

Infusion therapy

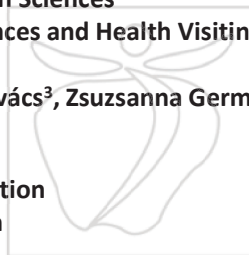
University of Pécs Faculty of Health Sciences
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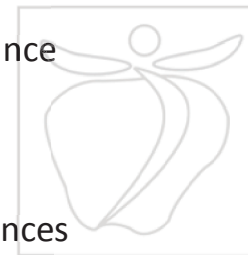
² assistant professor, deputy head of the institution

³ subject teacher



Purpose of the infusion therapy

- meeting and supplementation of the electrolyte, fluid need
- correction of the volume divergences (shock, dehydration)
- restoration of the acid-base balance
- nutrition
- correction of metabolic disturbances



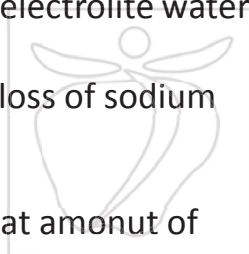
Exsiccosis (dehydration)

- Reduction of the volume of fluid spaces
- Tonicity, acid-base balance, disturbances in electrolyte composition

Hypotonic dehydration: loss of great amount of Na
i.e. diarrhoea, consumption of low electrolyte water

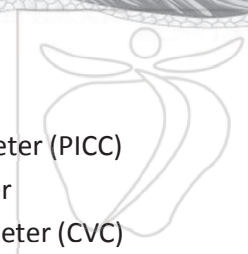
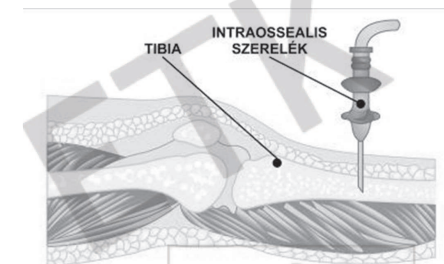
Isotonic dehydration: proportional loss of sodium and water

Hypertonic dehydration: loss of great amount of water (in heat), diabetes insipidus



Infusion therapy

- subcutaneous
- intraosseous
- intravenous (i.v.)
 - peripheral:
 - short catheter
 - midline catheter
 - central:
 - peripherally inserted central catheter (PICC)
 - tunneled central venous catheter
 - percutaneous central venous catheter (CVC)
 - implanted port



Infusion therapy

- indications
- length of the therapy
- (peripheral)veins' conditions
- general condition of the patient
- medications/solutions' features



Peripheral short cannula

indications:

- medication/fluid supplementation
- hypovolemia
- administering blood preparations

contraindications:

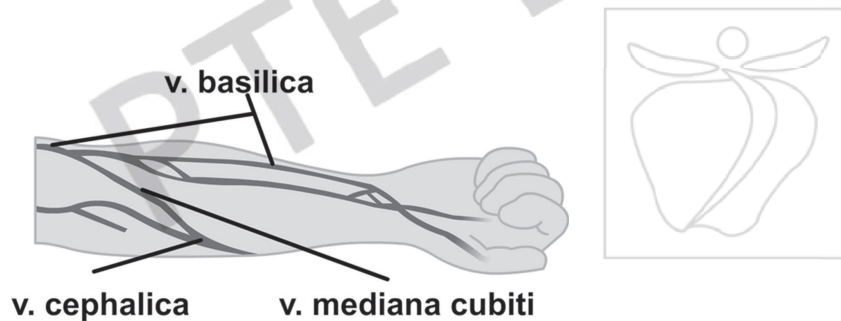
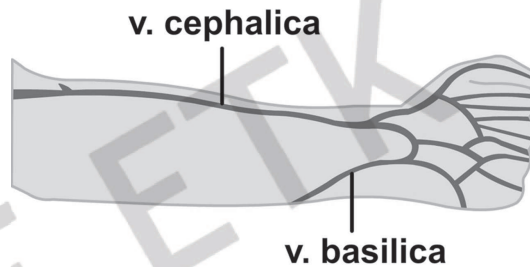
- injured, inflamed, burnt skin
- edematous limb
- venous thrombosis, obstruction



Peripheral short cannula

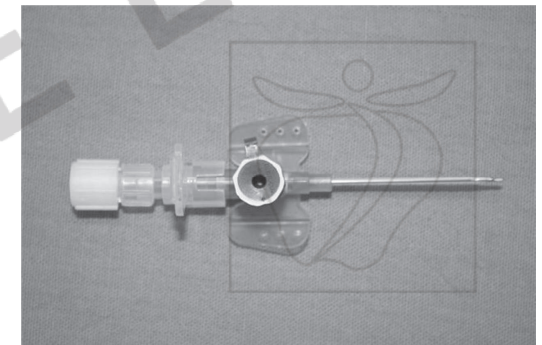
selection of vein:

