- note down “with/without diet” on request



Screening for the presence of haemoglobin in stool (occult bleeding test)

Quantitative stool examination

Total fat in stool

Purpose

- to determine the total fat content of the stool – increased fat appears if a digestive disorder or fat malabsorption occurs

Principles

- strict education, a maximum of 1.5 g of fat/kg, stool collecting for 3 days (weigh the stool each time), mixing the stool sample before collection

Microscopic stool examination

- performed when digestion or absorption disorders are suspected

Purpose

- to detect the amount of incompletely digested food remnants – suggests malabsorption disorder in the small intestine.

Principles

- Schmidt's diet 3 days prior to the test (rich in fats, sugars, proteins), on the 4th day of stool collection, in amount corresponding to the size of the sampling scoop, put into a wide-necked plastic container with a scoop



Stool collection container

Microbiological stool examination

Microbiological stool examination

- examination in case of diarrhoea, in asymptomatic carriers
- swab set – after sampling, a sterile swab on a plastic stick is inserted into Amies' medium with activated charcoal (universal transport medium)

Principles

- mark “stool on obligatory intestinal pathogens” on request form
- aseptic procedure
- swab is deeply imbedded in the medium of the swab set
- transport to the laboratory within 2 hours of collection, store at room temperature
- results with no positive findings are available within 48 hours
- outcomes: “negative” = incorrect sampling; “common bacterial flora” = correct sampling without evidence of pathological agents

BAKTERIOLOGIE

Oddělení klinické mikrobiologie

Číslo pojistěnce: _____ Razítko

Příjmení: _____

Jméno: _____

Adresa: _____ Jmenovka a podpis lékaře

Pojistovna: _____ Nákladové středisko: _____ Telefon: _____

Diagnóza: _____ Odbornost: _____

Uprášující informace

Datum a čas odběru: _____ Užívaná ATB: _____

Důvod odběru: _____

Odebraný materiál

výtěr z krku	likvor	šupiny	materiál jiný
výtěr z DÚ	krev	katetr močový	
výtěr laryngeální	sputum	punktát z	
výtěr z nosu	materiál z ETK	stěr z	
výtěr z recta	materiál z BAL	sekret z	
výtěr z oka	stolice	výtěr z	
výtěr z ucha	moč	hnis z	
výtěr z rány	tkáň	katetr jiný	
výtěr z pochvy	otisk	hemokultura z periferie	
výtěr z uretry	ejakulát	hemokultura z katetru	

Základní vyšetření

standardní bakteriologické kultivační vyšetření + citlivost	anaerobní kultivace
vyšetření stolice na obligátní střevní patogeny	ověření sterility
kultivace/ mikroskopie kvasinek	
kultivace/ mikroskopie vláknitých hub (plísní)	

Speciální vyšetření

MYKOLOGIE	PARAZITOLOGIE	STD
dermatofyta	střevní paraziti	GO (kapavka)
průkaz Ag kandida (mannan)	LEPEX	<i>Trichomonas vaginalis</i>
průkaz Ag kryptokok	kultivace akantaméb	ureaplasmata, mykoplasmata
průkaz Ag asperg (galektomannan)	mikroskopie malárie	screening SAG
průkaz Ag parafungální (glukan)	vyšetření na kryptosporidia	MOP
<i>Pneumocystis jirovecii</i>		

OSTATNÍ

	SCREENING
adenoviry, rotaviry	kultivace <i>H. pylori</i>
noroviry	barvení na TBC
<i>C. difficile</i> - toxiny	pneumokokový Ag z moči
kultivace legionel	pneumokokový Ag z likvoru
legionelový Ag z moči	VRE
	MRSA
	ESBL
	jiný

Poznámky:

2-056/12/4 Seznam laboratorních vyšetření a podmínky odběru viz Laboratorní příručka OKM

Stool collection for bacteriological examination

Stool collection for clostridium difficile toxin

Principles

- 1–2 mL of liquid or semi-liquid stool collected in a sterile plastic container
- outside of laboratory working hours, store the sample in the refrigerator and transport the next day, do not store at room temperature – this could result in degradation of Clostridium difficile toxin

Stool collection for detection of Helicobacter pylori

Principles

- collect a stool corresponding to the size of the sampling scoop in a wide-necked plastic container with a scoop
- diarrhoea is not suitable
- outside of laboratory working hours, store the sample in the refrigerator, transport the next day

Parasitological stool examination

Tests for the most common parasites

- pinworm (*Enterobius vermicularis*)
- roundworm (*Ascaris lumbricoides*)
- tapeworm (*Taenia saginata*)

Principles

- collect a stool corresponding to the size of sampling blade (3 times, every other day)
- perianal smear (3 times, every other day) – in the morning prior to the hygiene procedure
- pinworm detection – Use transparent adhesive tape. Spread the buttocks and stick the tape to the anus and perianal skin folds, press the buttocks together, stick the tape back on the slide, position the label in a way which does not prevent microscopic evaluation
- transport to the laboratory as quickly as possible

Medication Administration in Health Care Institutions

- Act No. 378/2007 Coll., On Pharmaceuticals and on Amendments to Certain Related Acts
- under a strict prescription by a doctor (with medication, amount, method and time of administration noted in the documentation)
- under a doctor's direct orders (NLZP – non-medical staff – according to competencies – Decree No. 55/2011 Coll., On Activities of Health Workers and Other Professional Staff)

Storage of medications

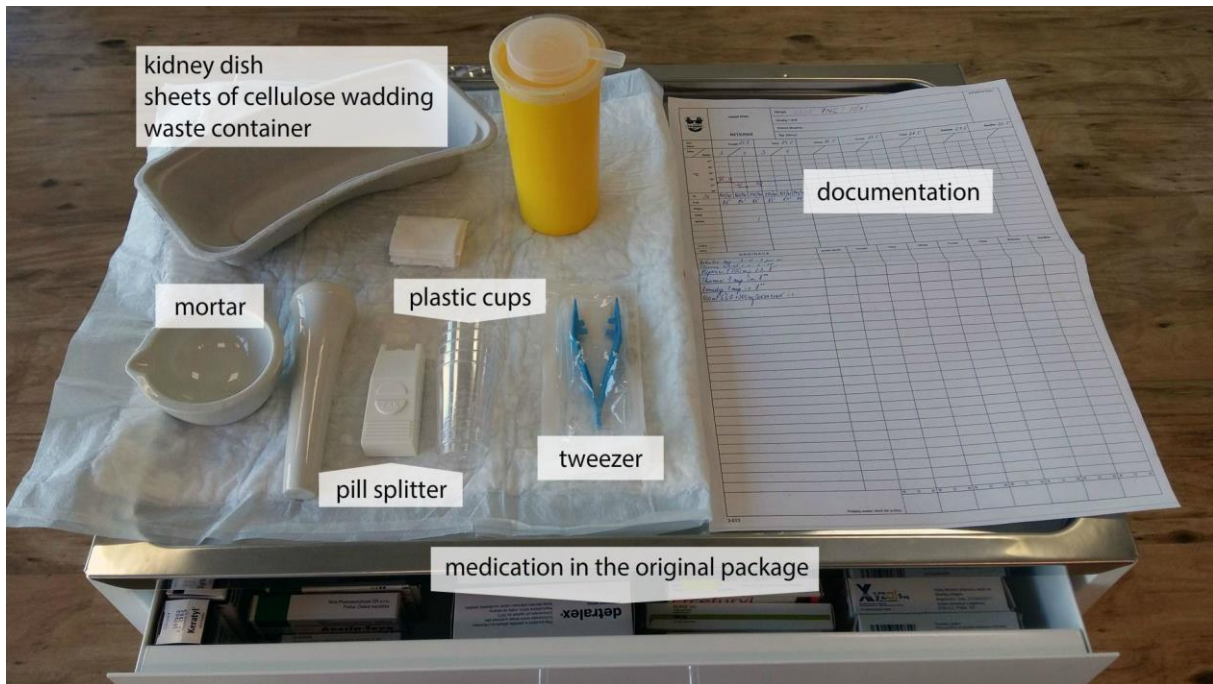
- in original packages with a visible expiration date
- temperature: room temperature (15–25°C), in a cold place (8–15°C), in refrigerator (2–8°C), or freezer (-15°C or less); temperature control once a day (record in writing)
- in a medicine chest
 - chest must be locked (with key stored in a safe place), not left open without surveillance, NOT close to central heating, NOT in direct sunshine
 - storage of medication – according to the administration method and pharmacological groups (separately for external use, injectable forms, tablets, antibiotics, and substances with increased risk), and in alphabetical order
 - addictive substances and opiates require a special regime, storage in a safe; strict record and documentation

Guidelines for medication administration

Principles

- **the right medicine**
- **the right dose**
- **the right form**
- **the right time**
- **the right patient**

- patient identification: **WHAT'S YOUR NAME?** (When were you born? – in the case of similar names) or according to the patient's identification bracelet
- medicine identification – name, dosage of drug (one tablet, one ampoule, etc.), administration method, compare with documentation, check the expiration date. **DO NOT ADMINISTER ANY UNLABELLED MEDICINE!**
- Give information to the patient.
- Secure the patient's position before using or administering the medicine.
- Check if the patient has taken the medicine.
- Make a record of drug administration (documentation, record of addictive substances and opiates).
- Evaluate the response to the drug based on verbal information and observation, make a record in documentation.
- If an error occurs, **REPORT IMMEDIATELY TO THE DOCTOR!**



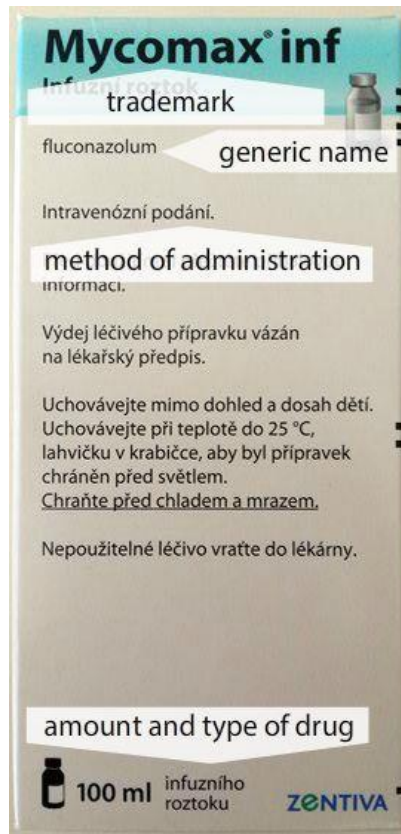
Medication administration aids

Designation of “magistraliter” prepared medications (medicines prepared at pharmacy)

- according to the method of use
 - white – internal use
 - red – external use
 - black + white + skull = poison
 - green – veterinary
- name + form (ointment, solution, capsule)
- date of preparation
- a pharmacy designation
- expiration
- etc. (flammable ...)

Designation of specialties (mass-produced pharmaceuticals)

- name and form of the medicine
- chemical composition and strength of the drug
 - FORTE – strong
 - BIFORTE – 2x strength
 - MITTE – weak
 - RETARD – prolonged effect
 - DUPLEX – double effect
- expiration date
 - month/year → date until which the drug is available (e.g. 12/2016 → until December 31, 2016)
- information concerning indication, dosage, application and storage
- manufacturer data
- additional information (for whom the drug is intended)
 - *pro adultis* – for adults
 - *pro infantibus* – for children



Example of a drug name



Examples of designation of medicines for adults and for children



Examples of drug expiration dates

Literature

- Krišková, A. a kol. *Ošetrovateľské techniky – metodika sesterných činností*. Martin, Slovakia: Osveta, 2006. pp. 334-406. ISBN 80-8063-202-2
- Pokorná, A. a Komínková, A. *Ošetrovateľské postupy založené na dôkazoch 2. díl*. Brno, Czechia: Masaryk University, 2014. pp. 6-69. ISBN 978-80-210-7415-6
- Decree No. 467/2012 Coll., of 18 december 2012, drawing up the list of health acts with point score, as amended. *In: Sbírka zákonů České republiky*. 2012, amount 174, pp. 6146-6201. ISSN 1211-1244.
- Act No. 44/2019 Coll, of 30. january 2019, amending Act No. 378/2007 Coll., on Pharmaceuticals and on Amendments to Some Related Acts (Act on Pharmaceutical), as amended *In: Sbírka zákonů České republiky*. 2019, amount 19, pp. 418-424. ISSN 1211-1244.

Oral medication administration

- the most common form of administration
- contraindications – vomiting, unconsciousness, inability to swallow, before GIT testing, in case oral intake is forbidden (per os not allowed)
- onset of effect within 20–30 minutes after administration
- sublingual drug administration (under the tongue) – effect onset within 1 minute

Principles

- if halving the drugs, use pill splitter (try to use a weight of medicine that corresponds to doctor's prescription to avoid the necessity of medicine splitting)
- capsules and dragees must not be split
- medicines outside the original package or blister cannot be used

Rectal medication administration

- administration of the drug into the rectum
- onset of effect within 15 minutes after administration
- after introduction of the suppository, recommended bed rest for 15–30 minutes (to prevent suppository loss)
- effect – local (defecation support), total body (antipyretics, painkillers, antiemetics, corticosteroids)
- medicine forms – suppositories, ointments, solutions
- benefits – not irritating GIT, good absorption, higher drug concentration in blood (rectal blood does not pass through liver)
- contraindications – diarrhoea, rectal bleeding, rectal amputation



Equipment for administration of a suppository per rectum

Enema

- introduction of fluid into the sigmoid colon via the rectum to promote defecation by stimulating peristalsis

Types of enemas

- cleansing enema (promotes complete evacuation of faeces from the colon)
- oil-retention enema (lubricates the rectum and colon, allowing faeces to absorb oil and become softer and easier to pass)
- therapeutic enema (contains pharmacologic therapeutic agents)
- diagnostic enema (introduces diagnostic substances into the colon)

Equipment

- rectal tube (chosen according to the age and body constitution of the patient)
- irrigator (enema bag)
- correct volume of lukewarm (tepid) solution
- water-soluble lubricant (for easier and smoother insertion of rectal tube without causing rectal irritation or trauma (e.g. vaseline, Mesocain gel (anaesthetic effect))
- wooden tongue depressor
- non-sterile gloves
- disposable pads, cellulose towels
- disposable kidney dish
- stand for irrigator holder
- enema bag holder

Explain to the patient

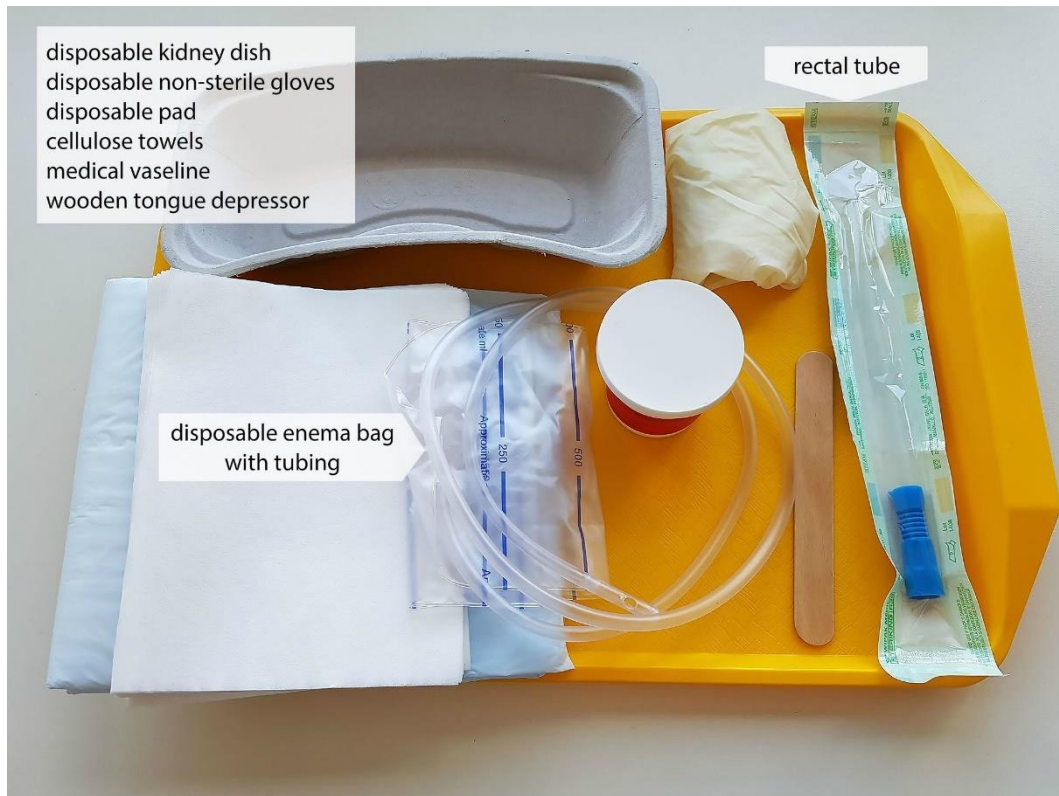
- the reason for administering the enema and the method to be used
- how they should co-operate during the application staying in the right position, retaining fluid in the colon during and after application (10 minutes minimum)

Procedure

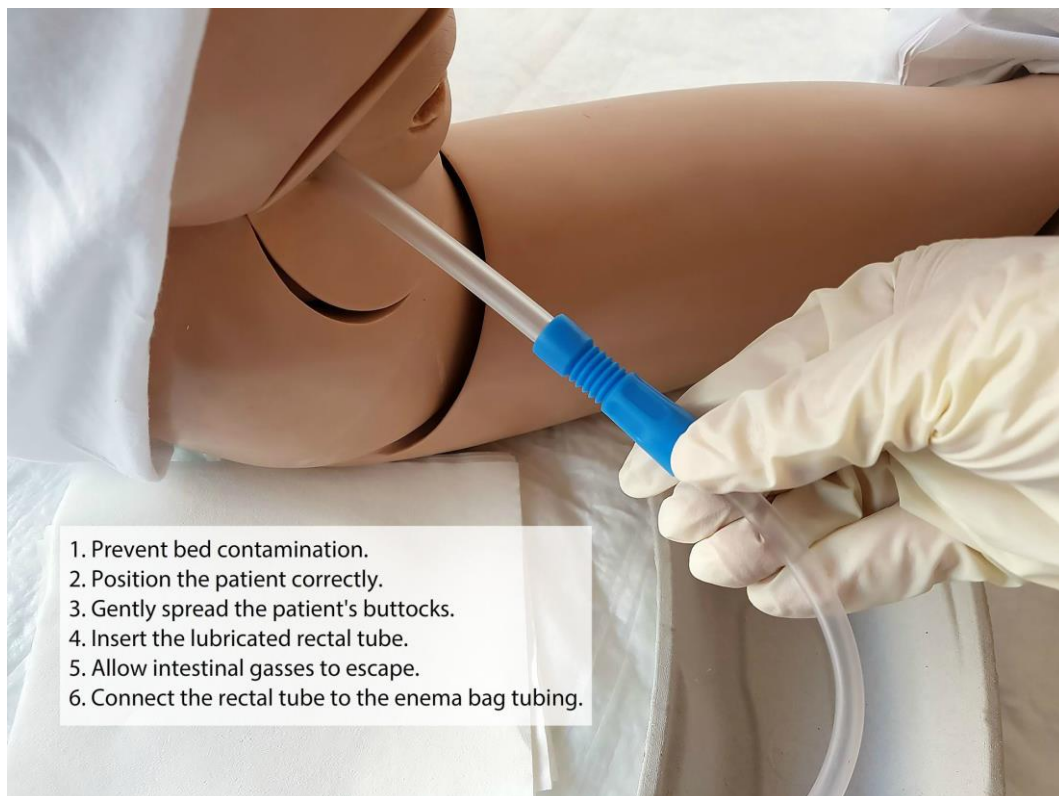
- Protect the patient's privacy.
- position: the most suitable position is the patient lying on their left side, with right knee flexed (facilitates the penetration of the fluid into the sigmoid and descending colon); lying on the right side with limbs flexed is also allowed
- Flush the irrigator set (venting).
- Insert the lubricated rectal tube into the anus.
- Allow intestinal gasses to escape.
- Connect the enema bag with the tubing.
- Slowly instil the solution.
- Interrupt administration if the patient needs to defecate; give patient enough time for breathing and relaxation.
- Evaluate if the enema was effective – evaluate the stool (inspect colour, consistency, odour and amount of the stool).
- Monitor for any complications: pain, bleeding, ineffectiveness of the enema.
- Record outcomes in the documentation.

Cleansing enema

- complete evacuation of faeces from the colon before a diagnostic examination, before surgery, or before childbirth
 - high-cleansing enema – application of 1.5 to 2 litres of tepid solution (tap water)
 - low-cleansing enema – application of commercially prepared disposable enema (i.e. YAL solution)



Preparation of equipment for high-cleansing enema



Inserted rectal tube connected to enema bag tubing



Equipment for low-cleansing enema



1. Prevent bed contamination.
2. Position the patient correctly.
3. Shake the product to create a foam.
4. Remove the bottle cap.
5. Gently spread the patient's buttocks.
6. Insert the lubricated tip of the enema.

Administration of YAL enema solution



End of YAL solution enema administration

Laxative enema

- softening the stool, facilitating stool emptying
 - micro-enema – administration of a small amount of solution (100 to 200 mL of castor oil, glycerine oil, or original saline solution for direct use); a small volume of solution is easier to retain in the large intestine
 - drop method of rectal enema administration – application of the solution drop by drop (solution drips through the infusion set and rectal tube (60 minutes, a gentle method)



Equipment for the drop method of enema administration

Removing faecal impaction by hand

- performed if the laxative enema is not effective. Faecal impaction is the inability to pass a collection of hard stool
 - removal of faecal impaction is performed by a physician (excessive rectal manipulation causes injury)
 - the ampule of the rectum is cleaned of so-called scybala (lumpy, hardened stool)

In case of constipation, "paradoxical diarrhoea" may occur (constipation + leakage of loose stool around the hardened stool, resulting from large intestine irritation).

Therapeutic enema

- administration of a medicinal substance into the intestines, most often in the form of commercial enemas (i.e. Salofalk, a therapy for nonspecific intestinal inflammation)

Diagnostic enema

- insertion of a contrast agent into the intestine (i.e. before contrast radiography, a radiological diagnostic method used for examination of large intestine diseases; the contrast medium (barium or iodine) is administered rectally to improve imaging of the large intestine structures (the patient's bowels must be cleansed with several cleansing enemas prior to the examination)

Vaginal medication administration

- administration of the drug to the vagina
- onset of effect within 15 minutes after administration
- medicine forms – vaginal globules, healing solutions, vaginal tablets, creams, suppositories, foam
- vaginal rinse (irrigation) – purpose: disinfection before surgery, curative in case of infection
- contraindication – menstruation

Eye medication administration

- drug administration into the eye (ophthalmic)
- drug administration to both eyes – ODS (oculus dexter et sinister), administration to the right eye – OD (oculus dexter), left eye – OS (oculus sinister)
- purpose – instillation (drops, ointment, solution), irrigation (conjunctival sac)
- effect – local

Principles

- individualized medicine (for 1 person only, label with name of the patient!)
- expiration date at least 1 month from opening (must be marked on the package when opened)
- the application part of the package must not touch the eye or eyelashes (palpebral = eyelid reflex, corneal = corneal reflex)
- 10-minute intervals between applications; first apply drops, then ointments (when you apply ointment, think about patient's safety – potential for blurred vision)
- if you apply drops into one eye, prevent simultaneous application into the other one

Pupillary dilation

- mydriatic application (for pupil dilation) 30 minutes before examination of the back part of the eye; should not be given to a person with glaucoma (risk of “a green blur”, glaucoma attack); the eyes are sensitive after examination, the vision is blurred; protect eyes with sunglasses; driving a car is forbidden



Eye medication administration

Ear medication administration

- purpose – instillation (application of drops, ointment, or solution to the external auditory canal), irrigation – removal of the cerumen
- effect – local

Principles

- head secured (to prevent ear canal injury)
- medicines and solutions must be at room temperature

Nasal medication administration

- purpose – instillation (application of drops, ointment, solution, or gelatine sponge (to stop bleeding), irrigation – (Rhino Horn/nasal lavage)
- effect – local, onset of effect within 1–2 minutes after administration

Principles

- clean nose (patient should blow their nose)
- secure head (injury prevention)
- make lavage with lukewarm liquid

Inhalation

- inhalation of therapeutic substance into the airways in the form of steam or gas; the particle size affects penetration into individual parts of the airways
- Purpose – relaxation of bronchial muscles, release of mucus, reduction/enhancement of mucosal secretion, disinfection of mucous membranes
- Types – climatic (natural), artificial (compressed gas)
- Onset of effect within 2–3 minutes after administration
- Equipment – inhalers (compressor base, ultrasound based), hand-held (pocket) inhaler

Principles

- in fasting patient (2 hours after a meal), but not in case of treatment for asthma and stenocardia, in which case medicines must be provided for immediate relief
- orthopneic position (Fowler's) in patient on bed
- suitable aid in proper size (mask, mouthpiece, AeroChamber)
- when combining bronchodilators and corticosteroids, bronchodilators should be administered first
- after corticosteroids, rinse patient's mouth with water (to prevent *soor* / oral thrush)
- For manual inhalers, always instruct the patient about the purpose of administration and the correct procedures for application (close mouth tightly around the mouthpiece of the inhaler, coordinate pressing down on the inhaler applicator and breathing; hold breath, then breathe out; children should use mask – Opti/Aero Chamber inhaler, etc.).
- keep safe distance between the table inhalers and the appropriate steam temperature (according to the doctor's orders and the purpose of the inhalation)



Inhalation of a therapeutic substance through the mask for a child (OptiChamber)



Use of a hand-held inhaler for a child



Using a hand-held inhaler for an adult – type of disc-haler (inhalation powder)



Using a hand-held inhaler for an adult – type of turbuhaler (inhalation powder)



Using a hand-held inhaler for an adult – aerosol for inhalation

Parenteral medication administration

- inserting a sterile solution into the body
- when preparing drugs for parenteral administration, consider the use of gloves, especially in the preparation of antibiotics and drugs for biological treatment

Purpose

- preventive, diagnostic, therapeutic



Disinfection of the ampoule neck



Taking the medicine from the ampoule



Taking the medicine from the vial

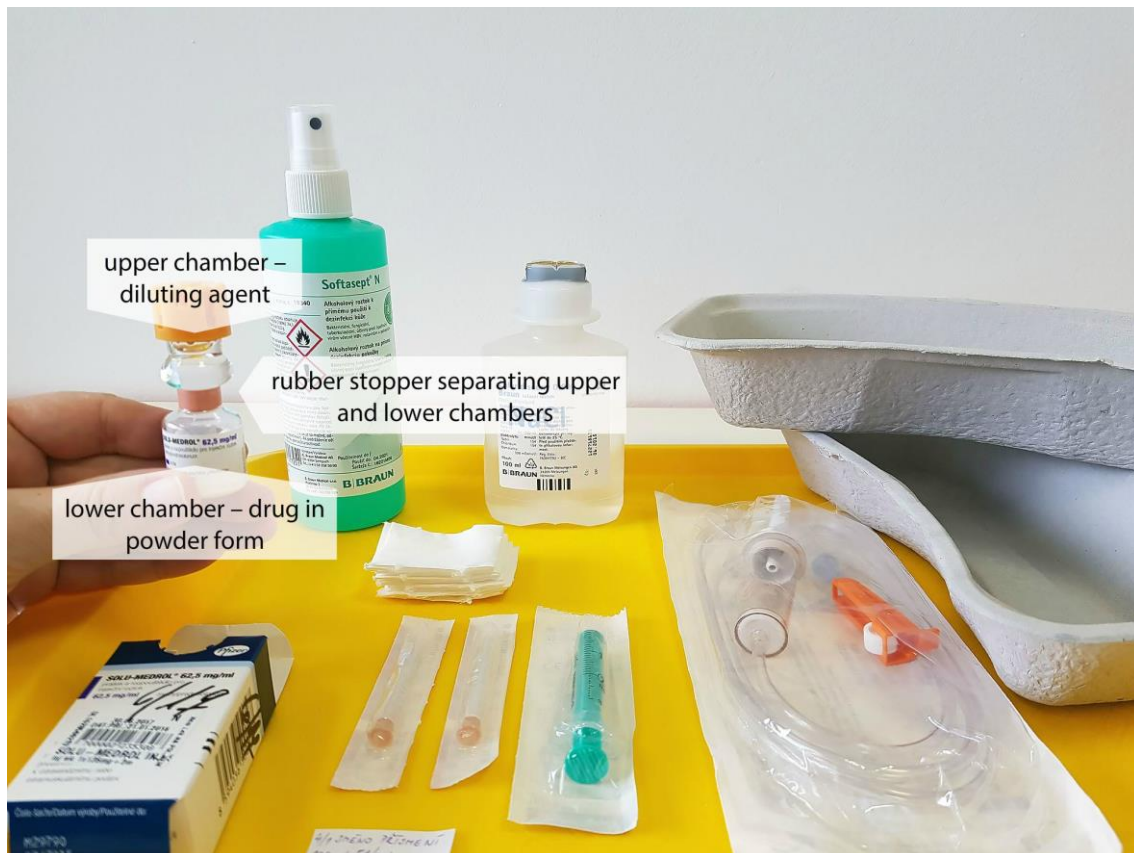
Preparation of the drug in powder form

Preparation of a diluent

- when dissolving the drug in powder form, follow the leaflet and the doctor's orders
- the most common diluents are normal saline solution, Glucose solution 5%, water for injection, and/or a diluent included as a part of the original medicine package

Drug preparation in powder form – SOLU-MEDROL

- an example of a drug preparation in powder form (Solu-Medrol) for intravenous administration – diluent is a part of the original package



Drug preparation in powder form 1 preparation of equipment and prescribed medication



Preparation of the drug in powder form 2 – drug dilution



Preparation of the drug in powder form 3 – withdrawal of the drug

Preparation and designation of the diluting solution



Preparation of the diluting solution 1 – multiple sampling pump MINI-SPIKE



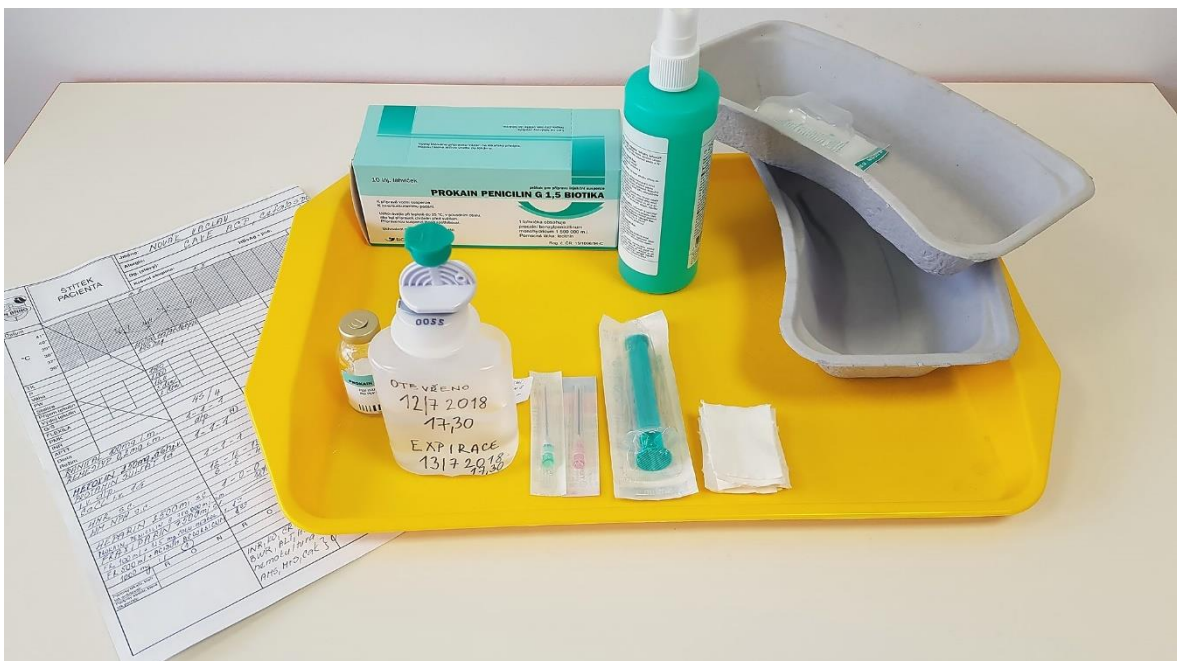
Preparation of the diluting solution 2 – mark the expiration date of the diluent after the first use
(We prefer to use a sticker.)



Preparation of the diluting solution 3 – aspiration of the solution via mini – spike

Drug preparation in powder form – PROCAIN PENICILLIN G

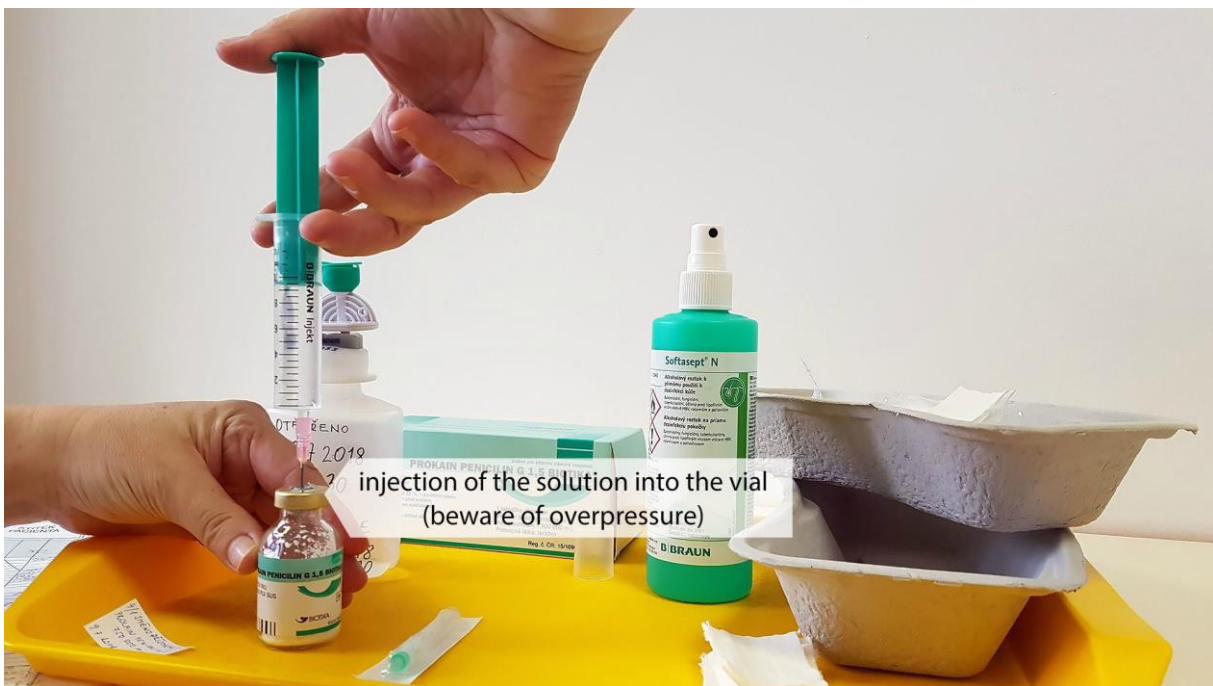
- An example of a drug preparation in powder form (Procain Penicillin G) for intramuscular administration – diluent is not a part of the original package
- According to the physician's orders we need to administer 750 000 IU of Procain Penicillin G intramuscularly
- 1 vial contains 1 500 000 IU. We dilute the powder with 10 mL of normal saline solution and administer 5 mL of the diluted drug. The vial and the remainder of the drug are discarded according to the Hygienic-Epidemiologic standards of the health institution



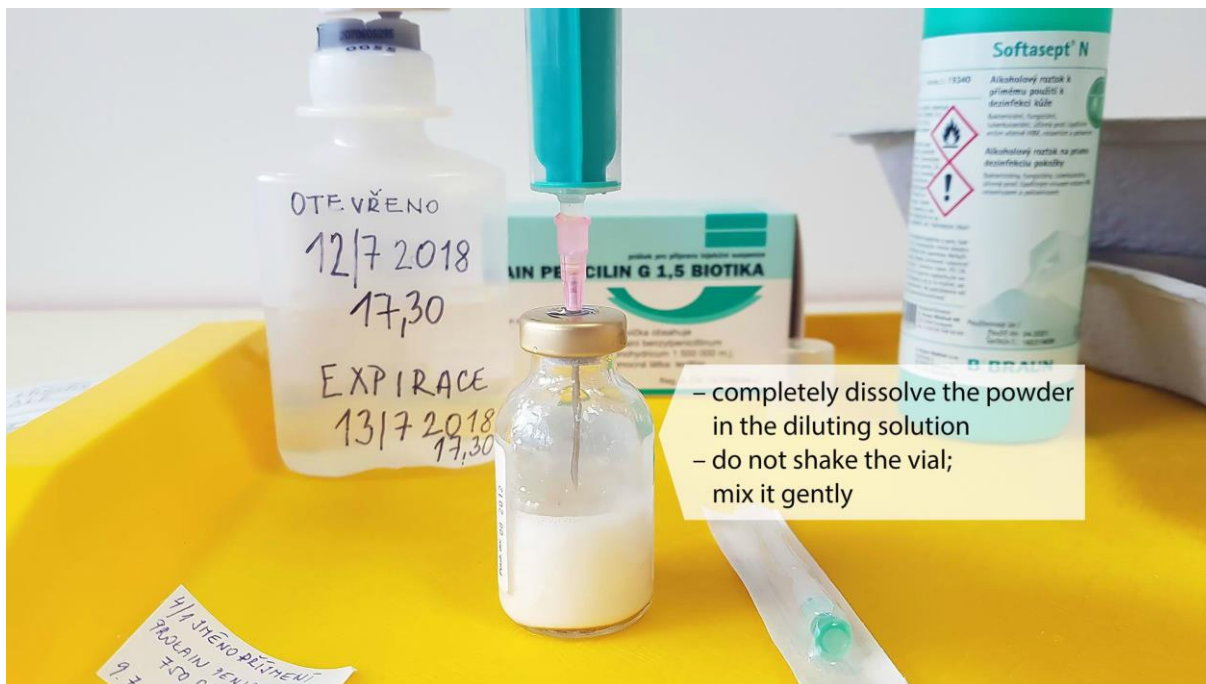
Drug preparation in powder form 1 – preparation of equipment and prescribed medication



Drug preparation in powder form 2 – withdrawal of the diluting solution



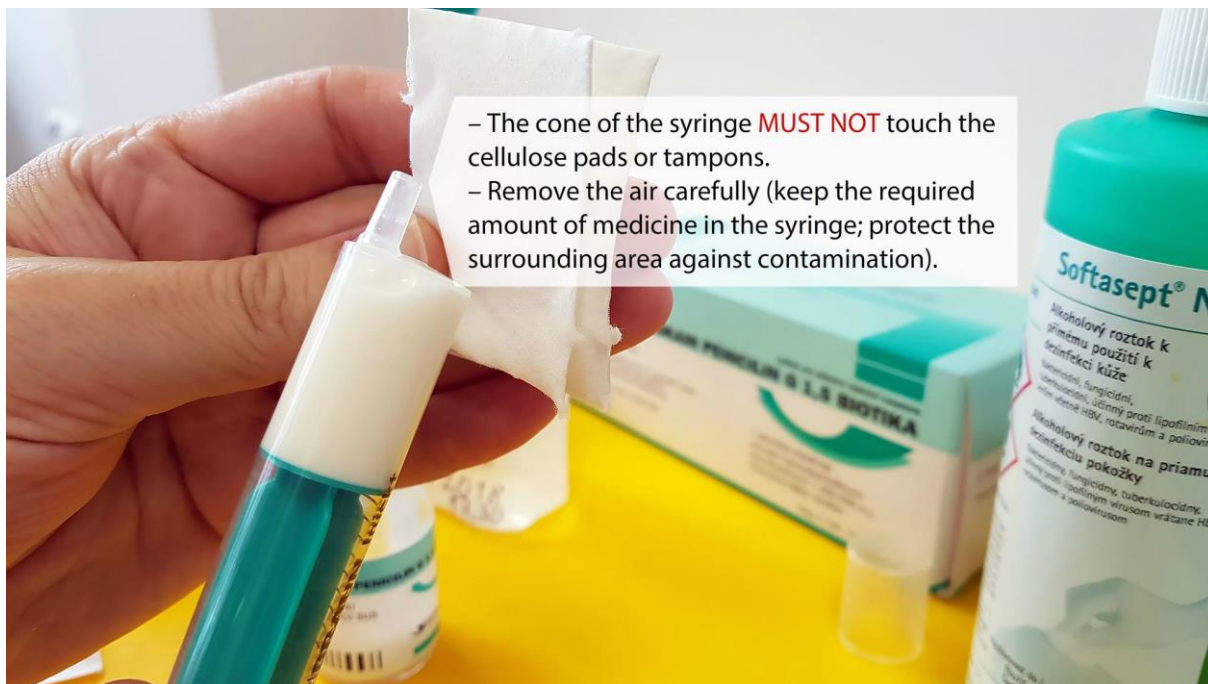
Drug preparation in powder form 3 – injecting the diluent into the drug vial



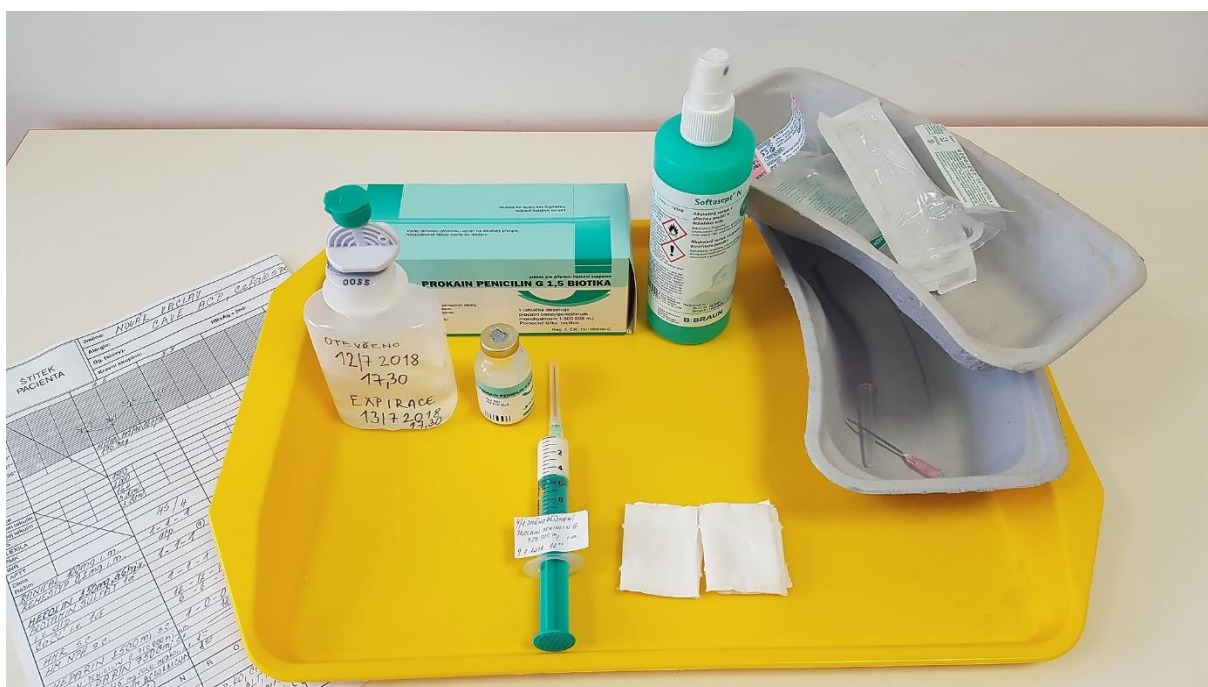
Drug preparation in powder form 4 – dissolution of powdered medicine



Drug preparation in powder form 5 – withdrawal of the dissolved drug from the vial



Drug preparation in powder form 6 – removal of air from the filled syringe (prior to needle exchange for application)



Drug preparation in powder form 7 – drug ready for intramuscular administration

Intracutaneous (Intradermal) injection (I.D.)

- small amount of drug (0.1–0.2 mL or less)
- under a doctor's authority

Purpose

- diagnostic (tuberculin or allergy tests)
- prophylactic (active vaccination against TB)
- therapeutic (symptomatic treatment with a vaccine)

Application sites

- the outer and inner sides of the forearm
- the shoulder area – deltoid area
- frontal part of the chest – pectoral area
- the back, around the shoulder blades – above the trapezius muscle
- the outer part of the thigh, in the area of the quadriceps muscle

Method of application

- 15° angle of penetration (formation of whitish bud = correct method of application)

Subcutaneous injection (S.C.)

- therapeutic purpose (application of treatment solution up to 2 mL)
- the most common drugs – insulin (1, 2, 3), heparin
- onset of effect within 10–20 minutes (up to ½ hour) after administration
- drugs are absorbed most quickly around the navel

Application sites

- abdomen, about 5 cm from the navel (rectus abdominis muscle)
 - insulin and low molecular heparin
 - short needle, up to 1.5 cm, skin fold according to the needle length
 - abdomen site cannot be used for pregnant women or patients with firm muscles (risk of bleeding into the muscle)
- outer middle third of the arm (*biceps brachii* muscle)
- buttocks (*gluteus medius* muscle)
- outer middle third of the thigh (*musculus quadriceps femoris*)



Application site of a S.C. injection into the abdomen

Method of application

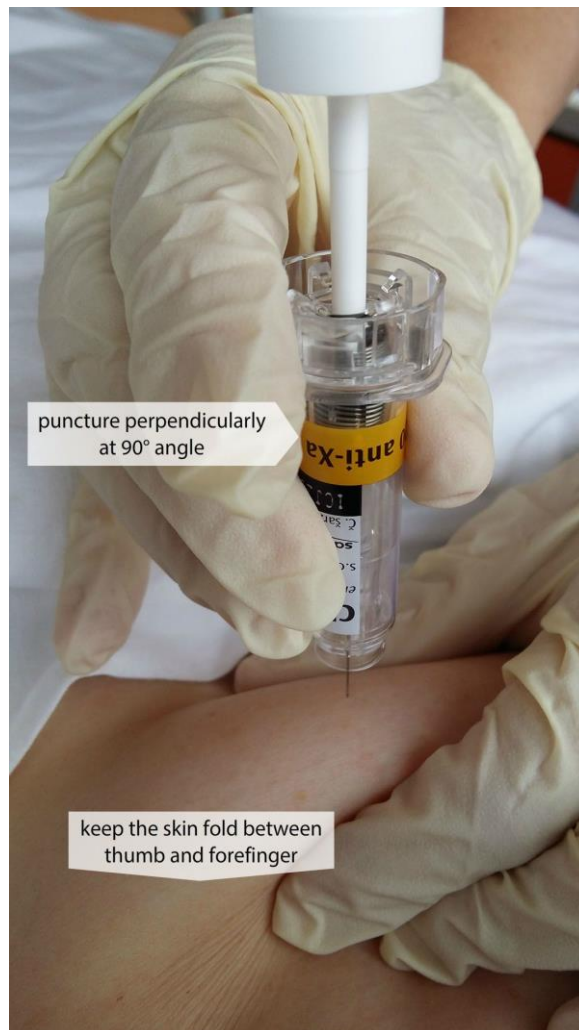
- depends on the type of medicine (low molecular weight heparin, heparin drug, insulin, etc.) and the type of syringe (pre-filled syringe, insulin syringe, insulin pen, 2 mL syringe with short needle up to 2.5 cm)
- for parenteral intervention, consider using gloves

Low-molecular weight heparins

- syringes are pre-filled by manufacturer with an integrated needle – do not push the bubble out of the syringe before application – disinfect the injection site – create a skin fold and keep it throughout the application – puncture perpendicularly at 90° angle – do not aspirate – apply medication, then count to ten (about 5 seconds) before removing syringe – pull out needle – release the skin fold – apply a clean cellulose swab – do not massage



Equipment for S.C. injection – low molecular weight heparin



S.C. injection into the abdomen – low molecular heparin

Insulin pen

- without skin fold – disinfect injection site – puncture perpendicularly at 90° angle – DO NOT aspirate – apply medication, then count to ten (about 5 seconds) before removing syringe – apply a clean cellulose swab – pull out needle



S.C. injection into the abdomen with insulin injection pen

Insulin syringe / syringe with integrated needle (1, 2)

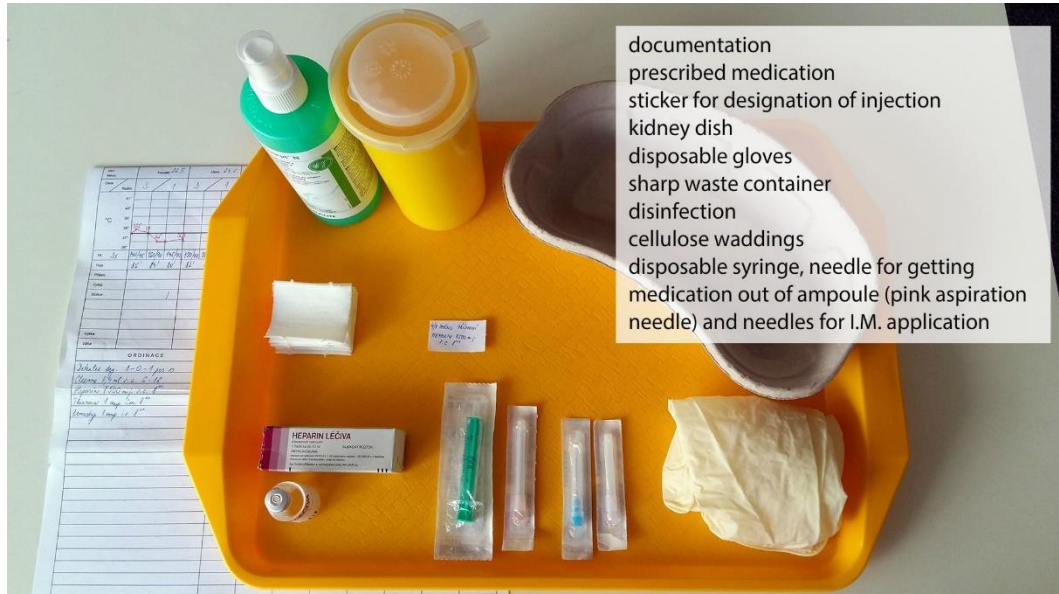
- disinfect injection site – create a skin fold – puncture perpendicularly at 90° angle – release the skin fold and aspirate – apply medication, then count to ten (about 5 seconds) before removing syringe – apply a clean cellulose swab – pull out needle



S.C. injection into the abdomen – insulin syringe, syringe with integrated needle

Heparin from a vial (or any other S.C. injection)

- use orange, blue needle – disinfect injection site – create a skin fold – puncture at 45° angle – release the skin fold – aspirate – apply medication – apply a clean cellulose swab – pull out needle – do not massage



Equipment for S.C. injection using a standard syringe and needle



S.C. injection into the arm – standard syringe and needle



S.C. injection into the arm – standard syringe and needle

Complications

- infection of injection site
- incorrect technique – application into a blood vessel, into a muscle, superficial application
- if the application site is not changed regularly, it can result in hypertrophy of the subcutaneous tissue, lipodystrophy (changes in or disappearance of subcutaneous fat), atrophy (reducing) of skin thickness

Intramuscular injection (I.M.)