- arm (not dominant)
- lower arm
- elbow bend
- upper arm



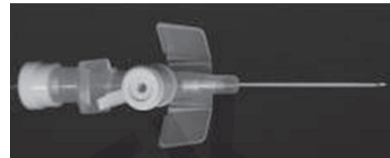
Peripheral short cannula

- its length is about 7.5cms (3 inches)
- 48-96 hours (average 72 hours vs. INS recommendation)
- isosmotic, pH 5-9
- different sizes
- types





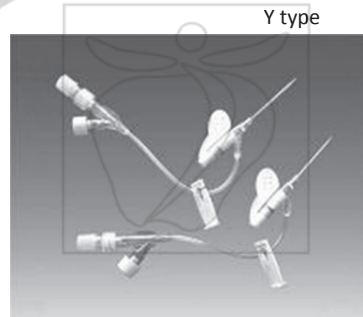
pen type



with injection port



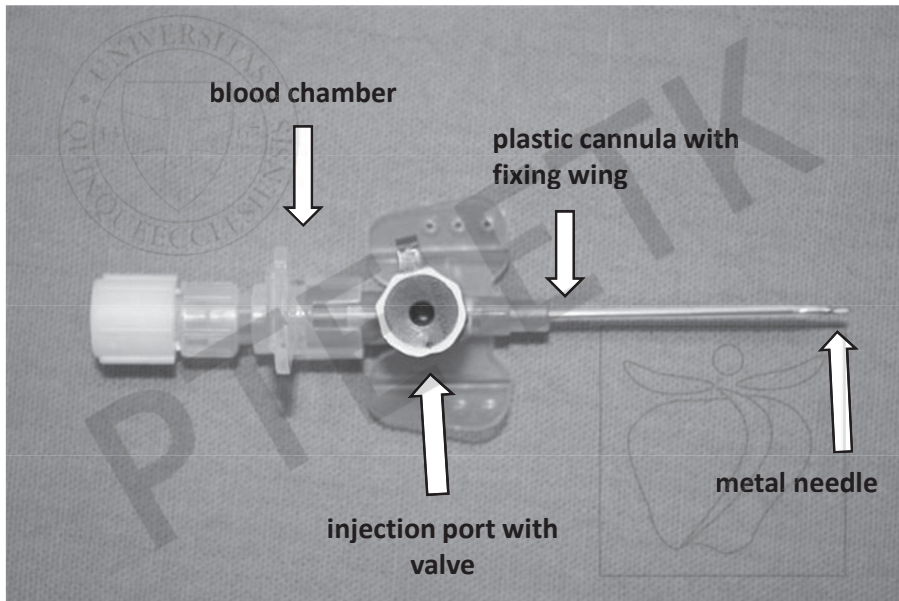
winged



Y type

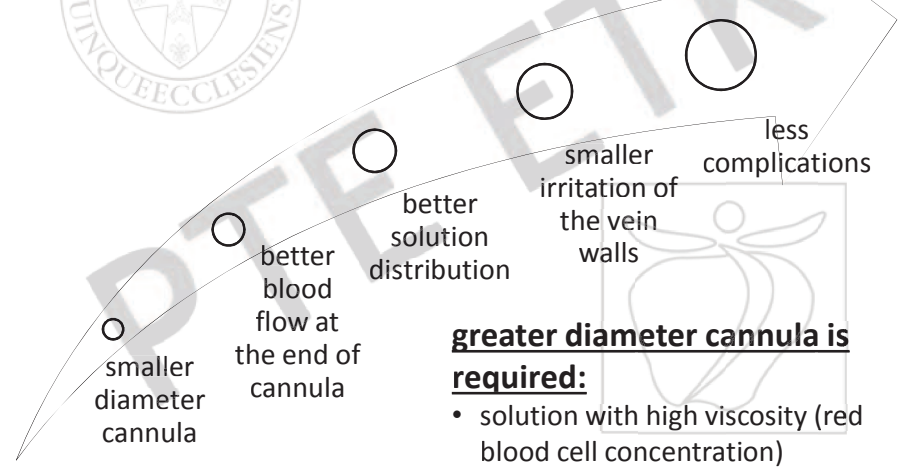
Peripheral short cannula sizes

24 G
22 G
20 G
18 G
17 G
16 G
14 G



NOT into small diameter vein

- preparations impairing vein
- hyperosmotic solutions

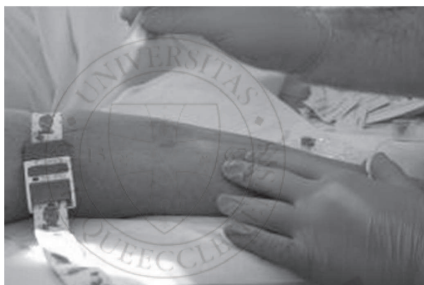
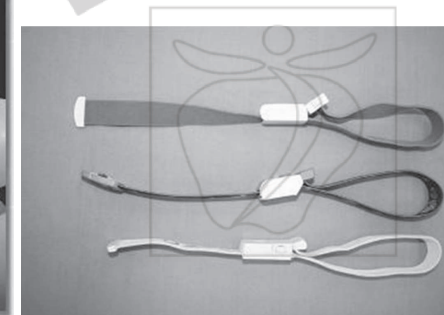


Insertion of short cannula