- drug administration in the form of a solution, suspension or emulsion
- diagnostic, therapeutic or prophylactic (vaccination) purposes
- drug volume 1–20 mL
- onset of effect within 5-10 minutes after administration

Benefits of I.M. injection

- faster absorption than with S.C. application (muscles are better-supplied with blood than subcutaneous tissue)
- muscle tissue accepts more liquid
- less risk of irritation than with subcutaneous tissue

Principles

- correct choice of injection site
- cachectic patient – application to the thigh preferred – with skin fold and at 90° angle (injection angle can be reduced by adjusting the length of the needle)
- do not apply I.M. injection to the gluteus medius/maximus muscle in children aged three years or younger (muscle is not yet developed). Use the thigh in this case



Equipment for I.M. injection



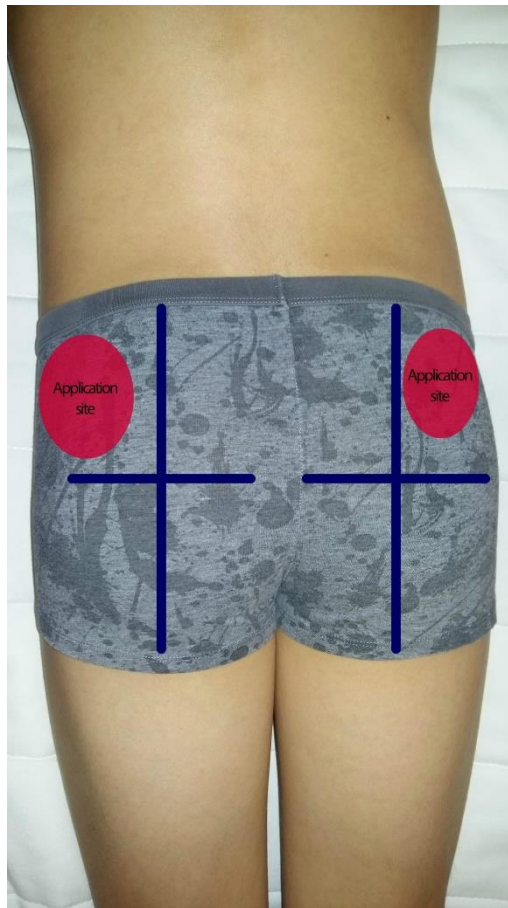
Intramuscular injection ready for administration

Application sites

- gluteus medius muscle
- gluteus maximus muscle
- external mid-third thigh (quadriceps femoris muscle) – application to a lower limb – divide thigh to thirds – application site – middle outer zone
- into the arm – deltoid muscle

Methods of application

- As this is a parenteral intervention, use disposable gloves.
- Find injection site by touch – disinfect – gently stretch the patient's skin at the injection site between thumb and forefinger – puncture at 90° angle – aspirate – apply medication – apply clean cellulose wadding – pull the needle out.



Application site of I.M. injection into gluteus maximus muscle – dividing muscle area into quadrants as a method for identifying the application site – the application site should be in the upper external quadrant)



Application site of I.M. injection into musculus gluteus medius – Step 1 – Identify the crest of the hip bone



Application site of I.M. injection into gluteus medius muscle – Step 2 (an alternate method for identifying the injection site)



I.M. injection into gluteus maximus muscle – Step 2 (another way to identify the injection site)



Application site of I.M. injection into quadriceps femoris muscle (m. vastus lateralis)



Application site of I.M. injection into quadriceps femoris muscle (m. vastus lateralis)

Complications of I.M. application

Mistake	Consequence	Manifestation
Incorrect injection site selection	nerve damage or blood vessel puncture	<ul style="list-style-type: none"> • pain • tingling • paralysis
Using too short a needle	medicine does not reach the muscle, only the fat layer, risk of encapsulation and formation of abscess	<ul style="list-style-type: none"> • pain • redness • oedema • increased body temperature (BT)
Sterility broken	risk of infection, inflammation	<ul style="list-style-type: none"> • pain • redness • oedema • increased body temperature (BT)
Bone puncture	needle bending/ breaking, tissue damage during extraction	<ul style="list-style-type: none"> • pain • bleeding

Disinfectant introduced to the site of injection inflammation

- pain
- redness

Intravenous injection (I.V.)

- intravenous administration of drugs in aqueous solutions; emulsions, suspensions and oil solutions CAN NOT BE USED
- applied by a doctor or nurse on the basis of a written mandate; the specific conditions of drug administration are determined by the internal code of the workplace
- according to Decree No. 55/2011 Coll., On the Activities of Medical and Other Professional Staff, the general nurse may also administer therapeutic agents without professional supervision (excluding radiopharmaceuticals and intravenous injections or infusions in newborns or children up to 3 years)
- for diagnostic or therapeutic purposes
- onset of effect immediately (within 1 minute)

Application sites

- the median vein and the basilic vein in the elbow hole (or less frequently the cephalic vein)
- veins on the forearm and back of the palm
- the great saphenous vein – frontal part of inner ankle in the lower limb
- in infants, veins in the temporal and parietal area

Principles of I.V. medicine preparation

- medicines intended for administration into the vein are always diluted with a sufficient amount of normal saline solution (20 mL) or administered as a part of an infusion
- the most commonly used dilution solutions are: normal saline solution; water for injection; 5% glucose solution
- in exceptional cases, certain I.V. drugs can be administered undiluted (e.g. Furosemide)
- when preparing I.V. injection, first aspirate the diluent solution, then the medicine (the infusion solution into which the medicine will be added cannot be used to dilute the drug)

Administration of I.V. medicine

- Flush peripheral or central venous cannula with 10 mL normal saline solution before and after I.V. medicine administration.
- duration of administration depends on the type of medicine (e.g. min.10 minutes for a direct bolus administration)

Washing out I.V. input

- PVC (peripheral venous cannula/catheter) – 10 mL normal saline solution before and after I.V. administration and after an infusion
- CVC (central venous cannula/catheter) – 10 mL normal saline solution before and after I.V. administration and after an infusion
- To flush, use 10 mL normal saline solution – draw solution into a 10 mL syringe, close the cone with a sterile needle or a stopper, and label syringe with sticker “Flush” or FR, or F 1/1.

- Disinfect the I.V. input before disconnection using a cellulose wadding with disinfectant (observe the exposure time).
- For antibacterial filters, follow the “do not touch” rule (do not touch the membrane).
- Use gloves.



Equipment for preparation and application of I.V. injection



Medicine ready for I.V. administration – bolus administration



Finding injection site for I.V. medicine application by touch



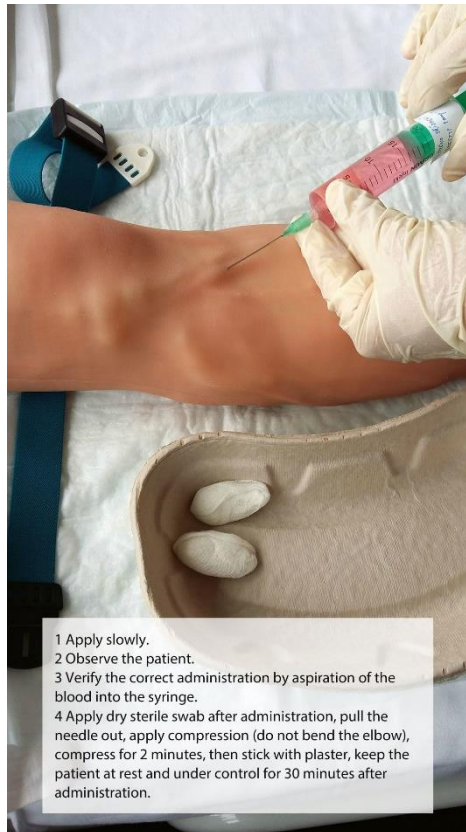
Disinfection of the injection site



Insertion of the needle into a vein (1)



Insertion of the needle into a vein (2) – check the vein puncture by aspiration of blood into the syringe, release the tourniquet, administer the medicine slowly



Application of I.V. injection – bolus administration

Complications of I.V. medicine

- paravenous administration – pain, oedema (apply cold compress).
- vein inflammation – phlebitis (local reaction or total body catheter sepsis), thrombophlebitis – vein inflammation with blood clot (cold compress, follow doctor's orders, administer any other medicines only into unaffected extremity).
- allergic reaction to the disinfectant – not waiting long enough for disinfectant to dry (about 30 seconds), resulting in disinfectant being inserted by the tip of the needle into the bloodstream.
- fast-onset symptoms – feeling hot, urge to urinate, nausea, tachycardia, tachypnoea (slow down the application).
- allergic reaction to a given medicine – severe nausea, tachycardia, dyspnoea, tachypnoea, redness, itching, signs of anaphylactic shock (immediately stop drug administration, retain secure intravenous catheter, call a doctor)
- air embolism
- nerve injury – paraesthesia – tingling, sensitivity disorders (immediately stop drug administration, call a doctor)
- medicine confusion – wrong patient or wrong medicine (inform a doctor)

Infusion

- introducing a large amount of fluids into the body by parenteral route = outside the gastrointestinal tract
- purpose: diagnostic (introducing contrast medium), or therapeutic (maintenance or equalization of water and electrolyte balance, delivery of minerals/vitamins, ensuring the energy needs of the organism, providing sufficient volume of circulating fluids, rapid drug delivery)

Application sites

- peripheral access – the basilic vein, the cephalic vein, the median cubital vein, the veins of the forearm and the back of the hand, the great saphenous vein (frontal part of the inner ankle at the lower limb), veins in the temporal and parietal area in infants
- central venous catheter – internal jugular vein, subclavian vein, femoral vein
- implantable venous port
- subcutaneous administration in palliative medicine

Types of infusion solutions

Infusion solution according to osmotic pressure		
Hypotonic lower osmotic pressure than in the bloodstream		F ½
Isotonic same osmotic pressure as in the bloodstream		F 1/1, G 5%, R1/1, H1/1, Ringerfundin
Hypertonic higher osmotic pressure than in the bloodstream		G 10%, G 20%, G 40%, Rheodextran 10%, Manitol 10%, Manitol 20%
Infusion solution according to the size of the molecules		
Crystalloids low-molecular (have small molecules)	quickly supply the body with water and electrolytes, but quickly leave the bloodstream; they are easily absorbable, keep acidobasic balance, regulate water and mineral balance	F 1/1 (normal saline) F1/2 (half-normal saline) R1/1 (Ringer's solution) H1/1 (Hartmann's solution) D1/1 (Darrow's solution)
Colloids high-molecular (have large molecules)	keep fluids longer in the bloodstream than crystalloids, used with patients in shock or in severe dehydration	plasma replacement solutions – the same oncotic pressure as plasma: Dextran, Gelifundol, Gelafusin etc. plasma expanders – higher oncotic pressure than plasma: Rheodextran, Haes etc.



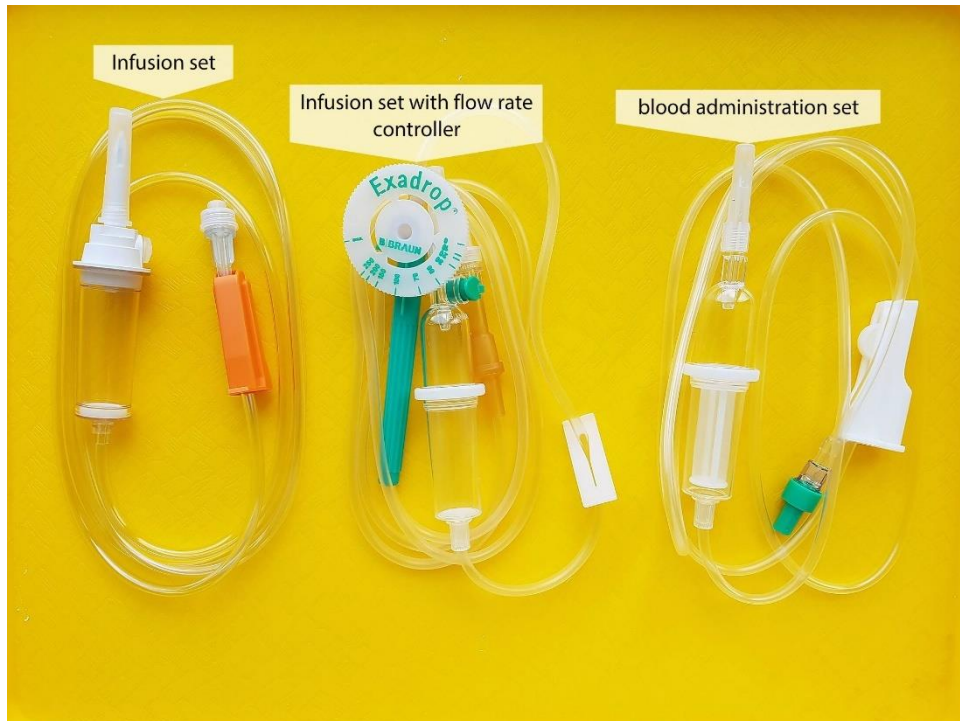
Types of infusions

Infusion administration

- continuously
- intermittently
- once
- by bolus

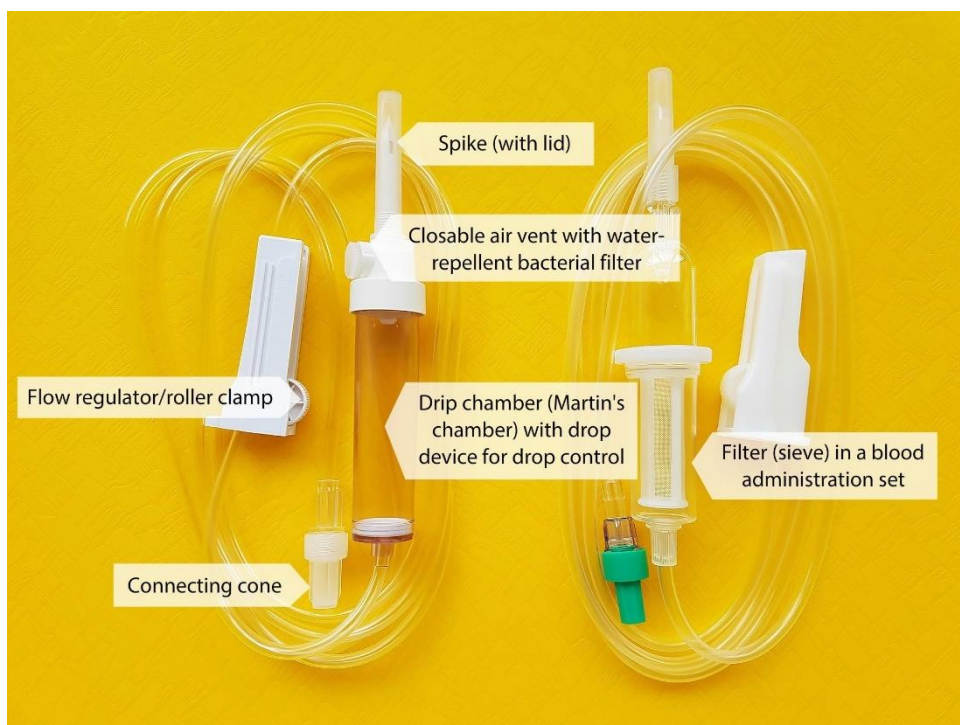
Patient preparation

- give the patient all necessary information, make sure the patient has an empty bladder and has defecated already, is in a suitable position, with the nurse call button within arm's reach



Infusion and transfusion set

Infusion and transfusion set – description of the parts



Infusion and transfusion set – description of the parts

Infusion designation on the label

- room and bed numbers (e.g. 4/1 (room No. 4, bed No. 1))
- surname and first name (year of birth in case of two patients with similar names)
- amount and type of infusion solution
- name + weight of drugs added to the infusion
- method of application (e.g. I.V.)
- infusion ranking in case more infusions are planned (inf. No ...)
- date and time

4/2 surname and first name 1978
500 mL F1/1 + 1 g Zinnat i.v.

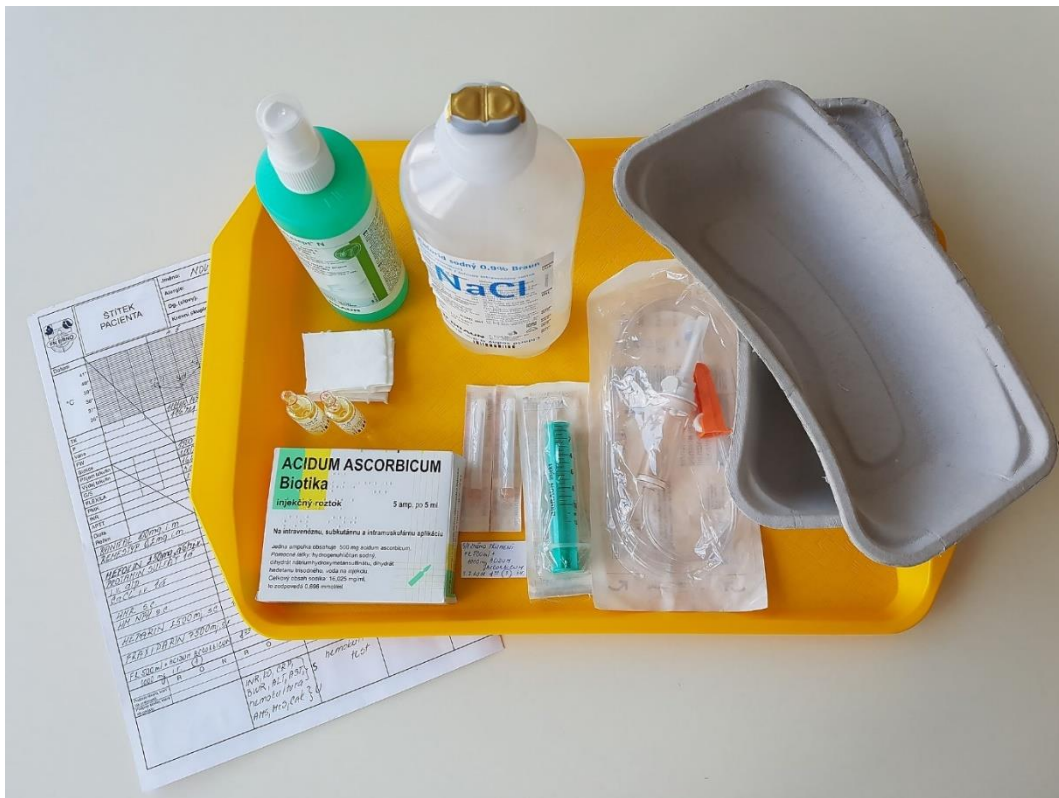
1

7 July 2016 at 6 a.m.

4/2 surname and first name 1978
500 mL F1/1 + 1 amp. Magnesium
sulfuricum 10% i.v.

7 July 2016 at 8 a.m.

Preparation of infusion



Preparation of infusion 1 – equipment (Order: Normal saline solution 500 ml + 1000 mg Acidum ascorbicum I.V.)



Preparation of infusion 2 – opening the ampules



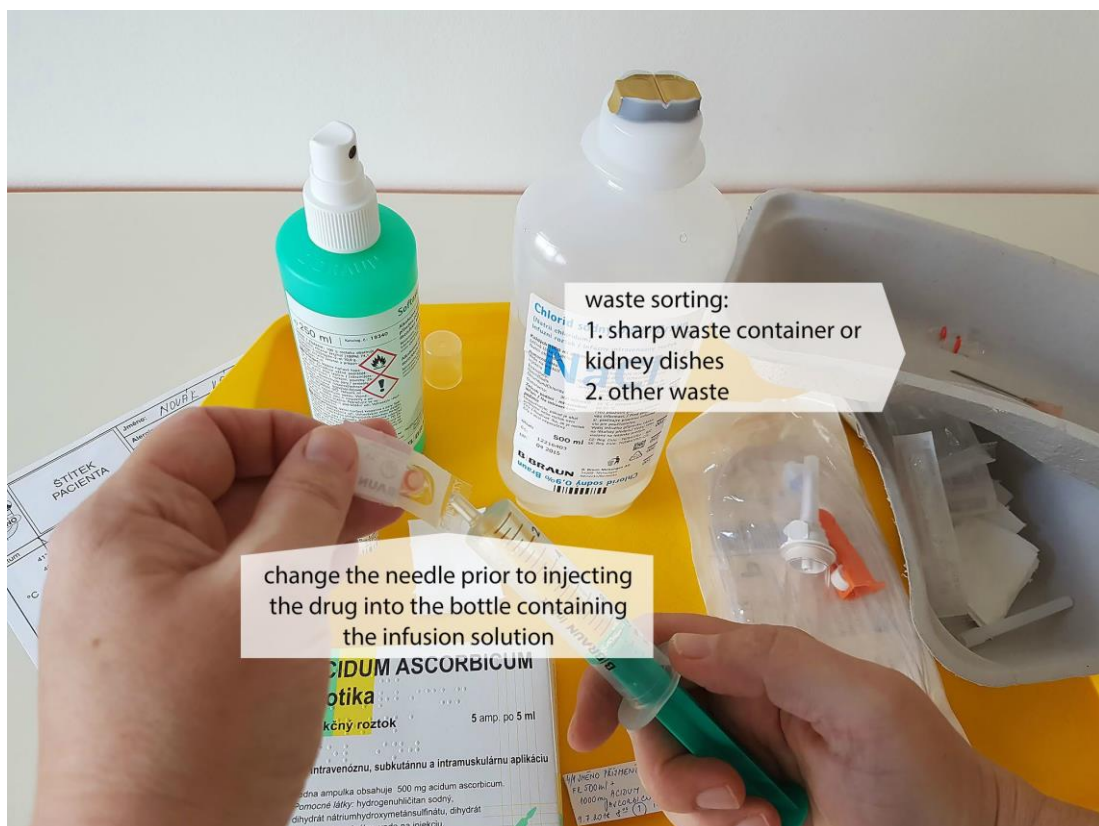
Preparation of infusion 3 – opening the syringe (showing the correct direction of opening with so-called peel effect)



Preparation of infusion 4 – taking the drug from the first ampoule



Preparation of infusion 5 – taking the drug from the second ampule



Preparation of infusion 6 – change the needle prior to injecting the drug into the bottle containing the infusion solution



Preparation of infusion 7 – inserting the drug into the bottle containing the infusion solution



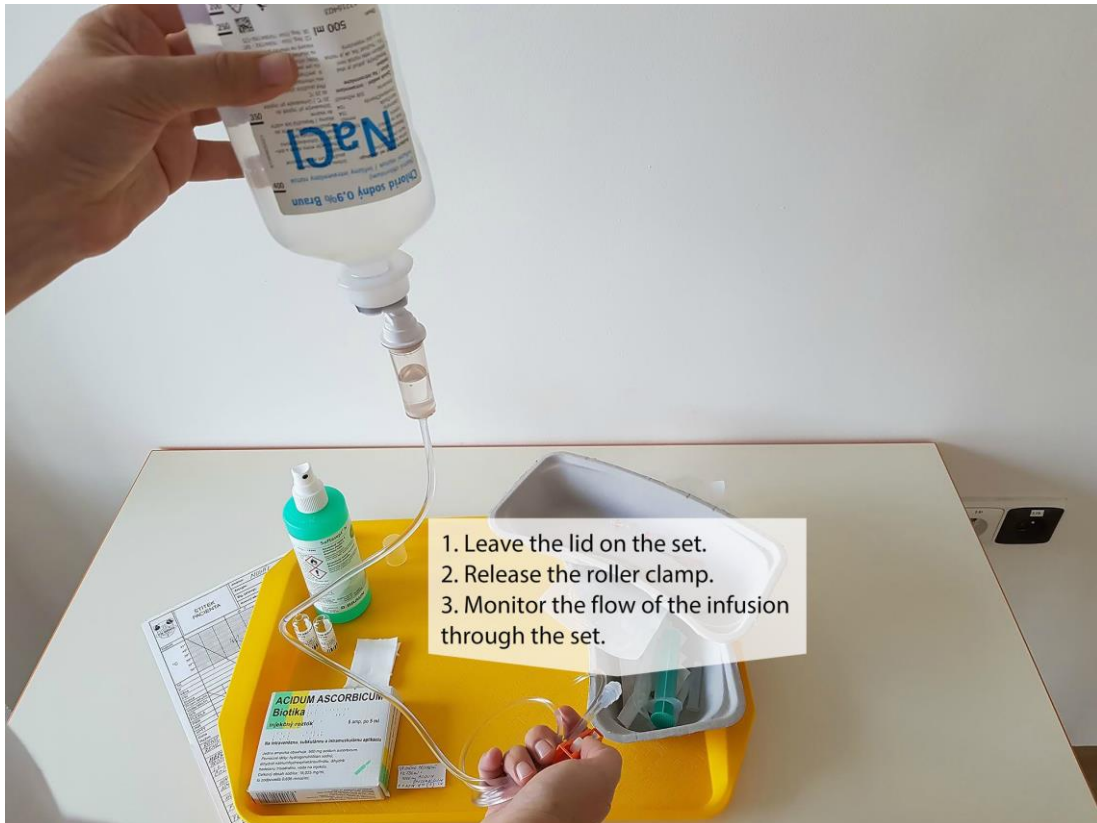
Preparation of infusion 8 – preparation of the infusion set



Preparation of infusion 9 – inserting the spike of the infusion set into the bottle



Preparation of infusion 10 – creating a fluid level in the drip chamber



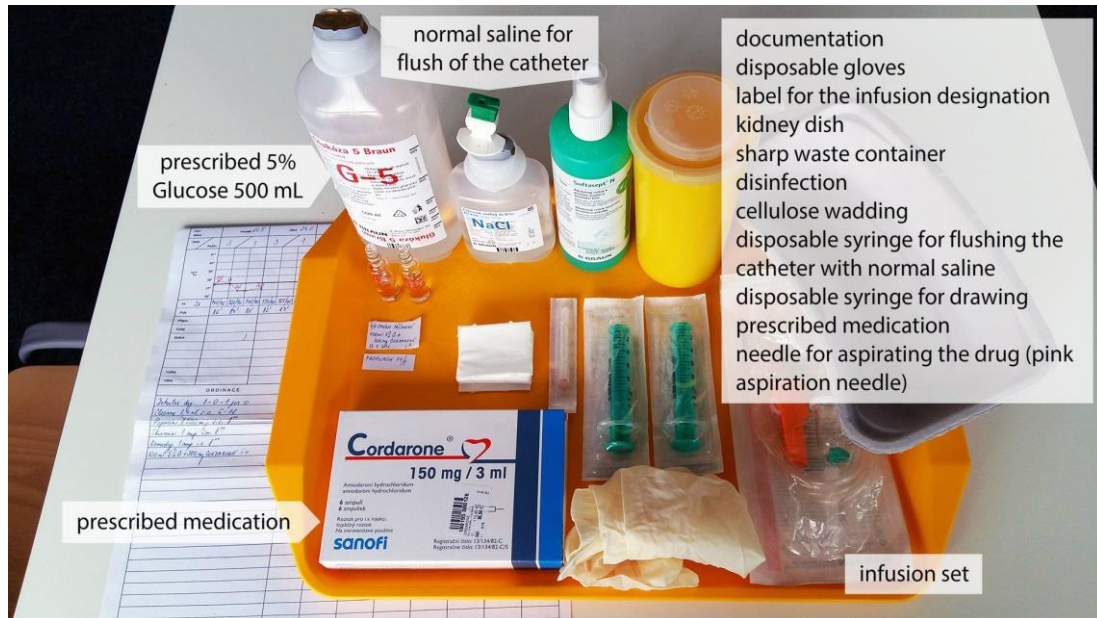
Preparation of infusion 11 – venting of the infusion set



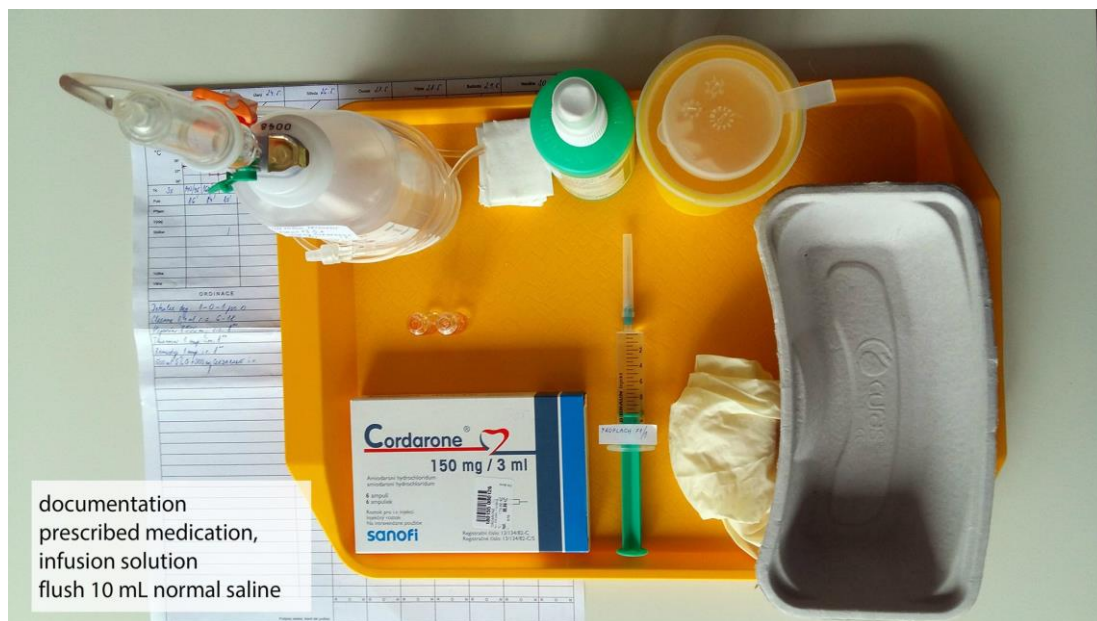
Preparation of infusion 12 – infusion ready to be administered to venous access (peripheral or central)

Addition of additives into the bottle during the infusion application

- disinfection of the entry point of the infusion bottle – insertion – note the added medicine on the label, indicate the quantity or weight



Equipment for infusion preparation



Infusion ready for administration

- Triple drug control prior to administration.
- Drug ampoules which were added into the infusion are subjects for final check at the patient's bed, after that they should stay in the nurses' room until the infusion is finished.



Infusion designation

The rate of infusion administration depends on

- the doctor's orders
- the composition of the infusion solution and the added medication
- the age and health condition of the patient
- speed control: roller clamp; infusion set with flow regulator (infusion set with a special wheel for speed adjustment); infusion drop counter; infusion perfuser, infusion pump. **DO NOT TOUCH** the roller clamp with gloves!



Labelling of the drop factor/index and pore size of the mesh in the transfusion set

F1/1 500 mL should last 2 hours	
500 mL (total infusion volume)	
-----	= 250 mL per hour
2 hours (total time)	

Number of drops per minute

the drop factor is indicated on the infusion set packages – 20 drops/mL

$$\text{Number of drops per minute} = \frac{\text{the total infusion volume} \times \text{the drop factor}}{\text{total time of infusion administration in minutes}}$$

For example:

$$\frac{1\,500 \text{ mL} \times 20 \text{ drops}}{360 \text{ minutes}} = 30\,000 : 360 = 83 \text{ drops/minutes}$$

✓ For example: prescribed medication 1 000 mL + 20 mL 7,45% KCl (total time 6 hours)

$$\frac{1\,020 \text{ mL} \times 20 \text{ drops}}{6 \text{ hours (} 6 \times 60 = 360 \text{)}} = \frac{20\,400}{360} = 56,666 = 57 \text{ drops/minutes}$$

Infusion complications

Problem	Symptoms	Intervention
Blood vessel injury	haematoma near the injection site	sterile injection site treatment, application of a compress, selection of another injection site
Rupture of the vessel wall (paravenous administration)	intumescence (swelling) around the injection site, local signs of inflammation – heat, pain, redness, swelling, loss of function (Latin: calor, rubor, tumor, dolor, functio laesa)	sterile injection site treatment, application of a compress, selection of another injection site and following the doctor's orders (seriousness varies according to the type of medication)
Allergic reaction	dyspnoea, pruritus/itching, increased body temperature	interruption of infusion application, the doctor will decide about next steps (e.g. antihistamines)
Infection, pyretic reaction	intumescence (swelling) around the injection site, local signs of inflammation – heat, pain, redness, swelling, loss of function (Latin: calor, rubor, tumor, dolor, functio laesa)	interruption of infusion application, the doctor will decide about next steps (e.g. antipyretics, antibiotics)
Air or fat embolism	dyspnoea, cyanosis, dušnost, shock symptoms	vital indication – life-threatening – start CPR (cardiopulmonary resuscitation) according to the patient's status, the doctor will decide about next steps
Overloading of cardiovascular system	dyspnoea, cyanosis, shock symptoms	vital indication – life-threatening – start CPR (cardiopulmonary resuscitation) according to the patient's status, the doctor will decide about next steps

Parenteral Nutrition

- method of nutrition administration into the bloodstream (by central venous catheter; concentrated solutions cannot be administered to peripheral veins)
- infusion administration 12 to 24 hours with infusion pump or infusion set with flow regulator
- rate depends on amount of administered medication, composition of the infusion mixture, daily fluid intake and health condition of the patient
- different types – mono bags, multi-chamber bags, all-in-one bags



All-in-one bag

Transfusion

Transfusion is the transfer of blood products or blood derivatives from a healthy individual/donor to a patient/recipient to supplement the recipient's blood or its components.

Procedures connected with blood collection, testing, processing, storage and distribution of human blood and its components are subject to legislative regulation (specifically Decree No. 130/2018 Coll. Laying down additional requirements for the quality and safety of human blood and its components).

Transfusion indications

- heavy loss of blood (injury, surgery, parturition, chronic haemorrhagic loss)
- anaemia, thrombocytopenia
- hypoxia, shock, intoxication
- burns
- oncologic diseases, chronic kidney and liver diseases
- blood clotting disorders

The “4C method” must be followed:

- correct indication
- correct blood product
- correct time
- correct amount

Types of transfusion

- **Allogeneic transfusion** – use of blood products and blood derivatives processed from donor blood.
- **Autologous transfusion (autotransfusion)** – a patient's own blood is collected and reinfused (preoperative blood collection: the patient donates 1–3 blood transfusion units 3–4 weeks before surgery)
- **Perioperative and postoperative recuperation** – a patient's own blood is sucked from the operating field during surgery with a special device and immediately returned to the blood stream
- **Exsanguinating transfusion** – neonatal red cell exchange transfusion in foetal erythroblastosis (maternal and foetal Rh incompatibility. An Rh negative mother creates antibodies against red blood cells of an Rh positive foetus, leading to severe haemolysis of foetal erythrocytes. Blood cell losses in the foetus caused by haemolysis are compensated for by increased haematopoiesis. Immature erythroblasts are released (this is called foetal erythroblastosis). **Re-exsanguinating transfusion** – repeated neonatal red cell exchange transfusion
- **Intrauterine transfusion** – exchange of foetal blood

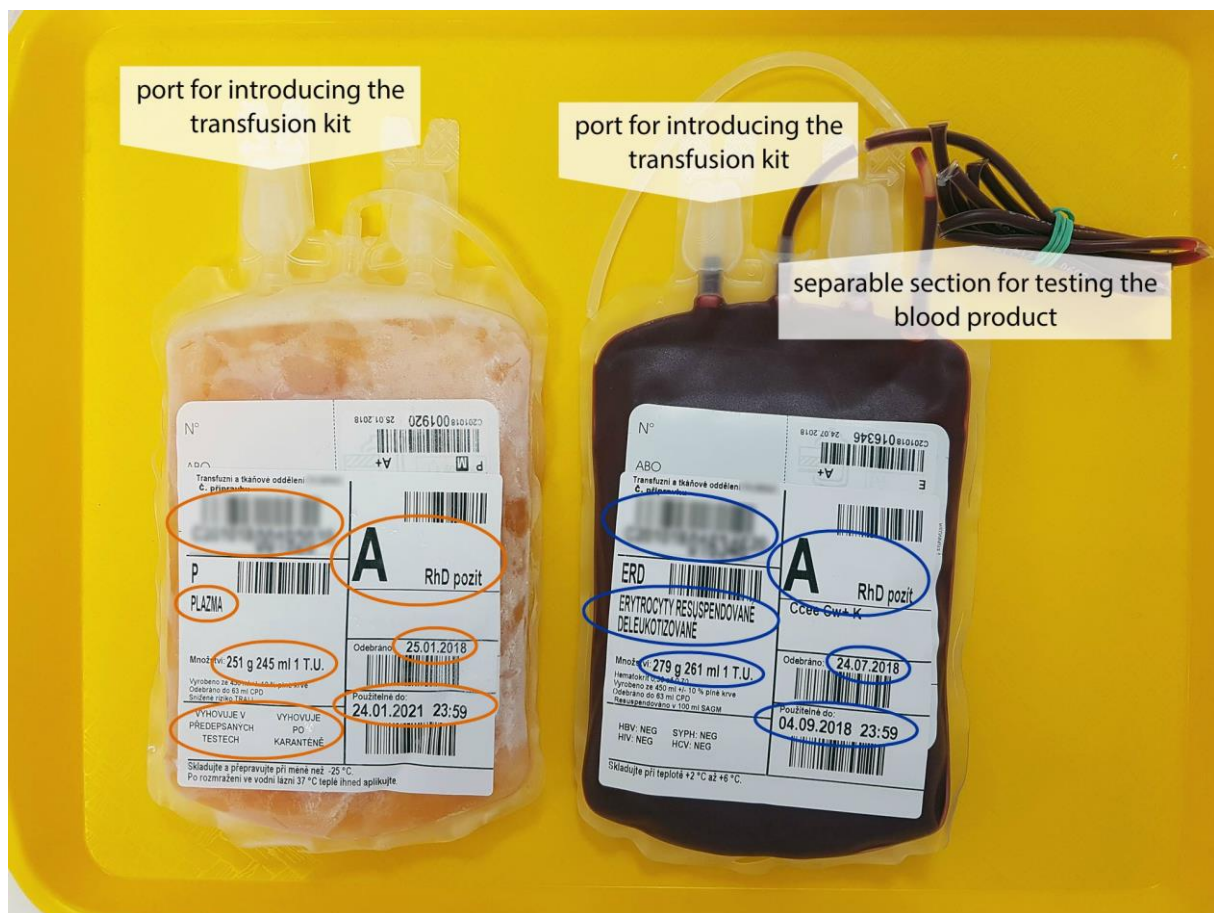
Blood products

- prepared in plastic bags at "blood banks"
- released on request
- must respect ABO system (blood group A, B, AB, O) and Rh compatibility
- **the amount** of a blood product is stated in **transfusion units (T. U.** = transfusion unit = the amount of blood product resulting from the processing of one standard full blood collection)

DESIGNATION OF BLOOD PRODUCT	CHARACTERIZATION
Whole blood	<ul style="list-style-type: none"> • currently used only in exceptional cases • indication: Massive blood loss
Packed RBCs	<ul style="list-style-type: none"> • blood from which part of the plasma has been removed; it has high haematocrit (0.65–0.75) • 1 TU = 250–300 mL • indication: anaemia • it flows slowly (high density), so it is not suitable for quick delivery during massive bleeding
Resuspended RBCs (leukocytes reduced)	<ul style="list-style-type: none"> • red blood cells diluted with resuspension solution, free of leucocytes • indication: the most frequently used blood product in therapy of surgical bleeding, anaemia, in haemato-oncology and paediatrics; compensates for the loss of RBCs, haemoglobin and lost volume
Washed RBCs	<ul style="list-style-type: none"> • RBCs without buffy coat (via plasma aspiration, washed with normal saline solution, and supplemented with a resuspension solution) • indication: When there is a risk of immunological response to the plasma components
Platelet concentrate	<ul style="list-style-type: none"> • indication: thrombocytopenia, thrombocytopathy • always freshly prepared, kept for 5 days under constant stirring at 22 °C
Plasma	<ul style="list-style-type: none"> • fresh frozen plasma, 1 TU = 200–280 mL • must be defrosted before delivery • indication: refill of circulating blood volume and substitution of coagulation factors • plasma components: <ul style="list-style-type: none"> ○ <i>albumin</i> – volume expander, used to increase intravascular volume of circulating blood ○ <i>fibrinogen</i> – used in case of bleeding due to native fibrinogen loss • specific globulins are prepared from plasma for immunological purposes • for clinical use, six months quarantine is required in order to reduce the risk of infectious disease transmission. Plasma is ready for use after the donor is repeatedly examined six months after the collection and found negative for HIV, syphilis, and hepatitis B and C

Designation of blood products

- title
- blood group and Rh factor
- volume
- composition and amount of preservative solution
- date and blood sampling number
- donor identification number
- guarantee of negativity of performed tests
- expiration date
- storage conditions



Blood products – plasma and resuspended RBCs (leukocytes reduced)

Ordering a blood product

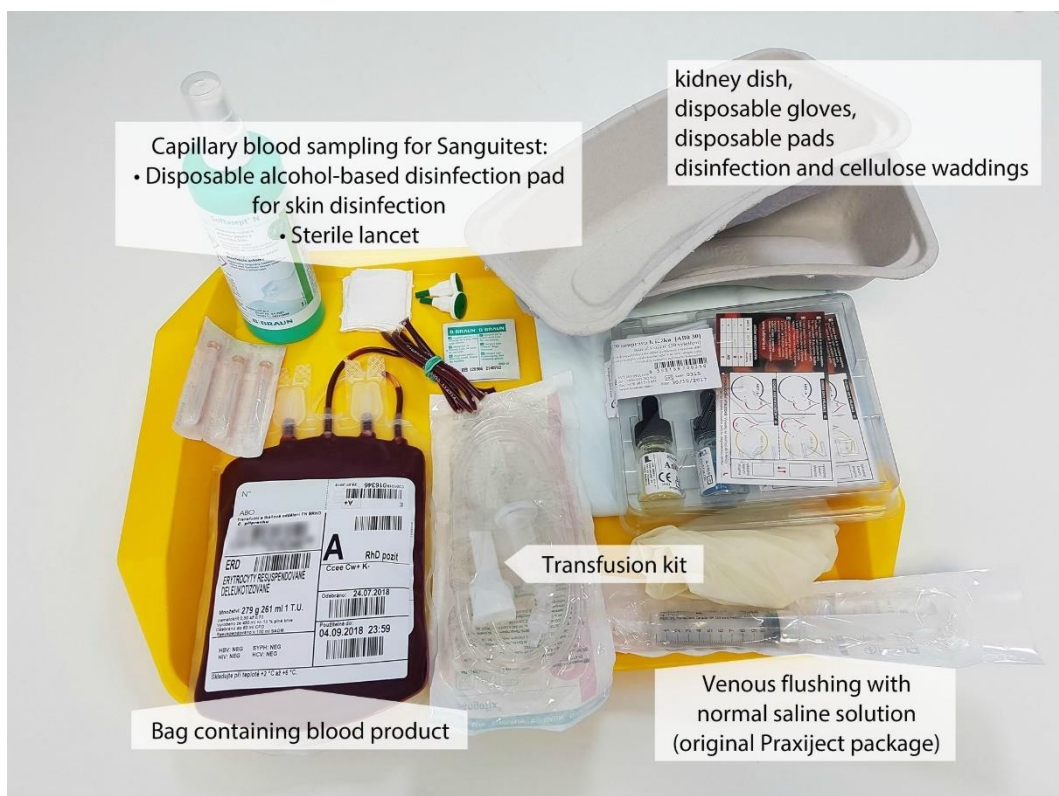
- request form for a blood product and immuno-haematological examination (the request form must be accompanied by a sample tube containing recipient's non-coagulable venous blood for blood group and Rh factor examination and for the compatibility test (one blood sample is sufficient to order 2–3 bags of a blood product)
- blood product is ready:
 1. STATIM – within 90 minutes after recipient's blood acceptance
 2. VITAL INDICATION – as soon as possible after a physician's phone call
 3. PLANNED – by the date and time written on the request form

Principles of administering a blood product

- the blood product should be administered within two hours of dispatch
- introduction of the transfusion kit (transfusion set) should be performed just prior to administration
- when administered, the product should be at room temperature
- if a central venous catheter is introduced, only the specified entry for the administration is used
- no other drugs are administered at the same time; the blood product must be given separately
- when using an overpressure transfusion, carefully monitor the progress (there is an increased risk of haemolysis, embolism, peripheral venous input port damage, and circulatory overload)
- used bags of blood product must not be kept; return them to the blood bank

Preparation of equipment

- blood product with dispatch form
- written consent for transfusion in patient's documentation
- original documentation of the patient's blood group
- a transfusion record book
- Sanguitest (ABO test, Bed-side test)
- capillary blood collection aids
- equipment for intravenous input introduction (if it has not already been introduced)
- equipment for vital signs measurement (tonometer, stethoscope, thermometer)
- non-sterile urine tube and diagnostic urine test strips



Preparation of equipment for Resuspended (leukocytes reduced) RBCs administration

Nurse's intervention

- Check the data on the bag containing the blood product and on the dispatch form.
- Check the original documentation of the patient's blood group.
- Visually inspect the blood product.
- Prepare patient's documentation.
- Prepare a transfusion record book (a registry of blood products and blood derivatives applied in the past).
- Measure and record vital signs.
- Collect urine for indicative biochemical examination (testing for the presence of proteins and blood).
- Call the physician: to check the bag, dispatch documentation, blood group, Rh factor, identification number of the product, expiration date, quantity and type of the product; make sure the patient's name, blood group and Rh factor match the patient's original documents).