- peripheral cannula with the appropriate size
- gauze
- disinfectant
- sterile ball wipes
- disposable non-sterile gloves
- strangulator (tourniquet)
- physiological sodium solution in 2-5ml injection
- closing cap
- bed guard

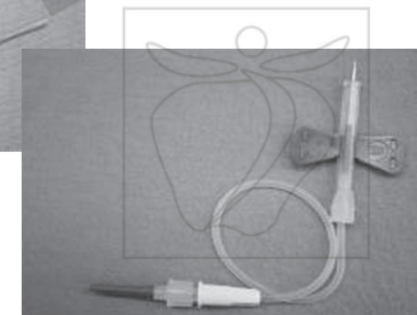


Insertion of short cannula



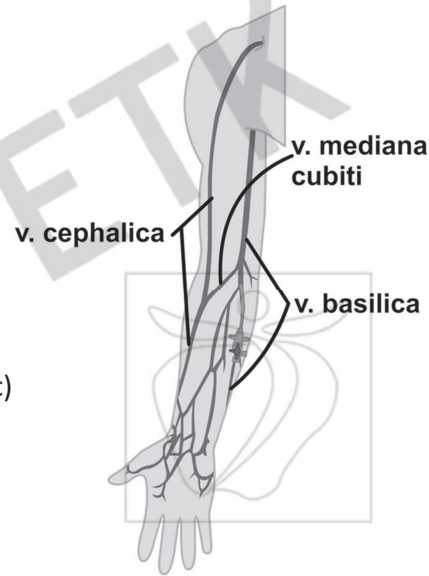
Alternative for peripheral short cannula

- winged needle

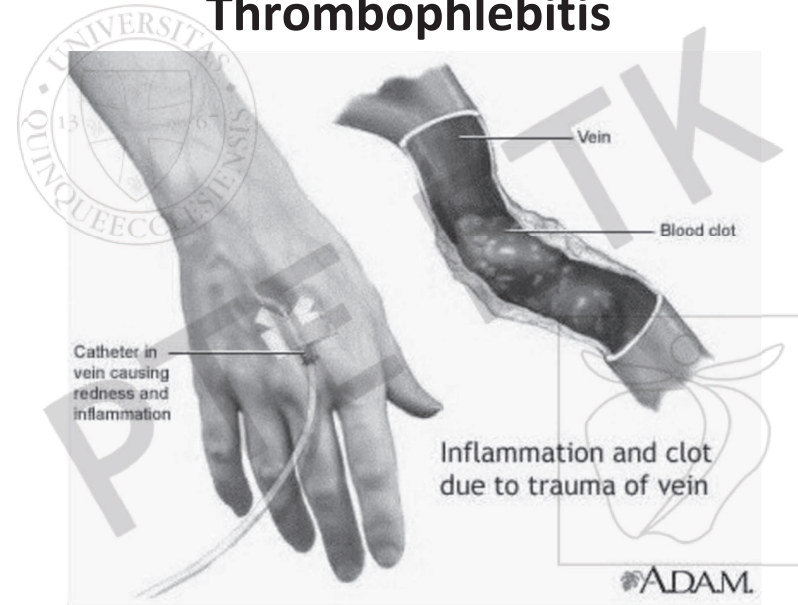


Complications

- Thrombophlebitis
- Extravasation
- Infiltration
- Infection
- Perforation of the vein, bleeding
- Thrombus formation
- Aeroembolism
- Accidental artery puncture
- Occlusion (thrombotic, mechanic)
- Overloaded circulation
- Allergic reaction