Č.	Datum a čas příjmu TP a KD	Číslo TP, šarže KD (štítek)	Jméno, příjmení a rodné číslo pacienta (štítek)	TP KD podán	Důvod nepodání	Jmenovka a podpis lékaře
389				ano ne		
390				ano ne		
391				ano ne		
392				ano ne		
393				ano ne		
394				ano ne		

TP — transfuzní přípravek
 KD — krevní derivát
 ano / ne — zakroužkujte vyhovující odpověď

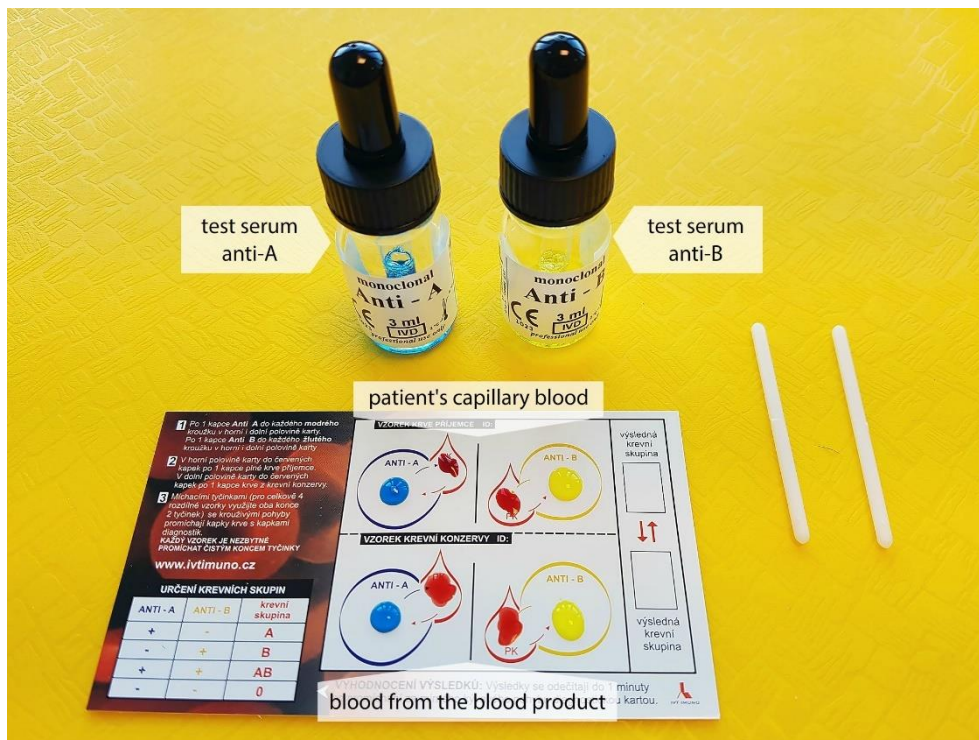
Transfusion record book (book is paginated; pulling out the pages or altering the records is strictly prohibited)

Sanguitest (ABO test, Bed-side test)

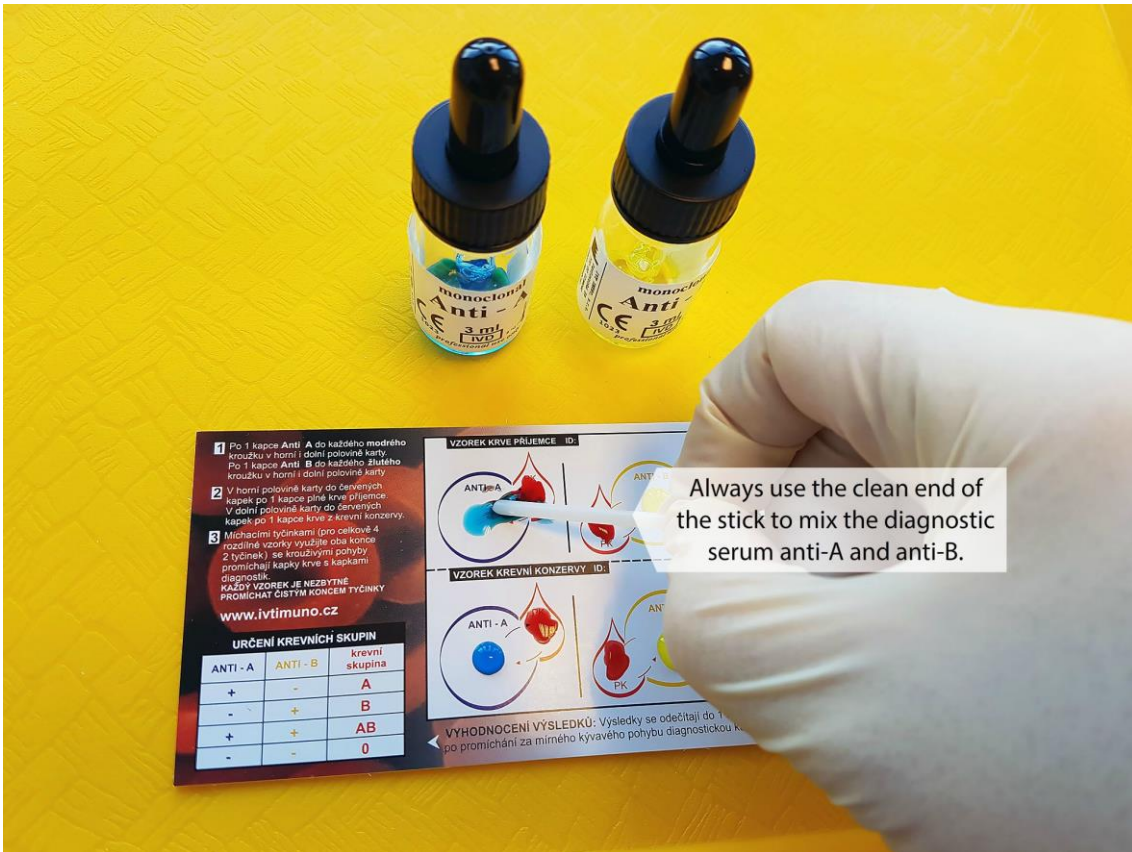
- a blood group reassurance test performed at the patient's bed using a diagnostic kit; performed by a physician; the capillary blood of the recipient and the blood from the blood product is assessed using test serum and final agglutination is evaluated



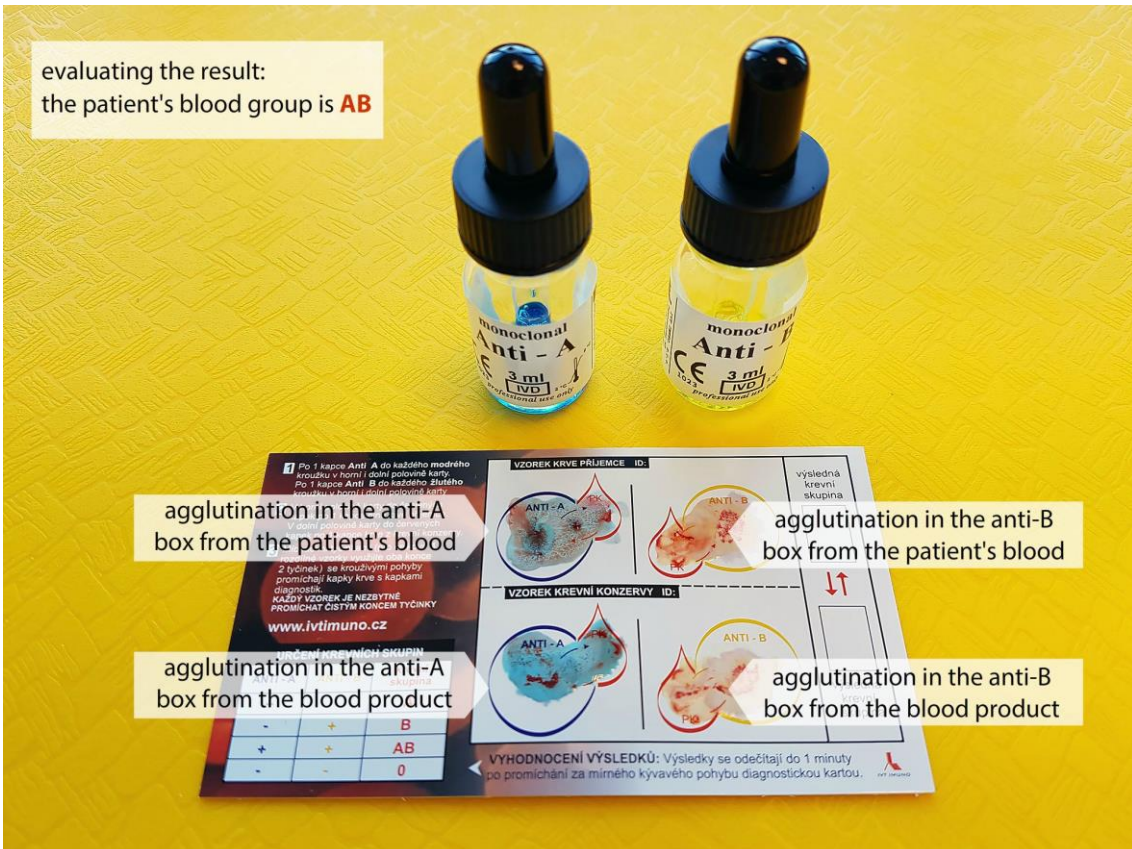
Sanguitest tools



Performing a Sanguitest at a patient's bed 1



Performing a Sanguitest at a patient's bed 2 – Mixing



Performing a Sanguitest at a patient's bed 3 – Evaluating the result

- the result of the Sanguitest must be recorded in the patient's documentation
- the physician certifies by signature that the blood product has been checked, that the blood groups are compatible, and that the Sanguitest results are correct
- nurse adjusts the transfusion rate (between 1.5 to 2 hours), writes down the time the transfusion started, and regularly checks the transfusion rate

Nurse's intervention after blood product administration

- ending the administration, leaving venous port in situ
- measurement of vital signs
- repeating the urine sample collection for indicative biochemical examination (testing for the presence of proteins and blood)
- designation of the transfusion bag and transfusion kit; storing them in the refrigerator for 24 hours (in case of a post-transfusion reaction)
- completing the records in the documentation and confirming by signature: the administration of the blood product, the commencement and completion time of the transfusion, the course of administration, the amount of product administered, any occurrence of post-transfusion reactions

Transfusion reactions

- acute or delayed
- nurse immediately interrupts the administration of the transfusion (but keeps the intravenous input port), calls the doctor, measures vital signs, follows the physician's orders, fills out an adverse event report

Haemolytic transfusion reaction (the most serious transfusion-related complication)

- cause – incompatibility between the blood group of the product and that of the recipient
- symptoms – increased temperature; increased heart rate; sensation of heat and pain along the vein receiving the blood; chills; shivering; dyspnoea; bronchospasm; headache; lower back pain; nausea; vomiting; oliguria; anuria; renal failure; shock status
- a strong reaction within 15 minutes of transfusion commencement (with only 10–50 mL of the blood product administered)

Febrile reaction (the most common)

- cause – pyrogen content in the blood product
- symptoms – rapid increase of body temperature, any time from 30 minutes up to 6 hours after completion of transfusion administration; chills; headache; nausea; vomiting; tachycardia; muscle pain
- progress is usually mild
- a fever of 38 °C is considered serious

Allergic reaction

- cause – hypersensitivity to components in the blood product (allergens, antibodies) or to anti-coagulable agents or preservatives

- symptoms – mucosal oedema; nettle-rash; increased body temperature; headache; diarrhoea; dyspnoea

Anaphylactic reaction

- symptoms – manifests within a few minutes after commencement of transfusion (cardiovascular collapse; respiratory distress; anaphylactic shock)

Circulatory overload / hypervolemia

- cause – fast administration, deteriorated renal functions
- result – heart failure and pulmonary oedema
- symptoms – breast pain; shortness of breath; aggravated anxiety; psychomotor agitation; visible increase of neck vein filling; cyanosis; tachycardia

Bacterial contamination and septic shock

- cause – contamination of the blood product
 - bacteria from the donor's skin during blood collection (skin Staphylococci)
 - bacteria in the donor's blood at the time of blood collection (Yersinia)
 - incorrect handling during blood product processing
 - damage of the plastic bag containing blood product
 - contamination before administration
- symptoms – increased body temperature; chills; hypotension

Plasma Administration

- The duties of the nurse and physician when administering the plasma are the same as those used for blood transfusion, except the Sanguitest is not performed.



Equipment for plasma administration

Blood derivatives

- pharmaceutically manufactured medical products made of plasma taken from several donors
- plasma is processed into the finished blood derivative by fractionation at specialized fractionation centres

TITLE OF BLOOD DERIVATIVE	CHARACTERIZATION
Albumin	<ul style="list-style-type: none"> • indication: albumin supplementation before and after surgery; treatment of hypovolemic states (haemorrhagic shock, burns); renal and hepatic failure; low level of albumin in plasma • principles: <ul style="list-style-type: none"> ○ do not administer the product with other medicines, blood products or blood derivatives ○ administer immediately after opening
Immunoglobulins	<ul style="list-style-type: none"> • IVIG – for I.V. administration • SCIG – for S.C. administration • IMIG – for I.M. administration • indication: therapeutic (infections, immunity disorders); prophylactic (vaccination) • e.g. in Rh negative mothers we administer the following: anti-D (IMIG, IVIG); hepatitis B (IMIG, IVIG); tetanus (IMIG); rabies (IMIG); cytomegalovirus (IVIG)
Concentrated coagulation factors	<ul style="list-style-type: none"> • factor VIII (antihæmophilic globulin); factor IX • indication: hæmophilia (congenital bleeding disorder – type A, B)
Human fibrinogen	<ul style="list-style-type: none"> • indication: blood diseases
Antithrombin III	<ul style="list-style-type: none"> • a physiological coagulation inhibitor • indication: acquired bleeding disorders; absence of antithrombin III (major injuries, sepsis, disseminated intravascular coagulation, hepatopathy, nephrotic syndrome)

Literature

- Řeháček V, Masopust J. a kol. *Transfuzní lékařství*, Praha: Grada Publishing, Czech Republic, 2013. ISBN 978-80-247-4534-3.
- Decree No. 130/2018 Coll., of 19 June 2018, amending Decree No. 143/2008 Coll., laying down additional requirements for the quality and safety of human blood and its components. *In: Sbírka zákonů České republiky*. 2018, amount 66, pp. 1702-1706. ISSN 1211-1244.

Oxygen Therapy

- oxygen treatment
- these factors change according to the doctor's orders – the method of administration, and the oxygen flow in litres per minute (children 1–4 L/min, adults 4–10 L/min)

Principles

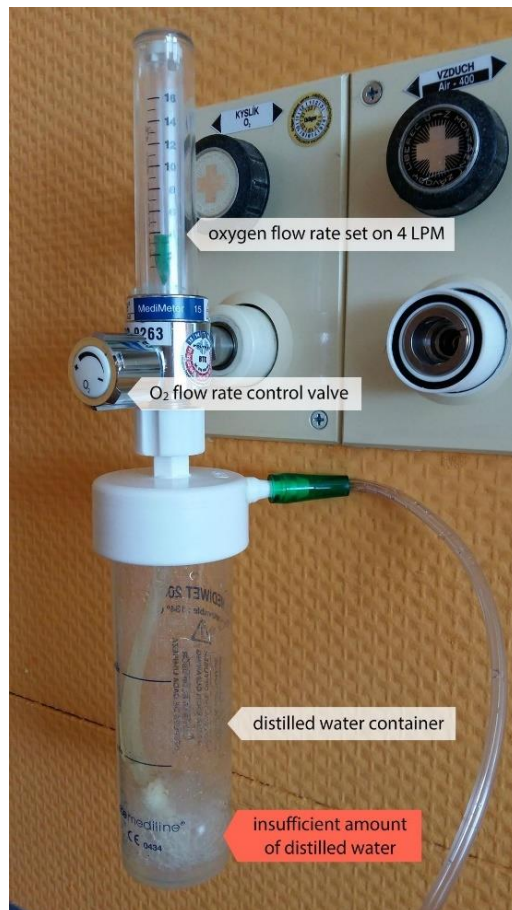
- safe handling – prevent contact with grease, flammable substances, volatile substances or open fire
- location – in a calm, quiet place, where the patient cannot fall, away from heating and direct sun
- separate full bottles from empty ones
- use appropriate equipment
- humidification with distilled water
- correct patient position (Fowler's position, orthopneic position)



Medical Gas and Electric Headwalls wall-mounted



Central gas distribution



Float flowmeter



Oxygen cylinder

Calculation of the amount of O₂ in the bottle

- A bottle of 3 litres under a pressure of 80 atm. Given a flow of 6l O₂/minute, how long can the O₂ in the bottle last?

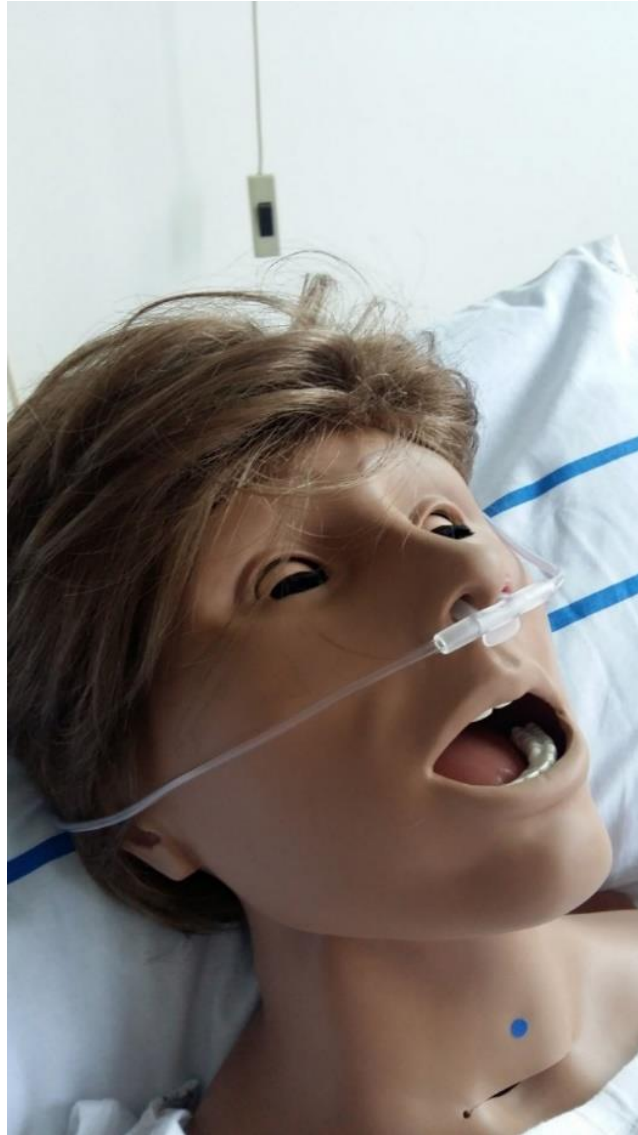
Calculation

- $3 \times 80 = 240$
- $240 : 6 = 40$ minutes

Inhalation equipment for oxygen therapy



Simple face mask



Nasal oxygen cannula (cannot be used if the patient breathes through his/her mouth)

Literature

- Pokorná, A. a Komínková, A. *Ošetrovatelské postupy založené na důkazech 2. díl.* Brno, Czechia: Masaryk University, 2014. pp. 42-48. ISBN 978-80-210-7415-6

Puncture

An invasive procedure with a diagnostic and/or therapeutic purpose

- puncture of natural body cavities (nasal cavity, chest cavity, abdominal cavity, spinal canal, joints, urinary bladder, Douglas space)
- piercing of organs (blood vessels, bones, lymph nodes, thyroid gland, liver, kidney, spleen)
- drainage of pathological forms (abscess, cyst, haematoma)

A puncture is often needed in order to perform

- body fluid collection – blood, urine, exudate, mucus, pus, joint fluid, cerebrospinal fluid, bone marrow
- tissue sampling (biopsy)

Puncture needles

Depending on the type of puncture, standard injection needles or special puncture needles are used. Puncture needles have different diameters and lengths. The puncture needles used to puncture tissues include an inner obturator that prevents the clogging of the needle after penetration into an organ. Special puncture needles called trocars allow instruments to be placed after removal of the obturator.