Thrombophlebitis



Thrombophlebitis

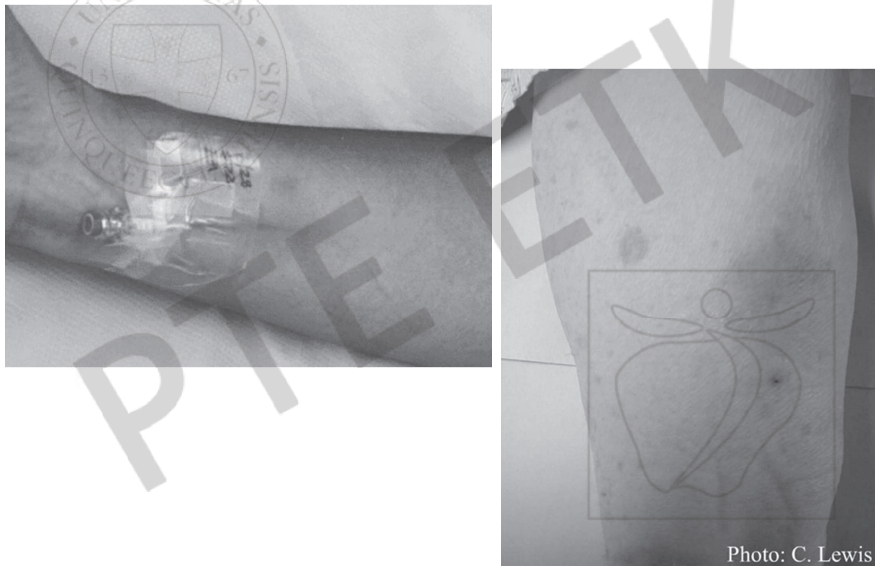
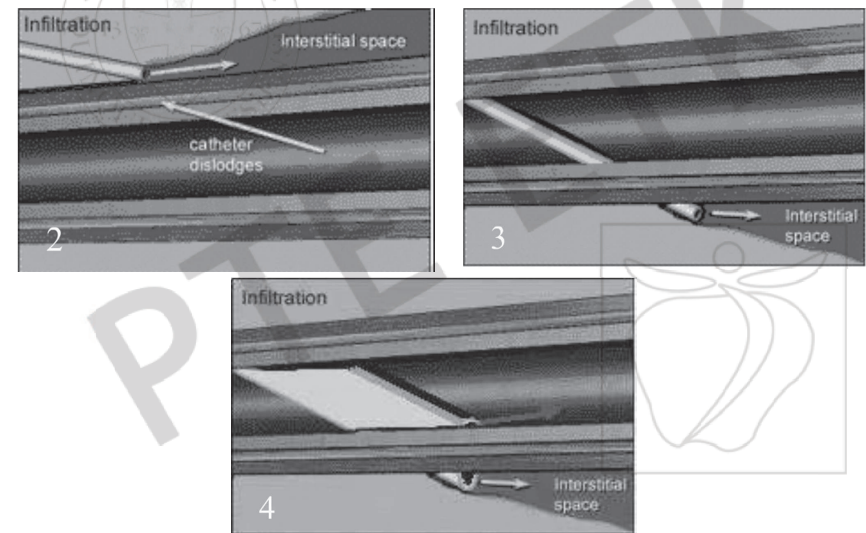


Photo: C. Lewis

Extravasation/Infiltration



Extravasatio/Infiltráció



Prevention of complications

- rules for sepsis/antisepsis
- reduction of the friction of cannula to the vein
- application of the appropriate solutions
- signs of inflammation-change of cannula to the other side
- change of cannula (72 hours)
- insertion-where is no flexion
- the smallest is the even appropriate cannula
- application of in-line filters
- change of bandages
- change of infusion equipment (72 – 96 hours)

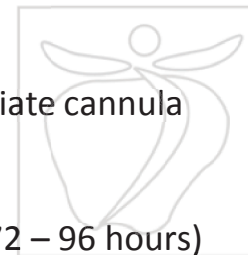
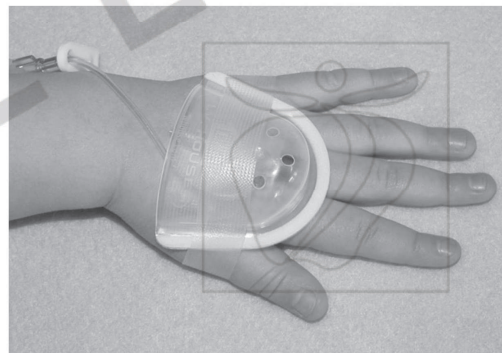


Figure 17-8 ■ I.V. House protective device. (Courtesy I.V. House, St. Louis, Mo.)



Needlestick accidents

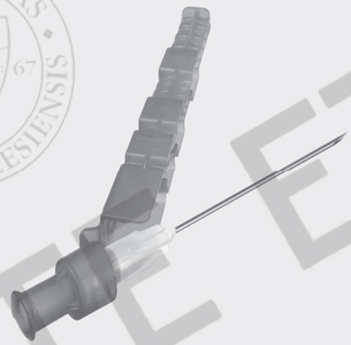
In Europe:

- 1.000.000/year

Security system – goals:

- reduction of needlestick accidents
- prevention of bloodflow infections
- no need to change the habitual action
- 2010/32 EU directive
- active and passive techniques

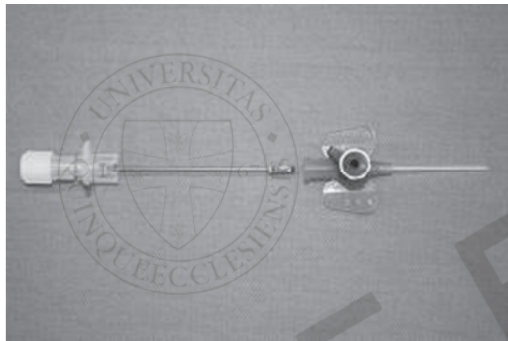




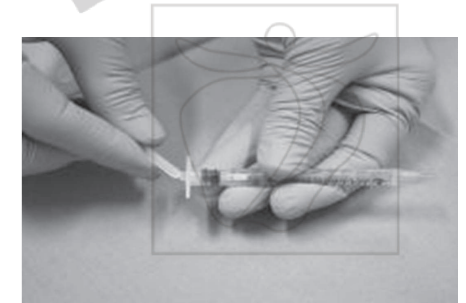
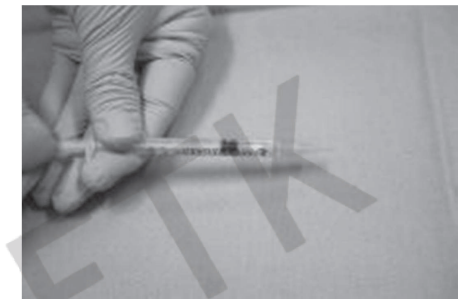
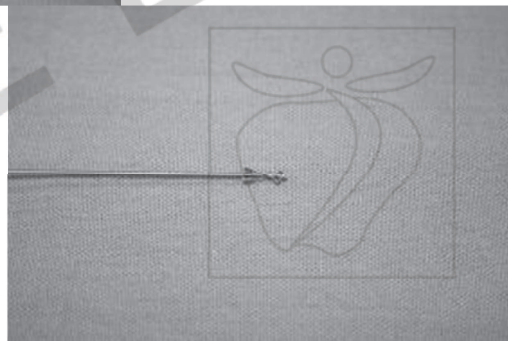
Active
according to some studies: refusal
accounts for 90%

Safety needles

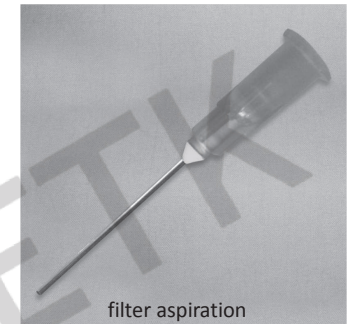
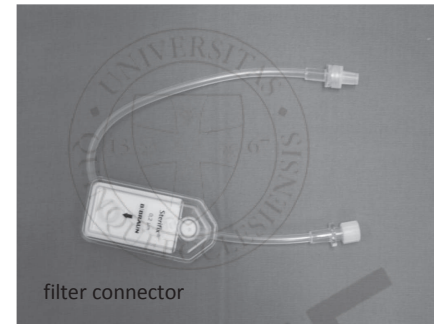
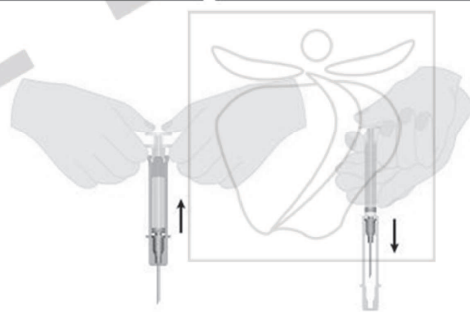
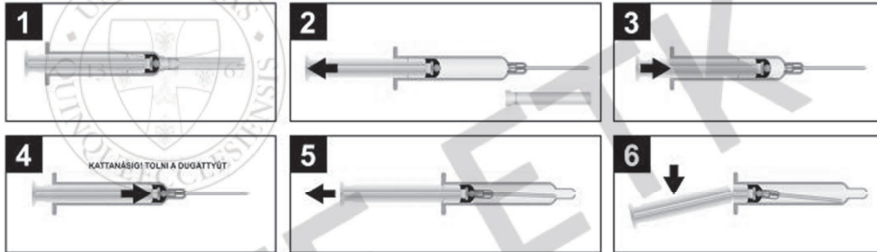
- not connected in advance