Overview of some punctures

Lumbar puncture	
Insertion site	<ul style="list-style-type: none"> • spinal canal between lumbar / loins / vertebrae L3-L4 or L4-L5
Diagnostic purpose	<ul style="list-style-type: none"> • cerebrospinal fluid (CSF) collection for biochemical, microbiological, serological and cytological examination • delivery of contrast dye • control of CSF pressure
Therapeutic purpose	<ul style="list-style-type: none"> • relief of CSF (in case of overproduction, circulatory disorder, obstruction of cavity pathways, hydrocephalus) • administration of therapeutic agents into the spinal canal • delivery of anaesthetics in spinal anaesthesia
Position during procedure	<ul style="list-style-type: none"> • lying on the side, with knees drawn to chest (embryo position) • sitting on a bed or chair, leaning forward (cat's back position)
Patient and equipment preparation	<ul style="list-style-type: none"> • inform the patient about the procedure • gain signed informed consent • prepare a sterile table with equipment for lumbar puncture • sterile tubes for CSF samples • Claude manometer (for CSF pressure measurement)
Handling after the procedure	<ul style="list-style-type: none"> • horizontal position on the back—for 24 hours after using a traumatic needle, for 4 hours after using an atraumatic needle (with a rounded tip) • increased fluid intake (for faster cerebrospinal fluid production and supplementation)

	<ul style="list-style-type: none"> • monitoring vital signs and neurological symptoms (numbness and tingling of the legs, headache, nausea, vomiting, unconsciousness) • monitoring the injection site (swelling, bleeding, leakage)
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Sternal puncture

Insertion site	<ul style="list-style-type: none"> • chest bone, at the level of the 2nd–3rd intercostal space, in the sternal manubrium in children
Diagnostic purpose	<ul style="list-style-type: none"> • obtaining bone marrow for morphological, immunological and cytogenetic examination (for detection of abnormal development of blood elements, to diagnose anaemia, leukaemia, lymphoma ...)
Therapeutic purpose	<ul style="list-style-type: none"> • none
Position during examination	<ul style="list-style-type: none"> • in a horizontal position on the back, resting on a firm surface
Patient and equipment preparation	<ul style="list-style-type: none"> • inform the patient about the procedure • gain signed informed consent • a sterile table with equipment for sternal puncture • biopsy slides and cover glass slides to smear the obtained aspirate
Handling after examination	<ul style="list-style-type: none"> • rest on bed for 2 hours • monitoring vital signs • monitoring the injection site (swelling, bleeding, haematoma)

Trephine biopsy

Insertion site	<ul style="list-style-type: none"> • wing of ilium of the hip bone
Diagnostic purpose	<ul style="list-style-type: none"> • bone marrow aspiration for cytological and histological examination – in contrast to a sternal puncture, trephine biopsy allows for a histological examination (a punch biopsy of bone marrow for microscopical evaluation of the tissue structure, used to diagnose haematological diseases)
Therapeutic purpose	<ul style="list-style-type: none"> • none
Position during examination	<ul style="list-style-type: none"> • on the belly or on the side
Patient and equipment preparation	<ul style="list-style-type: none"> • inform the patient about the procedure • gain signed informed consent • hemocoagulation examination – procedure with increased risk of bleeding • sterile table with equipment for trephine biopsy • Jamshidi needle (special puncture needle for bone marrow biopsy) • fixation solution for the tissue sample
Handling after examination	<ul style="list-style-type: none"> • rest on bed, on the side of the puncture site, compression bandage at the puncture site for 1–6 hours • monitoring vital signs • monitoring for pain (analgesics application) • monitoring the insertion site (swelling, bleeding, haematoma)

Abdominal puncture	
Insertion site	<ul style="list-style-type: none"> insertion site at the Monro point (a point at the right edge of the rectus abdominis muscle, between the umbilicus and the anterior superior spine of the ilium)
Diagnostic purpose	<ul style="list-style-type: none"> collection of exudate for biochemical, microbiological and cytological examinations
Therapeutic purpose	<ul style="list-style-type: none"> evacuation of the exudate / ascites from the abdominal cavity (ascites occurs in liver cirrhosis, heart failure, kidney and pancreas diseases, tumours in the abdominal cavity, inflammation and thrombosis in the abdominal cavity, lack of proteins) administration of therapeutic substances lavage in peritoneal dialysis
Position during examination	<ul style="list-style-type: none"> Fowler's position
Patient and equipment preparation	<ul style="list-style-type: none"> inform the patient about the procedure gain signed informed consent abdominal X-ray weigh the patient and measure the circumference of the belly a sterile table with abdominal puncture equipment sterile tubes for aspirated samples drainage set with graduated collecting container for evacuation of the exudate
Handling after examination	<ul style="list-style-type: none"> weighing the patient and measuring the circumference of the belly rest on bed in semi-sitting position for 2 hours monitoring vital signs monitoring for pain (analgesics application) monitoring the insertion site (swelling, bleeding, haematoma)
Pleural puncture (Thoracentesis)	
Insertion site	<ul style="list-style-type: none"> when removing the fluid: in the 6th–8th intercostal space, in the posterior axillary line (below the level of the effusion) when removing air: in the 2nd–3rd intercostal space, in the mid clavicular line
Diagnostic purpose	<ul style="list-style-type: none"> collection of exudate for biochemical, microbiological and cytological examinations
Therapeutic purpose	<ul style="list-style-type: none"> evacuation of exudate or air into a closed drainage system (in order to restore negative chest pressure, to relieve overpressure, and/or allow a collapsed lung to expand) administration of medicinal substances
Position during examination	<ul style="list-style-type: none"> the position depends on the insertion site sitting on a chair, legs wide open, the patient leaning forward into the back of the chair sitting with the forearms supported sitting on a chair with the arm raised on the puncture side
Patient and equipment preparation	<ul style="list-style-type: none"> inform the patient about the procedure gain signed informed consent

	<ul style="list-style-type: none"> • examine the breathing by auscultation and evaluation of respiratory phenomena • examine by tapping and evaluate the sounds • lungs and chest X-ray • ultrasound of the lungs and chest • a sterile table with equipment for thoracentesis • sterile sample tubes • closed drainage system for draining the exudate
Handling after examination	<ul style="list-style-type: none"> • rest on bed in elevated position • monitoring vital signs (with emphasis on the quality and character of breathing, occurrence of dyspnoea, coughing and expectoration) • monitoring pain (analgesics application) • monitoring the insertion site (swelling, bleeding, haematoma)
Renal puncture	
Insertion site	<ul style="list-style-type: none"> • depending on the position of the organ, insertion of the puncture needle aided by ultrasound
Diagnostic purpose	<ul style="list-style-type: none"> • tissue sampling for histological examination
Therapeutic purpose	<ul style="list-style-type: none"> • none
Position during examination	<ul style="list-style-type: none"> • on the belly, with abdominal support
Patient and equipment preparation	<ul style="list-style-type: none"> • inform the patient about the procedure • gain signed informed consent • check blood pressure compensation • pause during administration of drugs to check for blood clotting • provide biochemical examination of blood and urine • provide hemocoagulation examination – procedure with increased risk of bleeding • provide ultrasound examination of the kidneys • admission to hospital • fasting after midnight • local anaesthesia, sedation • a sterile table with puncture equipment • fixation solution for obtained tissue samples
Handling after examination	<ul style="list-style-type: none"> • rest on bed for 24 hours, in horizontal position, on the back • compression bandage at the insertion site for 6 hours • monitoring urine (blood in urine, bleeding into the kidney) • sufficient hydration (bleeding prevention) • monitoring vital signs • monitoring pain (analgesics application) • insertion site monitoring (swelling, bleeding, haematoma) • ultrasound to check renal area 24 hours after examination • no physical exercise or bathing in warm water for 14 days after the procedure

Hepatic puncture	
Insertion site	<ul style="list-style-type: none"> • depending on the position of the organ • targeted liver biopsy – puncture aided by ultrasound (gaining a sample from a specific part of the liver, directly from the affected source) • non-targeted liver biopsy – puncture not aided by ultrasound (aspiration of any part of the liver, in case of pathological changes affecting the whole liver)
Diagnostic purpose	<ul style="list-style-type: none"> • tissue sampling for histological examination
Therapeutic purpose	<ul style="list-style-type: none"> • none
Position during examination	<ul style="list-style-type: none"> • horizontal position, on the back, with the right hand behind the head
Patient and equipment preparation	<ul style="list-style-type: none"> • inform the patient about the procedure • gain signed informed consent • blood pressure compensation • pause during administration of drugs to check for blood clotting • provide haemocoagulation examination – procedure with increased risk of bleeding • admission to one-day hospital stay (may also be done as an outpatient procedure) • fasting after midnight • local anaesthesia, sedation • a sterile table with puncture equipment • fixation solution for obtained tissue samples
Handling after examination	<ul style="list-style-type: none"> • rest on bed for 24 hours lying on the right side • compression bandage at the insertion site for 6 hours • monitoring vital signs • insertion site monitoring (swelling, bleeding, haematoma) • checking the blood picture before discharge • no physical exercise or bathing in warm water for 14 days after the procedure

Literature

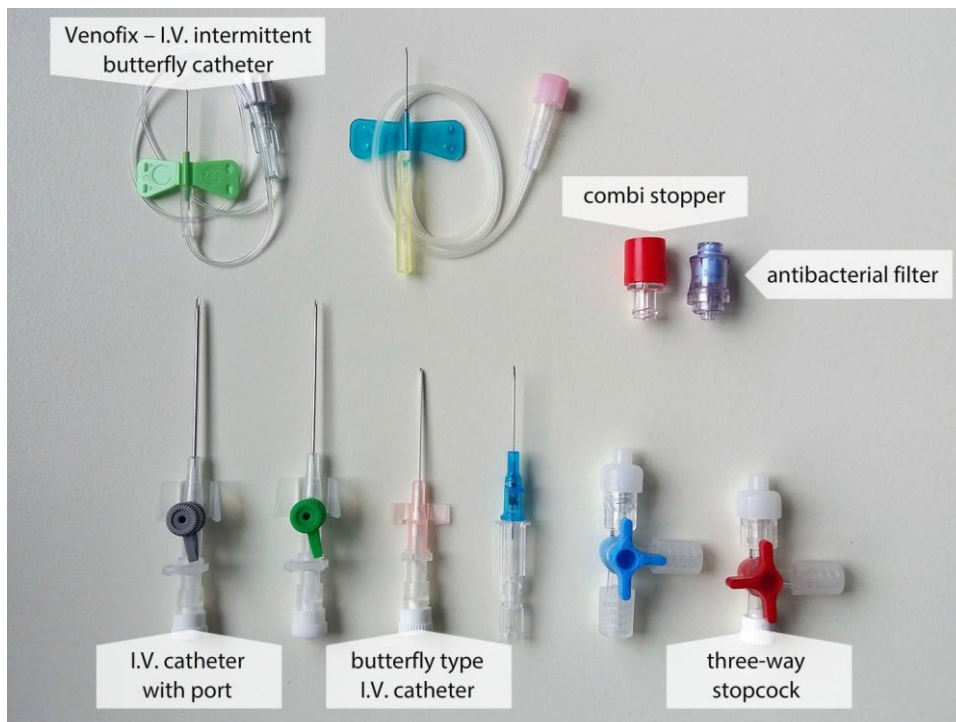
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Peripheral Venous Access Therapy

Most commonly used vascular access in medicine – an invasive procedure, when peripheral blood stream is available via peripheral venous catheter.

Purpose

- diagnostic – the application of a contrast agent
- therapeutic – intravenous administration of drugs and infusion solutions, parenteral nutrition, blood transfusion products and blood derivatives

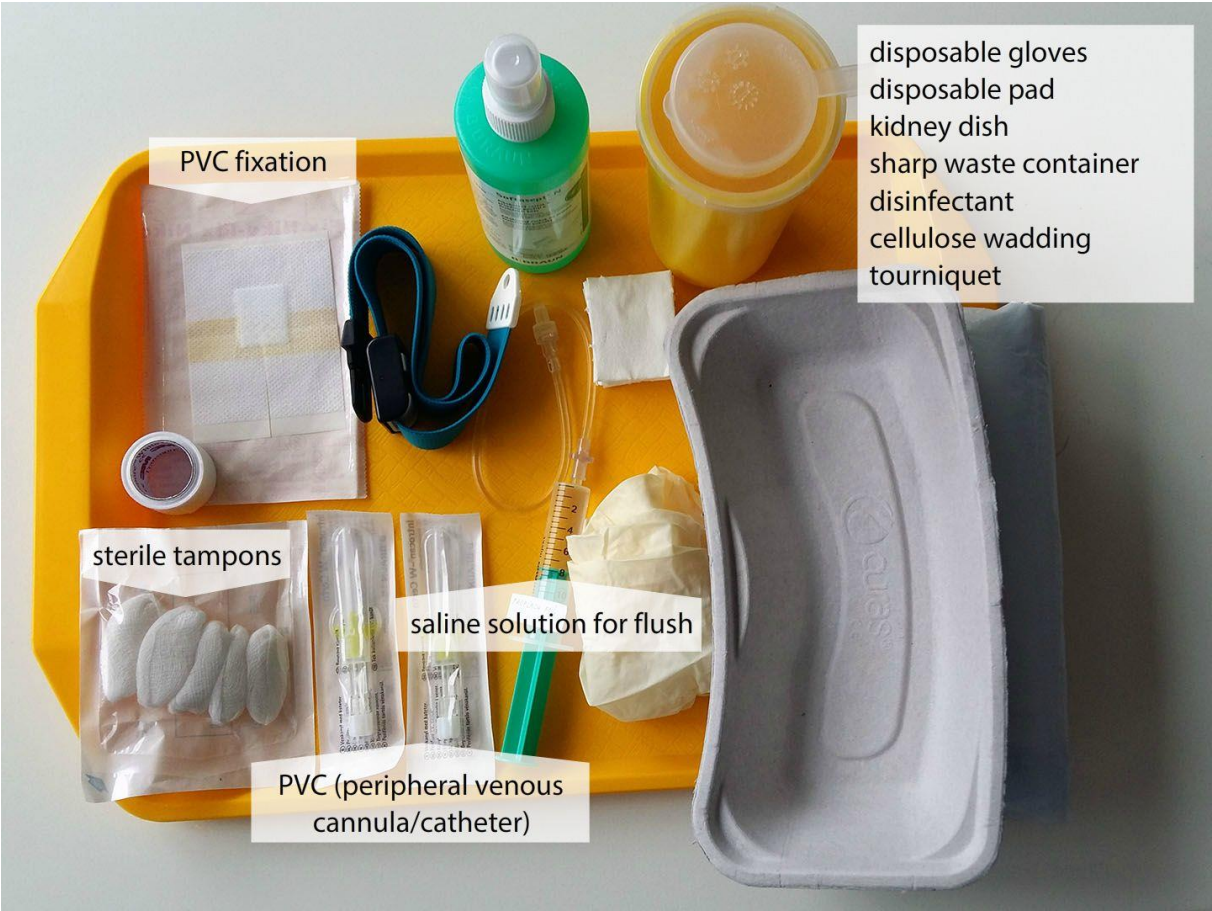


Types of peripheral vein cannulas (PVCs)



Types of peripheral venous catheter fixation

Peripheral venous catheter introduction



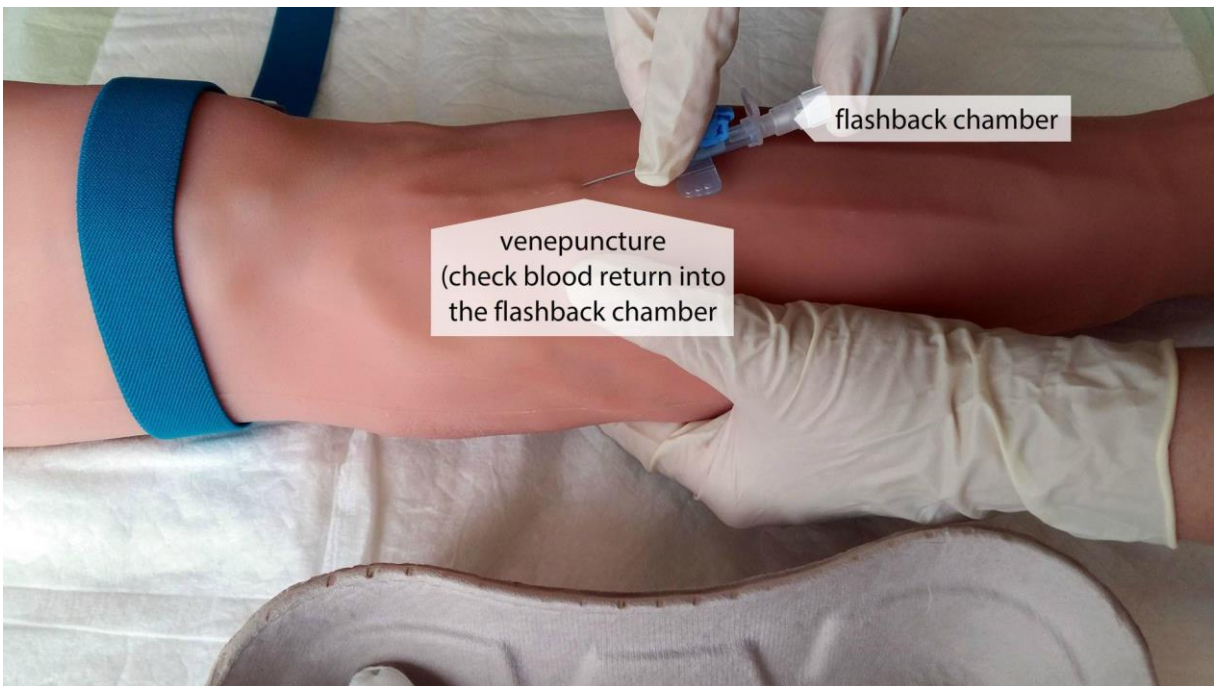
Equipment for introduction of peripheral venous catheter



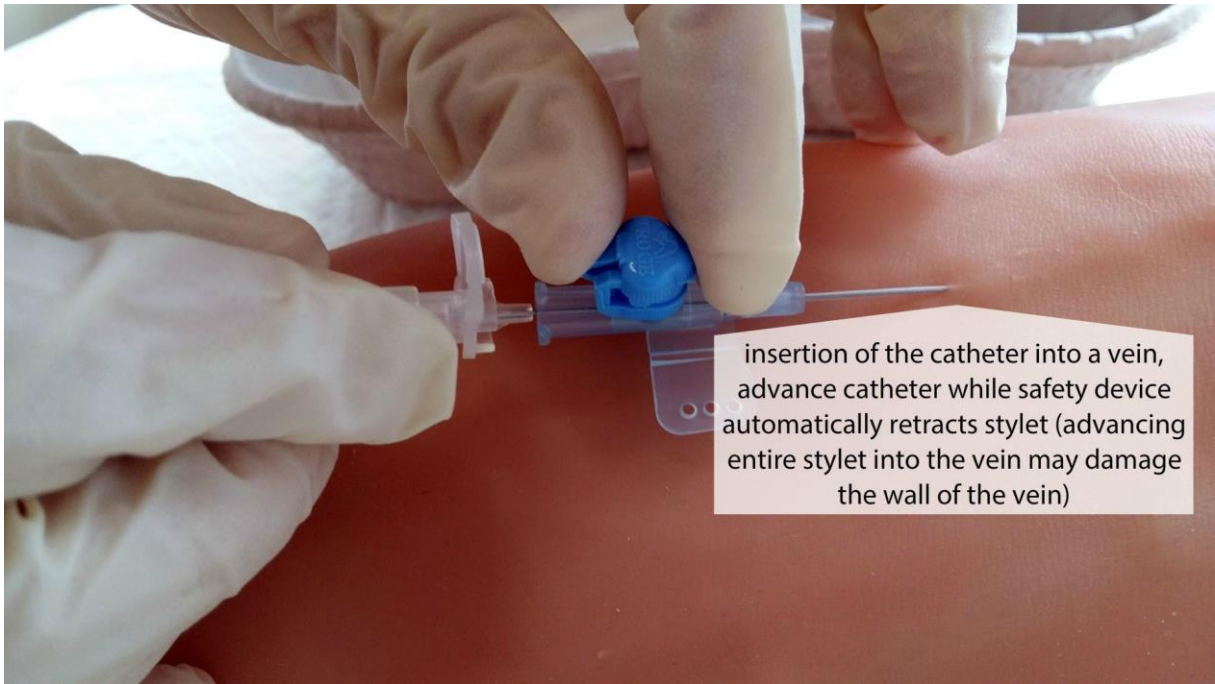
Palpitation of a suitable place to introduce a peripheral venous catheter



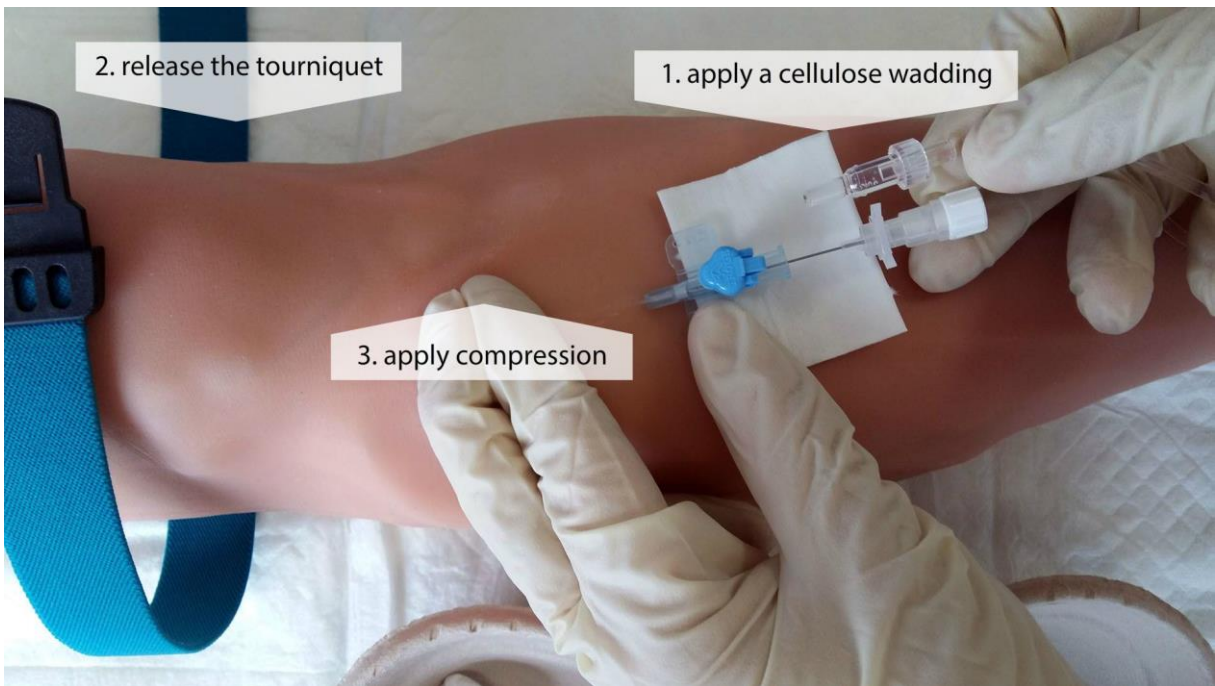
Disinfection of the application site



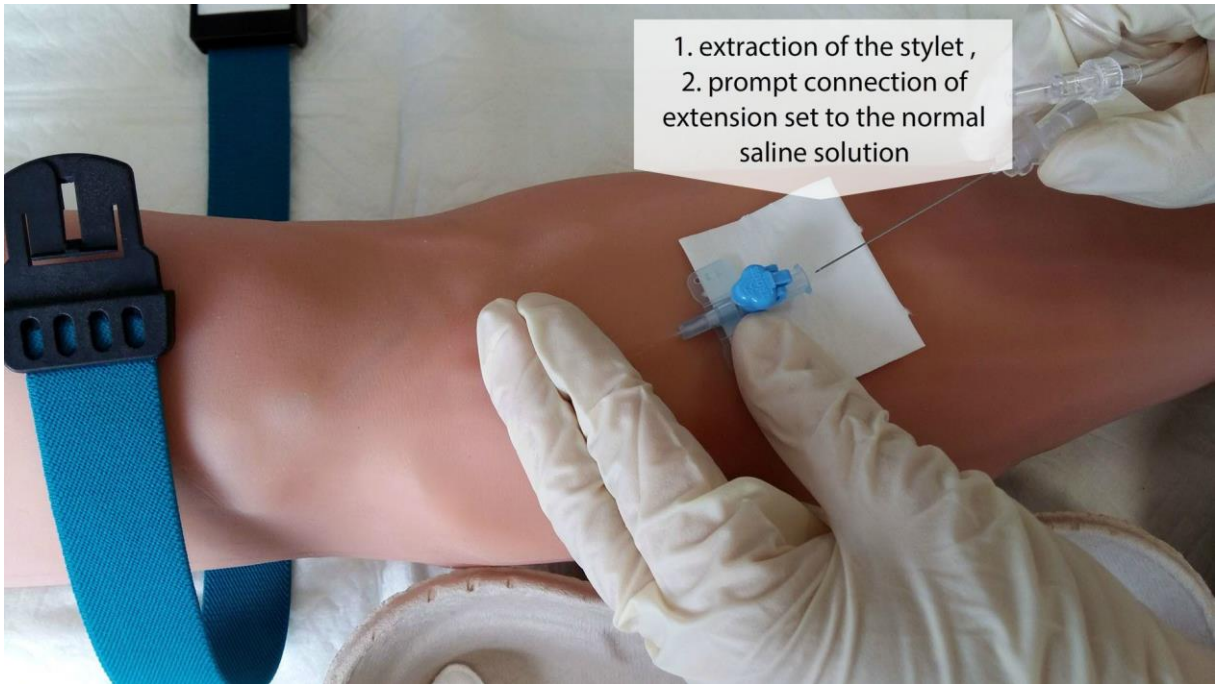
Introduction of peripheral venous cannula 1



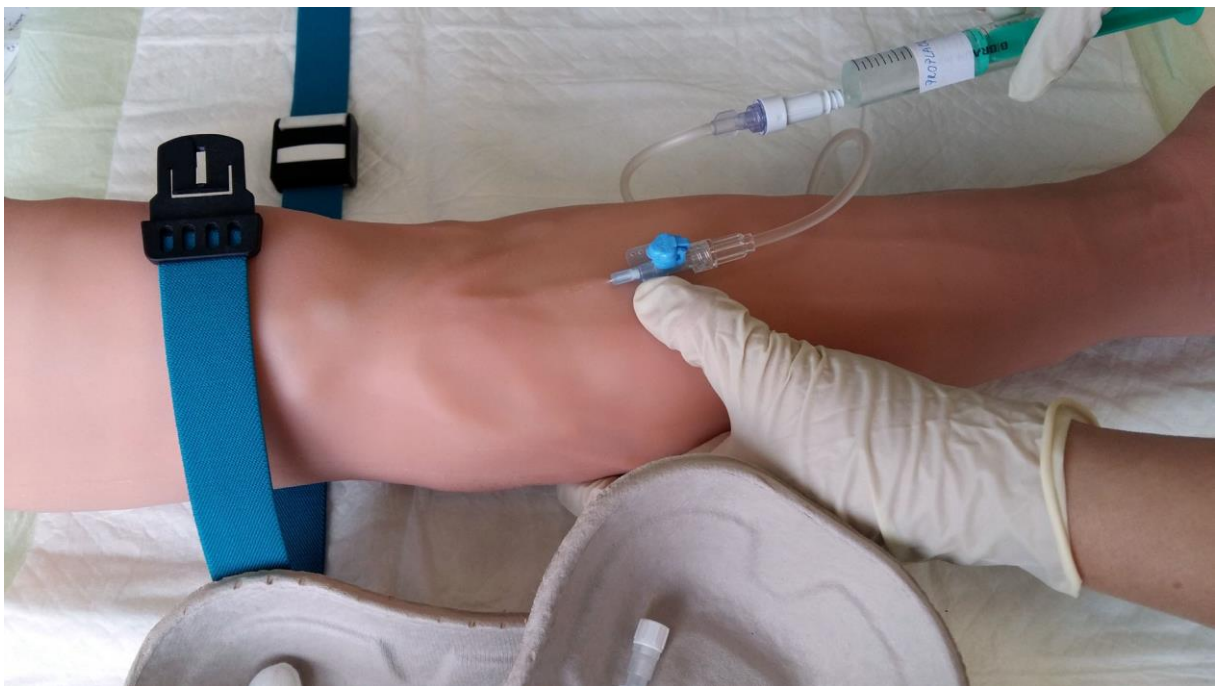
Introduction of peripheral venous cannula 2