passive

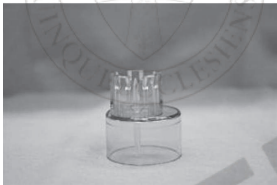


Safety Syringe



Infusion therapy Accessories

- Transfer cap



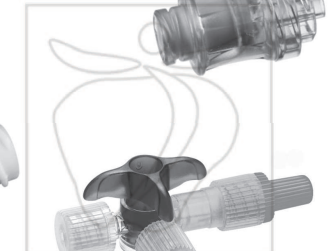
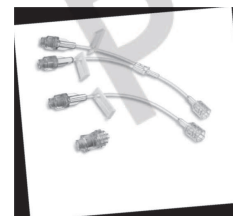
- Spyke



Infusion therapy Accessories

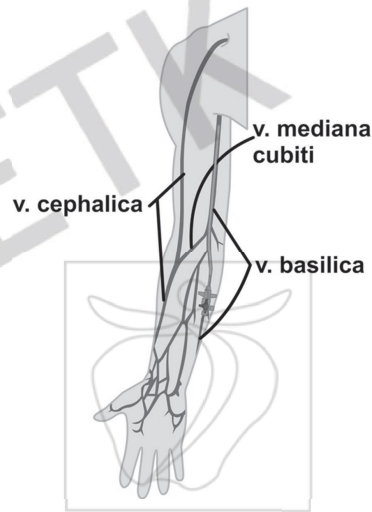
needle free connectors

- i.v. connectors („T” and „Y” connectors)
- venting/disinfect before use



Midline catheter

- 7.5-25 cms
- one month
- do not reach the axillary line
- advantages:
 - reduction of the risk of phlebitis
 - there is no arrhythmia
 - no need for x-ray
- solutions as short cannula



Midline catheter - contraindications

- diseases (paralysis, lymphedema) associated with reduced venous back-flow
- orthopedical and neurological diseases related to limbs
- dialysis graft- (chimino shunt)
- hypercoagulopathy



Insertion of midline catheter

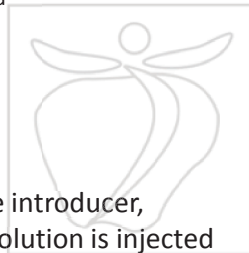
Means:

- Midline catheter with the appropriate size and length
- gauze
- disinfectant
- sterile ball wipes
- disposable non-sterile gloves
- nose-mouth mask
- protective jacket
- physiological sodium solution

- injections (20ml)
- drawing needle
- closing cap, three-way tap
- strangulator
- physiological sodium solution in 2-5ml injection
- closing cap
- bed guard

Special aspects:

Cannula is pushed slowly forward through the introducer, meanwhile alternately physiological sodium solution is injected and drawn back.



Peripherally inserted central catheter (PICC)

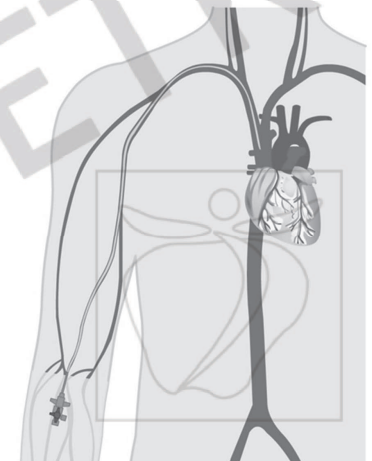
- longer than midline
- fewer complications with C.V. puncture

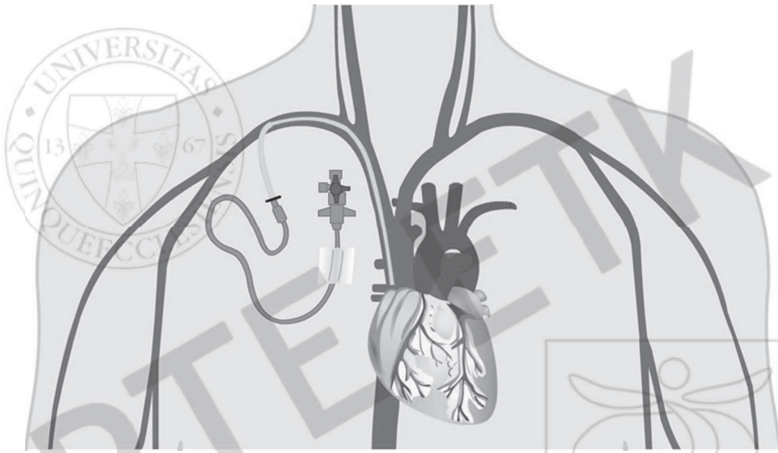
Indications:

- Over 6 days, even a year
- Frequent venous access
- Composition of solution

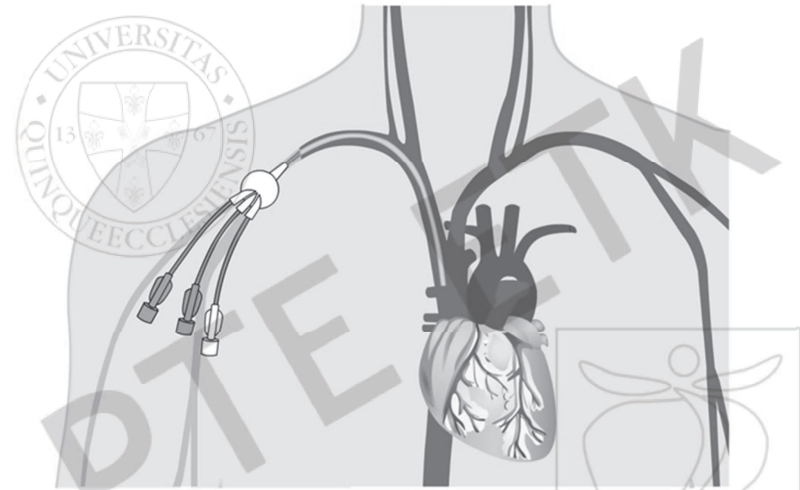
Complications:

- Vein wall rupture
- Bleeding
- Obstruction of catheter
- Thrombosis
- Phlebitis
- Catheter infection



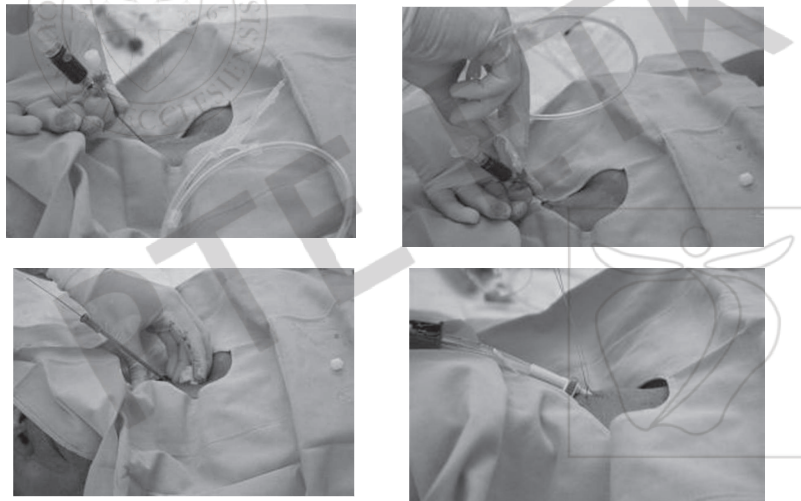


Tunneled Central Venous Catheter

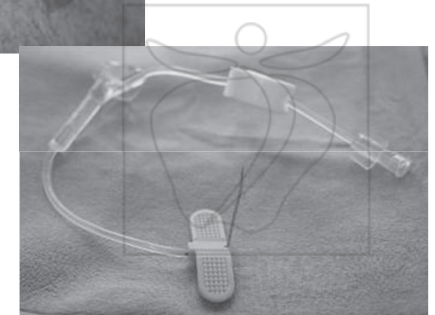


Percutaneous Non-Tunneled Central Venous Catheter (CVC)

Insertion of the CVC



Implanted Port

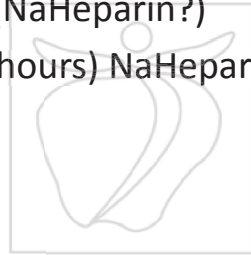


Huber needle

Rinse

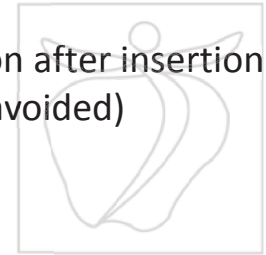
the amount of fluid for rinse is more than that of cannula

- medication/infusion/ after transfusion with physiological sodium solution (NaHeparin?)
- out of use-twice daily (in 8-12 hours) NaHeparin rinse
- midline/PICC/CV – min. 10 ml