Extraction of the stylet 1



Extraction of the stylet 2





Example of peripheral venous catheter fixation – mark the date of introduction of PVC, then record this in the documentation

Application of I.V. injection into the peripheral venous catheter



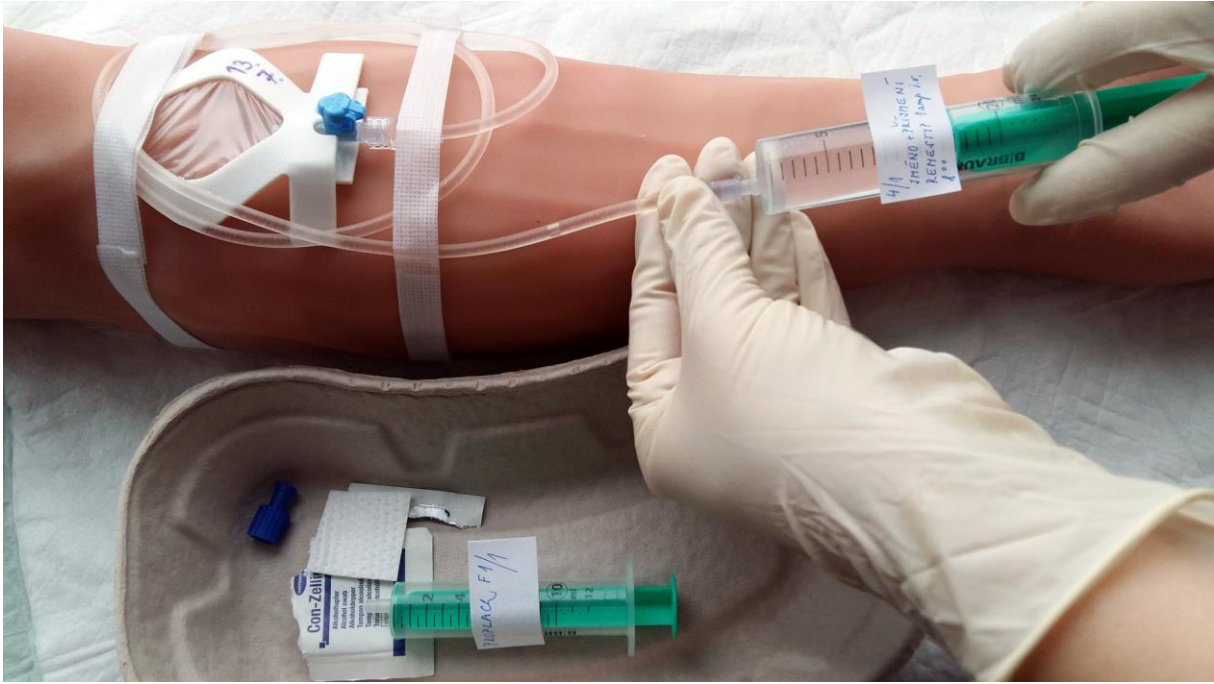
Disinfection of the end of the extension set with combi stopper



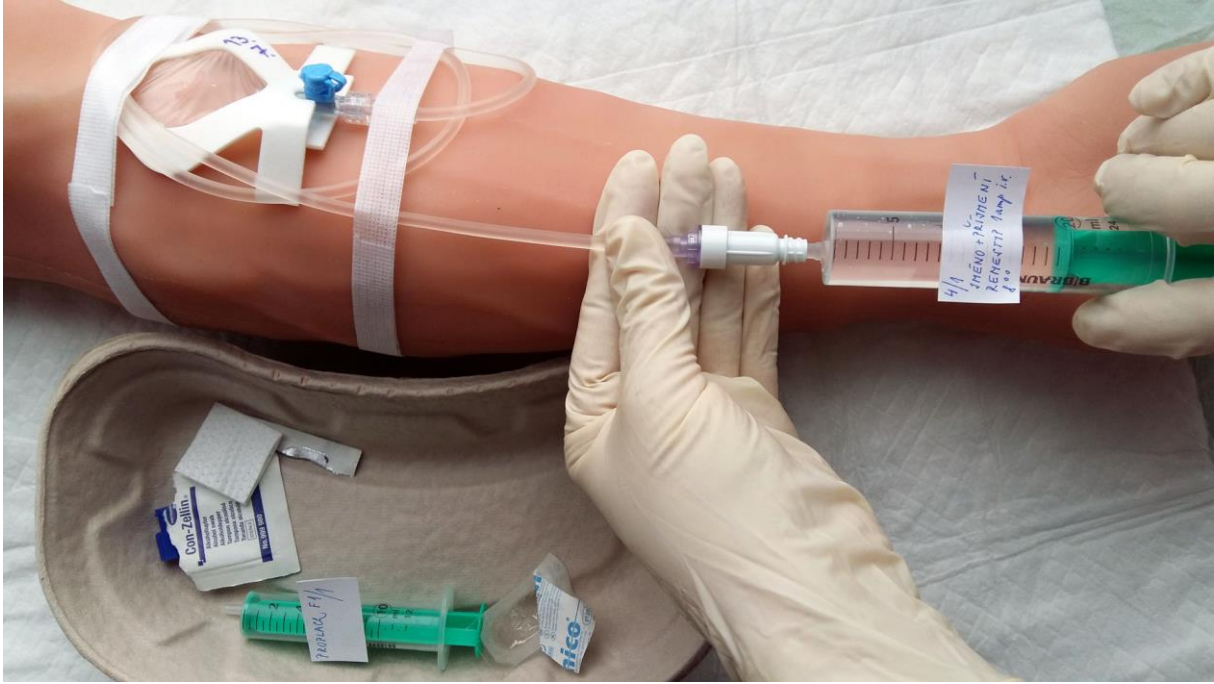
Kinking of extension set



Flush of the PVC with normal saline solution before intravenous drug administration



Intravenous administration of the drug to the peripheral venous catheter without antibacterial filter



Intravenous administration of the drug to the peripheral venous catheter with antibacterial filter



Flush of the PVC with normal saline solution after intravenous drug administration



Placing back the combi stopper

Hydration

- a basic human need
- hydration status evaluated by evaluating mucous membranes and skin, skin turgor, and the amount and density of urine
- sufficient oral intake of fluids (to assess the patient's self-sufficiency, to choose appropriate equipment enabling the intake of fluids, and to take into account the patient's limits), deliver the fluids parenterally if they cannot be taken orally
- suitable beverages – water, slightly mineralized mineral water, unsweetened light tea
- risk conditions for dehydration – children, seniors, diarrheal diseases, vomiting, fever, exposure to hot climate

Fluid balance monitoring

- following doctor's orders – fluid balance per time unit (e.g. 6 hours, 12 hours, 24 hours, ...)
- in the documentation you will see the abbreviation P/V (intake = input/output) or PVT (input/output = loss of fluids)
- need for well-balanced fluid intake and fluid loss, use of medicines according to the diagnosis and the health state of the patient (e.g. dehydration, pulmonary oedema)
- positive fluid balance = intake (P) > loss (V), negative fluid balance = P < V.
- accurate records must be kept of
 - fluid intake (exact volume of glasses, cups, etc.), soup and milk are counted, black coffee is not counted, the record is made after the entire content has been consumed; infusion solutions, blood transfusion products and blood derivatives are counted
 - fluid output (urine, drainage secretions, vomiting, gastric content derivation)
- if fluid balance is recorded by patient, thorough instruction is required; verification of understanding the instructions and control
- one 24-hour period of fluid balance monitoring is usually terminated at 6 a.m. and evaluated by a nurse performing night duty

Neglected hydration and oral cavity care in a hospitalized patient



Neglected hydration and oral cavity care in a hospitalized patient (1)



Neglected hydration and oral cavity care in a hospitalized patient (2)

Nutrition

- a basic human need

Nutritional status assessment

- anthropometrical examination (weight, height, BMI, waist circumference measurement, measurement of the circumference of the muscles on the non-dominant arm, measurement of skin fold thickness)
- biochemical markers – blood and urine examination
- clinical indicators – body constitution, symptoms of malnutrition, hydration status
- nutritional history – eating habits

Nutritional care

- provided by nutrition team, multidisciplinary team – dietitian, nurse, doctor, hospital attendant, health care assistant, hospital catering provider
- dietitian – performs nutritional diagnostics, solves nutritional problems, consults a doctor, suggests and evaluates nutritional measures
- nurse – recognizes, monitors and solves nutritional problems
- doctor – performs nutritional screening at admission, assesses nutritional status, orders dietary measures and solves nutritional problems
- hospital attendant, health care assistant – assists with food distribution, monitors food consumption
- food service – personalizes the diet according to the patient's needs

Dietary system

Diet

- Part of the treatment regime
- food individualized according to the doctor's orders
- requirements – food has energy and biological value, is harmless in hygienic-epidemiologic sense, and is tasty, diverse, warm, and aesthetically pleasing

Basic Diets

Diet number	Diet designation	Energy kJ	Indication
0	full – liquid	6 000	short-term administration; after oral cavity surgery; pharyngeal and oesophageal diseases, swallowing disorders; after tonsillectomy, jaw injuries or dental operations
1	pureed	9 500	chest and swallowing disorders (seniors, conditions after radiotherapy and chemotherapy); acute attack of gastric and duodenal ulcer disease; injuries and surgical procedures in oral cavity, throat or oesophagus

2	soft	9 500	gastric and duodenal diseases; after heart attack; skin diseases; allergies
3	regular	9 500	all foods, no restrictions
4	fat-modified	9 500	diseases of the liver, gallbladder and pancreas
5	low-residue	9 500	inflammatory bowel disease; intestinal surgery; diarrhoea after radiotherapy and chemotherapy
6	low-protein	9 500	kidney disease
8	slimming	5 300	overweight, obesity
9	diabetic (consistent carbohydrate diet)	individual	diabetes mellitus
10	low-sodium	9 500	hypertension; swelling; heart and blood vessel diseases
11	high-nutritional	12 000	malnutrition; cachexia; re-alimentation, convalescence; cancer; irradiation, polytrauma
12	toddler food (age 1–3 years)	7 000	normal diet, composition and consistency adjusted for the toddlers
13	children's food (age under 15)	9 500	normal diet, modified to children
14	selective diet	9 500	malnutrition; cachexia; mental anorexia, bulimia; selection of meals according to patient's wishes (provided by the nutrition therapist)

* diet No. 7 (low-cholesterol) – is no longer included in the dietary system as of 2008 (every diet should have low cholesterol content)

Special diets

Diet number	Diet designation	Indication
0-S	tea	tea in sips
1-S	liquid high-nutritional	chest and swallowing disorders + need of increased energy intake (seniors; conditions after radiotherapy and chemotherapy; injuries and surgical procedures in oral cavity, throat or oesophagus)
4-S	strict fat limitations	acute hepatitis; acute gallbladder inflammation; after cholecystitis; after cholecystectomy; after starving in pancreatitis
9-S	diabetic soft	diabetes mellitus with concomitant diseases of the digestive tract
W	warfarin	when treated with warfarin, diet with vitamin K excluded (no green leafy vegetables)
KVM	vanillylmandelic acid	when measuring vanillylmandelic acid content, fruits, vegetables and fruit juices are excluded

Standardized dietary procedures

Diet number	Diet designation	Indications
BLP	gluten-free	celiac disease; sprue
BL	lactose-free	lactose intolerance
P	pancreatic	gradual alimentation after pancreatitis
OK	occult bleeding diet before examination of occult (hidden) bleeding from GIT	

Enteral nutrition

- administration of pharmaceutically prepared nutritional products
- purpose – maintaining good nutritional status, improving nutritional status
- proper functioning of gastrointestinal tract is an essential precondition here

Methods of application

- sipping
- nourishment via the nasogastric feeding tube
- nourishment via naso-enteric feeding tube
- PEG – percutaneous endoscopic gastrostomy
- PEJ – percutaneous endoscopic jejunostomy
- feeding tube introduced surgically – jejunostomy, gastrostomy

Enteral Nutrition Products

- sipping products
- polymeric (high molecular weight) products
- polymeric modified products – modified for specific diseases
- oligomeric (low-molecular) products

Advantages

- stimulation of digestive tract motility and secretion of hormones and enzymes
- avoiding mucosal atrophy, maintaining a natural immunological barrier and bacterial balance
- lower costs than parenteral nutrition

Sipping

- the simplest form of enteral nutrition
- liquid products (Nutridrink, Diasip, Cubitan, Fresubin, etc.)
- products containing individual (single) nutrients or all components of nutrition

Principles

- explain to the patient the reasons for and the method of administration; patient drinks in small sips during the day – prevention of diarrhoea and nausea
- specially prepared sipping products – for a patient with non-healing wounds, oncological diseases, or dietary restrictions (Diasip for diabetes mellitus patients; Nutridrink Juice Style for fat-free nutrition; Nutridrink Multi Fibre for patients needing fibre, etc.)
- product temperature – according to the patient (colder sipping reduces nausea, promotes appetite)
- oncological patients during chemotherapy – alternate only two flavours to prevent aversion to flavours; useful in cases of nausea due to chemotherapy

Nasogastric tube (NG)

Provides nutrition

- nutritionally and chemically defined products are used
- a thin polyurethane or silicone tube is inserted
- Leave the tube inside for maximum 4–6 weeks; after 14 days a replacement or change of position is recommended to prevent pressure ulcers.

NG tube for gastric decompression

- inserting a thick PVC tube
- suction of stomach contents (monitoring the character and amount of secretions)
- gastric lavage in case of intoxication
- short-term (up to 7 days)
- NG tube positioning – prevention of pressure ulcers

Contraindications of NG tube use

- anatomical obstructions; acid burning of oesophagus; severe mucosal bleeding; risk of perforation of the oesophagus and stomach

Nasogastric tube insertion

- competence – general nurse without professional supervision, according to the doctor's indication, for conscious patients 10 years and older

1) Preparation of the patient

- semi-Fowler's (low Fowler's) position
- Blow the patient's nose.
- Assess nostril space.
- Remove and store dental prosthesis.
- Instruct the patient to breathe through the nose, swallow, then breathe out.



Preparing the patient for NG tube insertion



Equipment for NG tube insertion

*do not store the equipment in a kidney dish

2) Insertion of nasogastric tube

- position the patient – semi-Fowler's position – first have patient raise head, then after tube has passed through nasopharynx, have patient lower head. Patient takes a breath, then swallows (we advance the nasogastric tube during swallowing), then breathes out. Breathing and swallowing cycles to be repeated up to the indicated length on the NG tube). If the patient feels sick during insertion of NG tube, interrupt the procedure, let him/her take breath, make lessening the patient's anxiety a priority
- the correct length – from the xiphoid process of the sternum behind ear and to the tip of the nose, mark on the NG tube
- local anaesthesia – Mesocain gel
- NG tube can be stored in the freezer for approximately 30 minutes before insertion for easier insertion.



Insertion of NG tube

3) Verify the correct location

- auscultation – stethoscope on the xiphoid process of the sternum, inject 30 mL of air with Jeanette syringe – audible air bubbling
- Examine the pH of the aspirated gastric content by using pH indicators, physiological range 0–4; when introduced into the respiratory tract, the content has straw colour, pH 6–8.
- X-ray control

4) Details recorded in the documentation

Removal of the nasogastric tube

- on the basis of a doctor's orders
- undesired removal by the patient
- Before removal, clamp the NG tube according to the doctor's orders (e.g. one hour before removal or one day before; observe the patient – flatulence, belching, nausea, etc.).
- Insufflate 30 – 50 mL of air to prevent residue in NG tube.
- Instruct the patient – take a deep breath, hold breath, pull NG tube out.
- Record details in the documentation.



Removal of the nasogastric tube

Administering enteral nutrition

Bolus administration

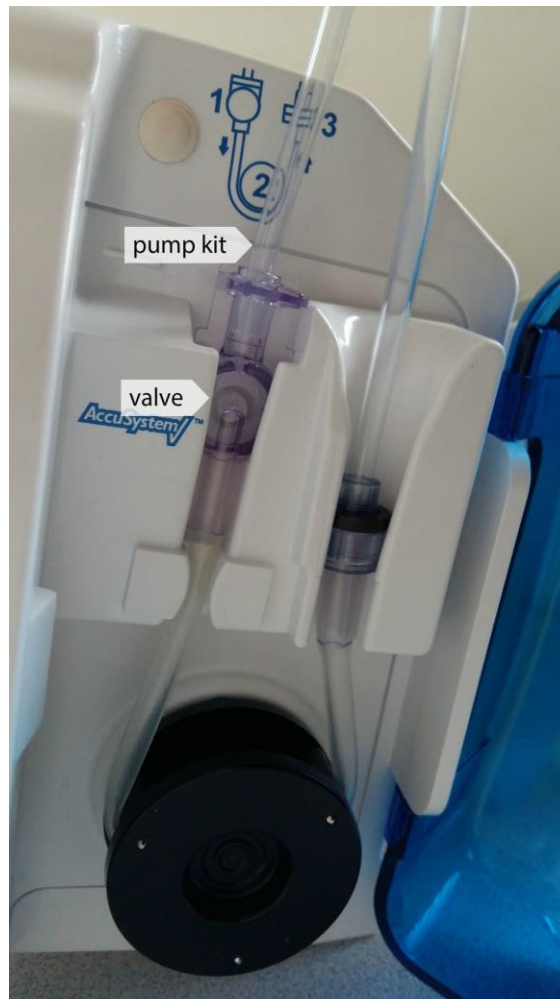
- between 6 am – 10 pm for 2–3 hours, Jeanette syringe, 150–300 mL of prescribed enteral formula
- overnight break
- room-temperature nutrition
- patient in semi-Fowler's position
- aspiration of the stomach content, over 100 mL skip the following dose, return the aspirated content back to the stomach (contains gastric juices)
- adequate speed and pressure of delivery
- Flush the tube with boiled water and close for 30 minutes, the patient should be in semi-Fowler's position after administration.

Continuous administration

- enteral pump (60–140 mL/hour)
- less risky (no risk of aspiration)
- overnight break



Enteral pump



Enteral pump – setting up the pump kit (pump kit, valve)

Nasojejunal tube (NJT)

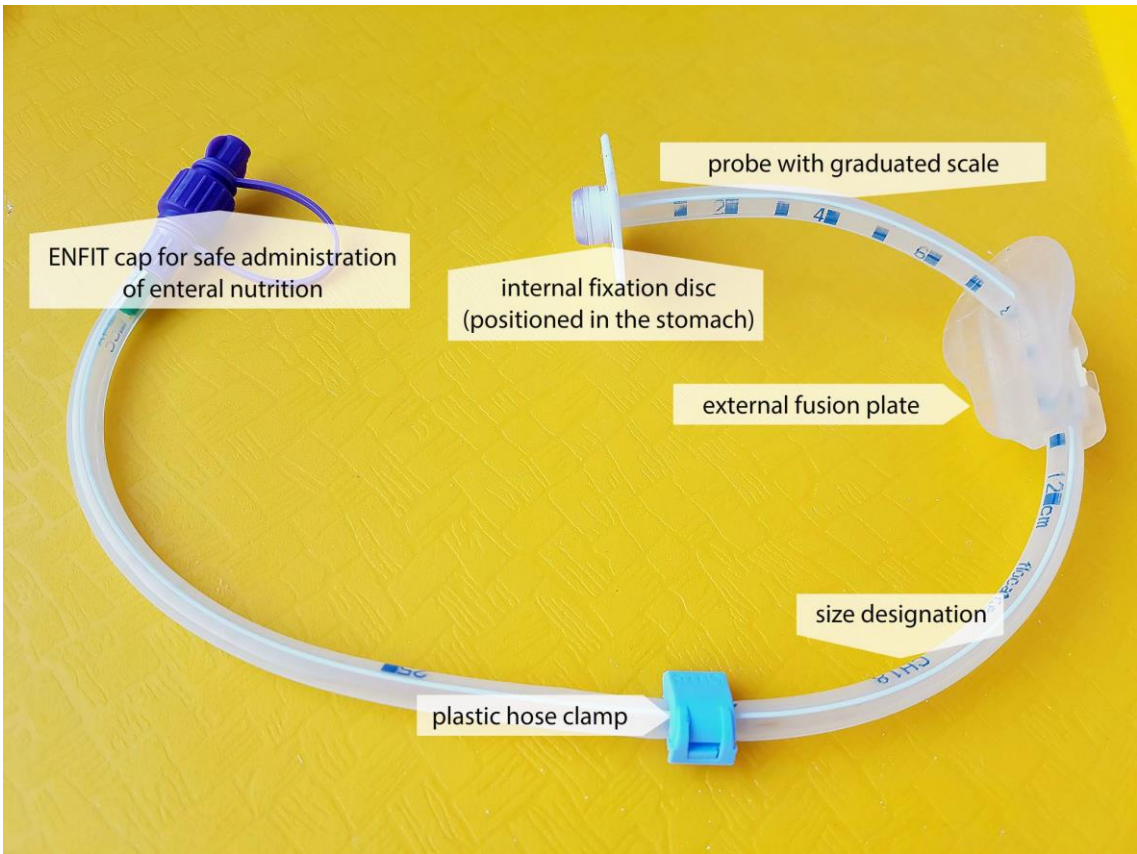
- nutrition to the jejunum under sterile conditions (reduced risk of regurgitation, vomiting, aspiration)
- pharmaceutical nutritive products, nutritionally and chemically defined (Fresubin, Nutrison, Isosource)
- feeding by a pump for enteral nutrition
- continuous 24-hour administration, or with an overnight break
- tube is flushed regularly with half-normal saline solution or sterile water (at least 20 mL three times a day, always when feeding is interrupted and always when it is started again)
- feeding may be provided for several months, even at home (by patient or relatives)
- inserted by a doctor with nurse assistance

Percutaneous endoscopic gastrostomy (PEG)

- insertion of tube into the stomach through the abdominal wall with use of endoscope
- for long-term enteral nutrition (over 6 weeks)
- feeding bolus or continuously (as with NGT)
- rebandaging of the wound, tube rotation
- feeding for several months can be provided at home (by patient or relatives)



PEG in the patient



Percutaneous endoscopic gastrostomy (PEG) – probe



Enteral nutrition product and set for enteral pumps



Enteral pump – accessories



Inserting set into enteral pump



Backpack for enteral pump – for transport and external use

Percutaneous endoscopic jejunostomy (PEJ)

- Insertion of the tube into the jejunum through the abdominal wall using an endoscope.
- nutrition into the jejunum under sterile conditions
- for long-term enteral nutrition (over 6 weeks)
- pharmaceutical nutritional products, nutritionally and chemically defined (Fresubin, Nutrison, Isosource)
- feeding by a pump for enteral nutrition
- continuous 24-hour administration, or with an overnight break
- the tube is flushed regularly with sterile half-normal saline or sterile water
- rebandaging of the wound
- feeding for several months, can be provided at home (by patient or relatives)

Parenteral nutrition

- method of delivering nutrients out of the digestive tract into the vascular system (directly into the bloodstream) – peripheral venous catheter, central venous catheter, venous port
- used for patients with dysfunctional digestive tract
- can be combined with enteral nutrition
- not a physiological route of nutrient administration

Purpose

- Ensuring the satisfactory nutritional state of the patient and the satisfactory state of his/her internal environment.

Methods of administration

To a peripheral vein

- short-term nutritional support
- risk of phlebitis
- solutions for hydration treatment (water, electrolytes)
- additional energetic intake – 5% Glucose
- supplementation of proteins and vitamins

To a central vein

- long-term nutritional support
- concentrated solutions without risk of phlebitis
- application to the subclavian vein
- application to the jugularis vein (end of the catheter in the superior vena cava)
- application to a venous port

Systems of administration

- multiple bottle system – single nutritional components in bottles (an obsolete system)
- all in one system – all nutritional components in one bag, the most frequently used

All-in-one bag

- bags prepared by manufacturer – the contents of the chambers are mixed just prior to the application
- bags prepared in the pharmacy according to the individual needs of the patient
- cyclically administered with an overnight break



All-in-one bag prepared by a manufacturer

Disadvantages of parenteral nutrition

- permanent venous access (risk of infection)
- unnatural way of eating (bypasses the digestive tract)
- risk of overdose
- impairment of the intestinal mucosa (atrophy, decrease in local immunity)
- high price

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Urinary and Bowel Elimination

- a basic human need
- equipment for urine and stool elimination (bedpan and urinal, bedside urinal holder, toilet wheelchair)

Assisting a patient in using a bedpan

Principles

- maintain privacy
- perform hygienic care after emptying (genital hygiene, hand hygiene, change personal and bed linen if needed)
- air out the room
- refrain from inappropriate comments
- do not put the bedpan on the floor, take it away covered with a lid, empty the contents of the bedpan, put it in a disinfectant/washer (1, 2)
- do not touch the clean laundry, patient's things, aids, handles, etc. wearing used gloves



Place bedpan under patient's hips



Maintain privacy during stool elimination on a bed

Urinary Catheterization

It is a placement of a sterile tube through the urethra into the bladder to drain urine.

Competence

- general nurse without professional supervision, according to the doctor's indication; for female patients the catheterization is performed by a nurse, for male patients only a nurse with intensive care specialization may do it.

Principles

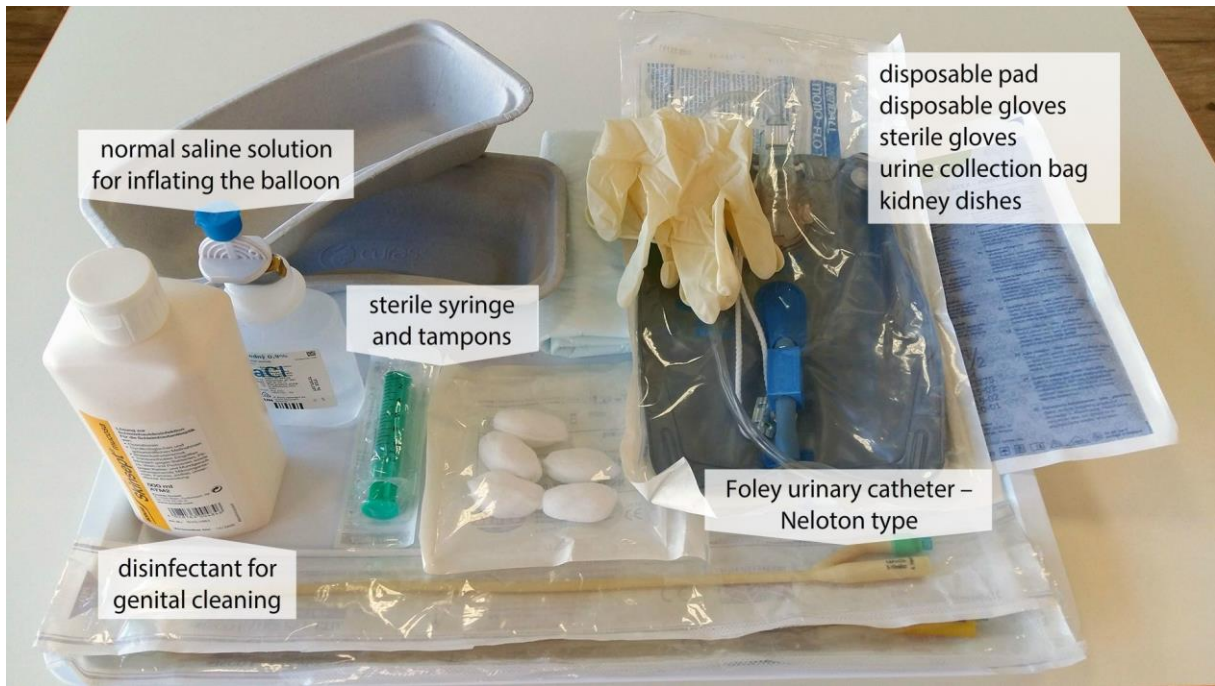
- aseptic procedure, disposable equipment
- proper insertion technique, proper manipulation of permanent urinary catheter (indwelling catheter, also known as Foley's catheter)



Equipment for one-time female catheterization



Equipment for one-time male catheterization



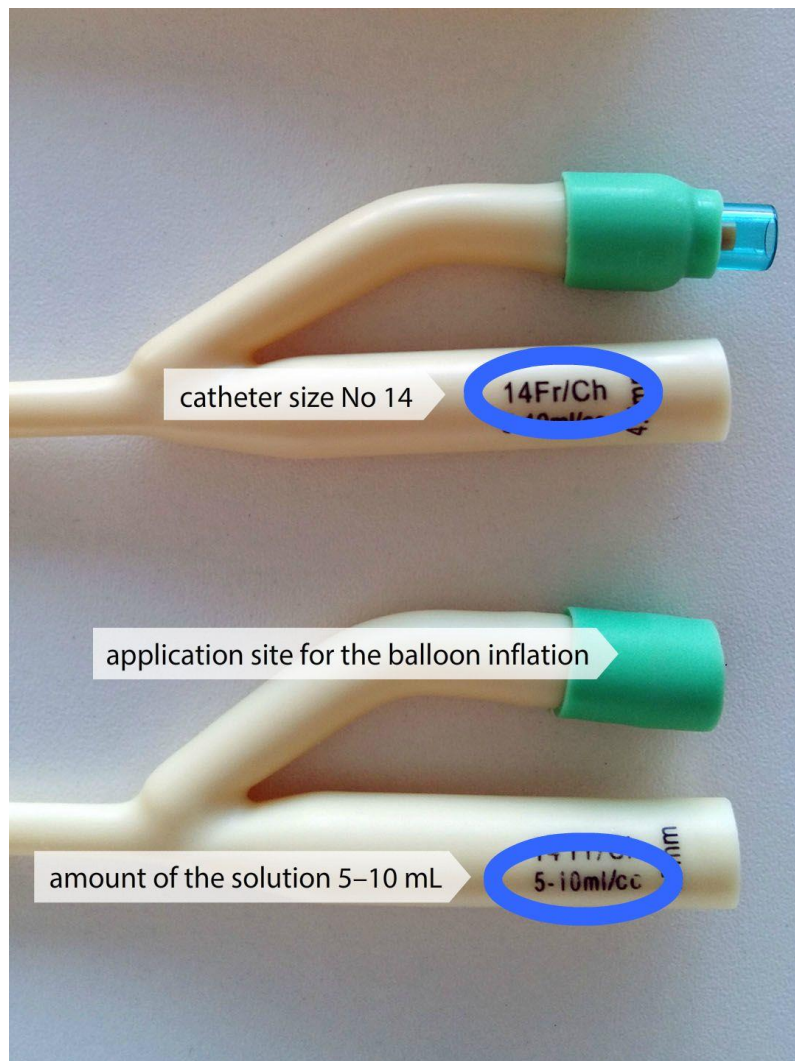
Equipment for inserting female permanent urinary catheter



Equipment for inserting male permanent urinary catheter

Urinary catheter size

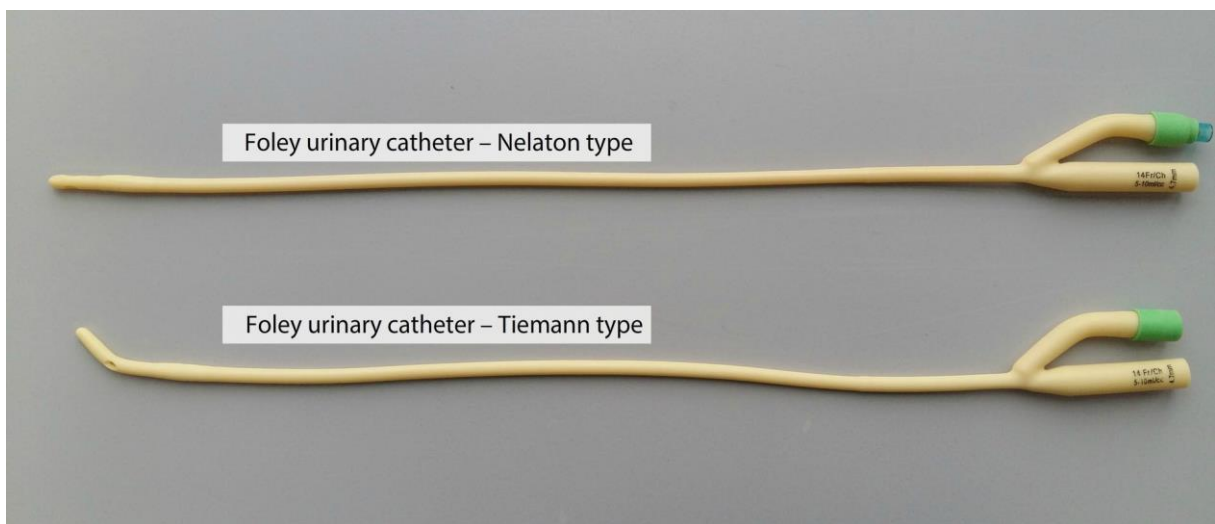
- size of urinary catheter is based on Charier (Ch) or French (Fr) scale – determines the size of the outer diameter of the catheter
- 1 Fr/Ch = catheter diameter 0.3 mm (the next size up is always 0.3 mm larger)
- size of the urinary catheter is chosen according to the body constitution, the most commonly used sizes are 14–18 Fr/Ch
- indication of disposable urinary catheters – the outer diameter and the catheter type are written on the package
- indications of permanent urinary catheters – indicate the size of the outer diameter, the amount of normal saline solution or water for injection determined for the locking balloon (secures catheter position in the bladder, prevents extraction)



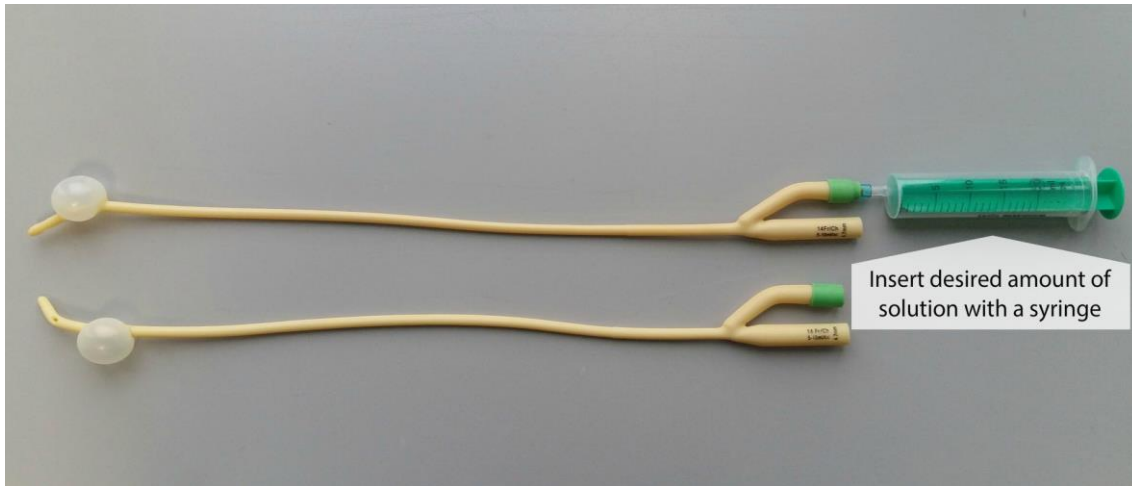
Indications on urinary catheters



Catheter types – original (sterile) package



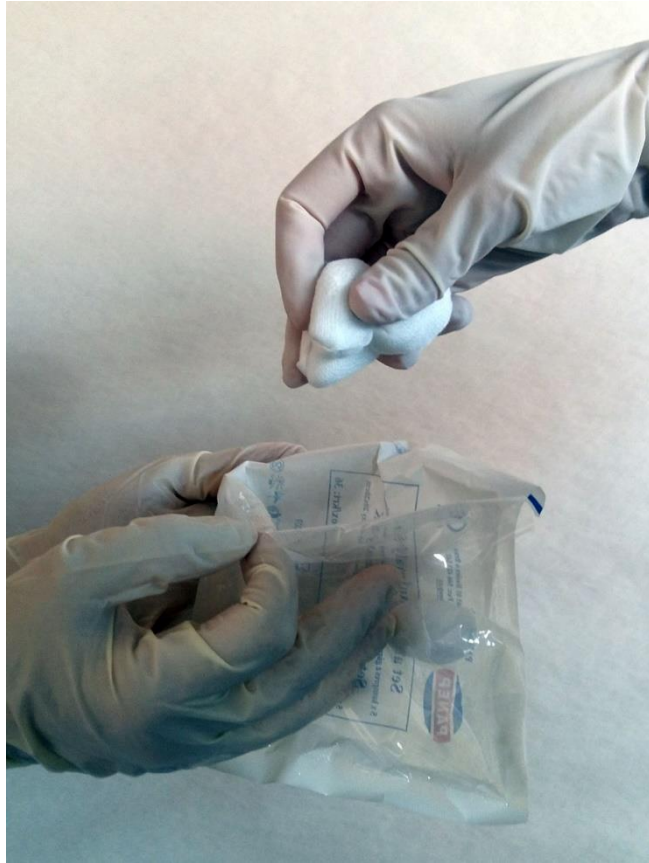
Types of catheters



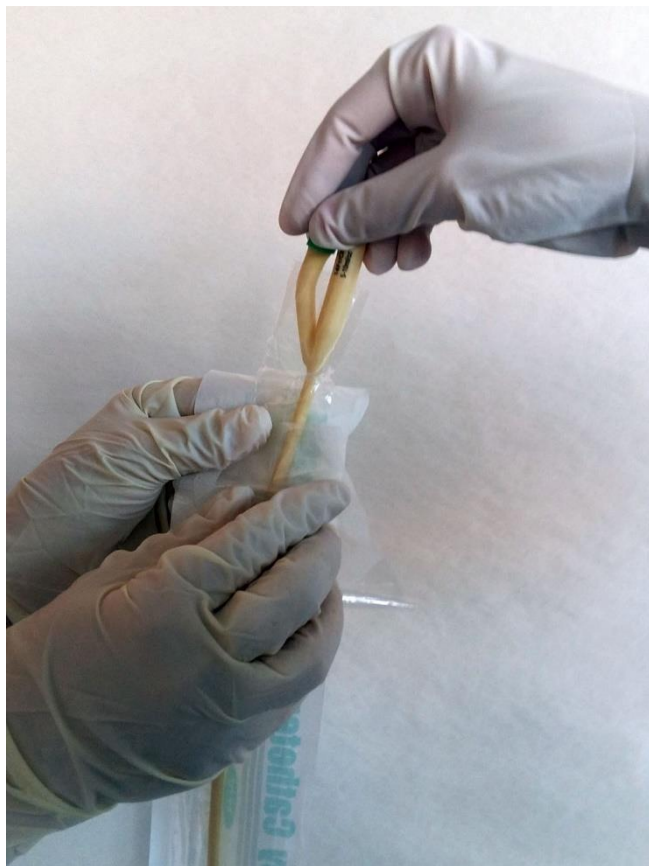
Obturator balloon (fixation of urinary catheter in urinary bladder)

Procedure for inserting a permanent (indwelling) urinary catheter

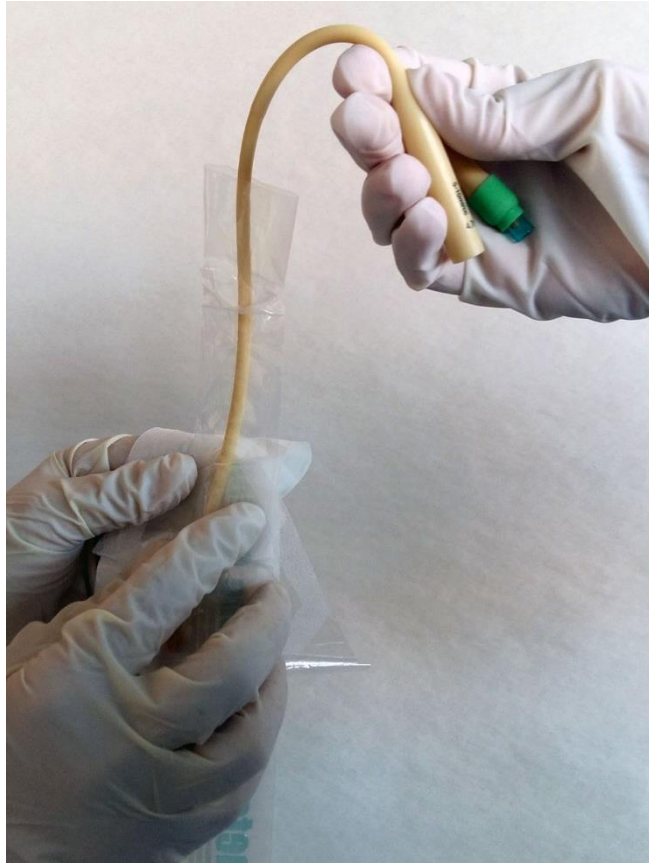
- Prepare equipment for insertion of urinary catheter.
- Explain the procedure to the patient – inform him/her about the procedure and post-intervention status, provide a suitable environment (protect privacy).
- Maintain aseptic conditions during the procedure.
- Provide patient care after the intervention.
- Record details in the documentation.
- sterile tweezers are sometimes used to insert a catheter into the male urethra
- mesocain or Instilla is used for local anaesthesia of the male urinary meatus



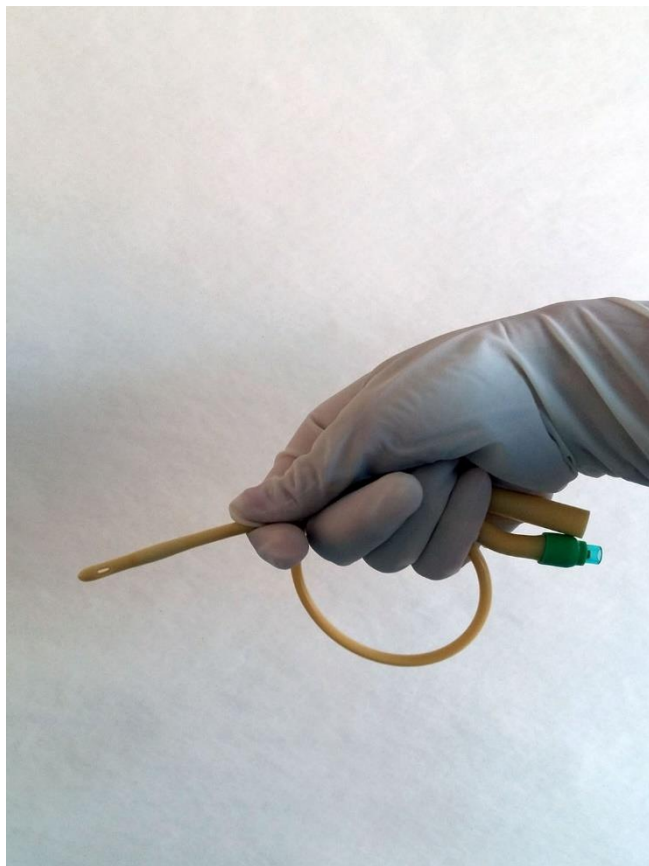
Pulling up sterile swabs to disinfect genitalia



Taking the urinary catheter out of the original package



Taking the urinary catheter out of the original package



Holding the urinary catheter



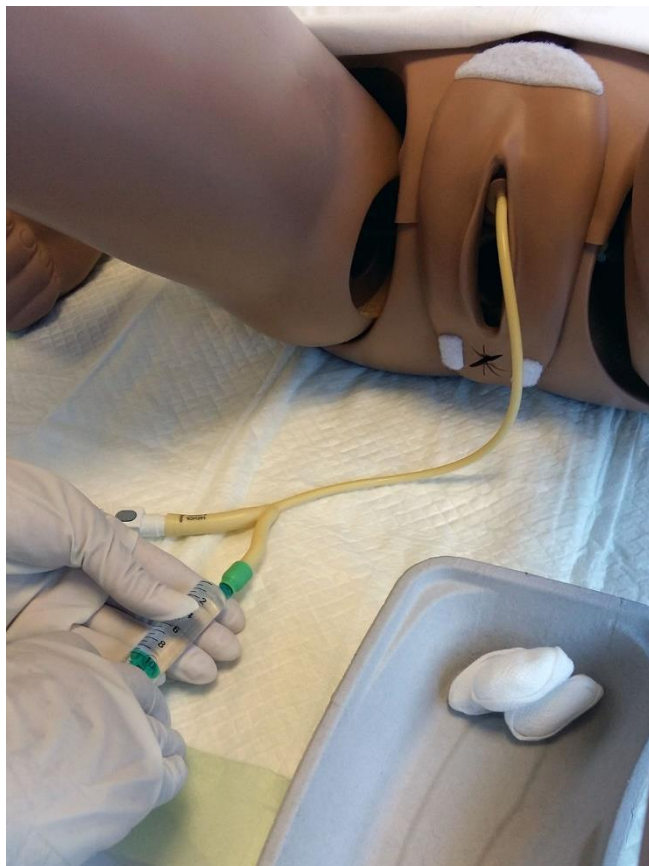
Application of Mesocain Gel to the male urinary catheter (before applying the gel to the catheter, squeeze approximately 1 cm of the gel out of the catheter; the applicator must not touch the catheter)



Disinfection of female genitals: from the left, from the right, through the centre (if the genitals are dirty, hygienic cleansing is necessary first)



Insertion of urinary catheter into female urinary meatus



Filling the obturator balloon with normal saline solution

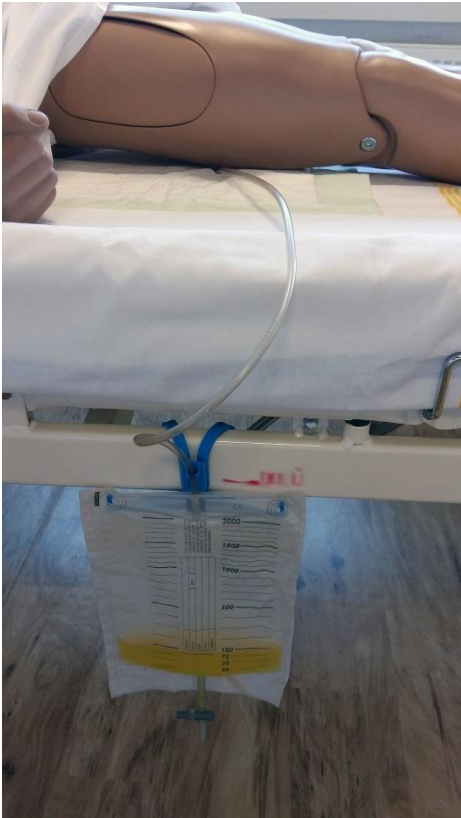


Types of urine collection bags

Manipulation of urine collection bag

- changing the urine collection bag – Follow a) Manufacturer's instructions and correct type of bag (special types for hourly diuresis measurement, bags with/without a drainage valve), b) department specifics
- Avoid disconnecting the urinary catheter and urine collection bag.
- Do not place on the floor or on the patient's body (belly, limbs); do not raise above bladder level (risk of urine backflow and contamination of the bladder); beware of clamping (bed, bed rails, patient's limb, etc.).
- catheter leads over the thigh

Examples of UNWANTED Manipulation of Urine Collection Bag



Inappropriate position – clamping the tube under the lower limb



Inappropriate position – clamping to bed assist rails



Inappropriate position – urine collection bag on the patient's belly



Inappropriate manipulation – above the bladder level, without gloves



Inappropriate position – urine collection bag on the floor

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