Bandage exchange

- transparent bandage- in a week
- simple gauze sheet- in 24 (48) hours
- contamination/wetting/loosening – ALWAYS
- out-patients: from 7-10 days on after insertion shower, bath (water must be avoided)



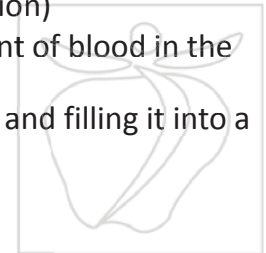
Antibiotic lock (CVC)

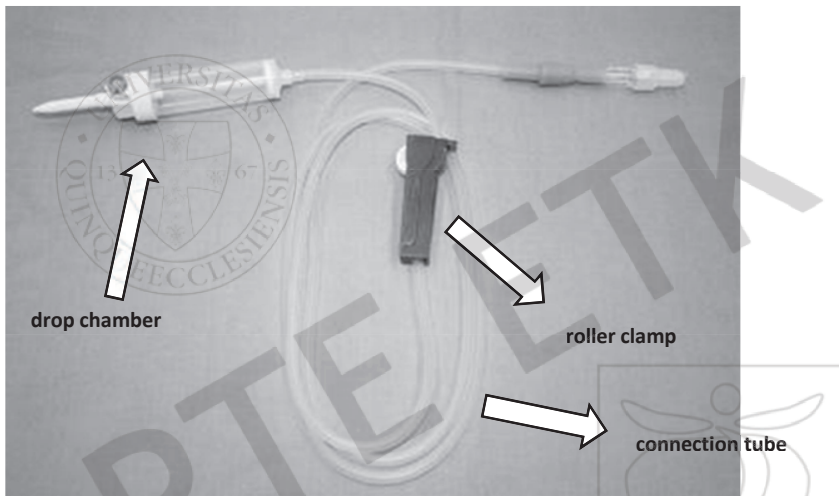
- in case of colonization for closing CV catheter
- filling cannula stem with antibiotic liquid (for the prescribed period - a few days)
- most of the time: Vancomycin, Gentamicin



Drawing blood from CVC

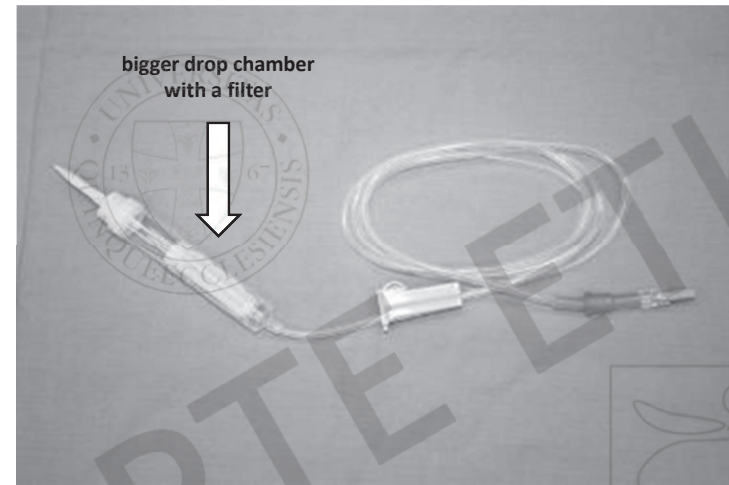
- stopping medication/ infusion 1 min. at least before intervention
- disinfection of cannula end and stem
- sampling from the max. diameter stem (injection, Vacutainer)
- rinse of cannula stem (sodium solution)
- drawing back three times the amount of blood in the cannula stem with syringe
- drawing blood with another syringe and filling it into a test tube
- rinse the cannula



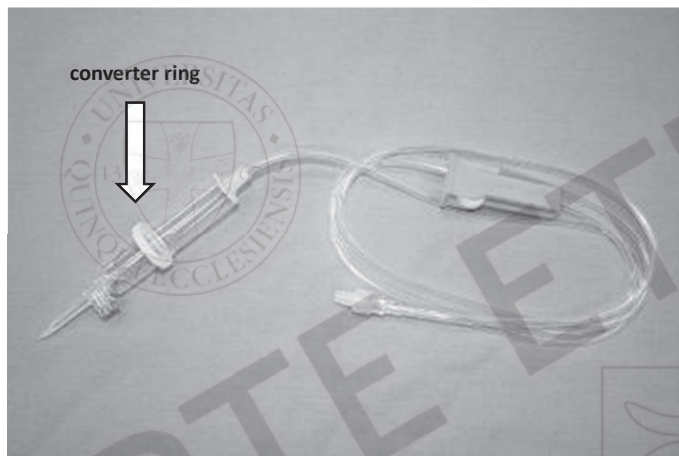


Standard infusion tubing

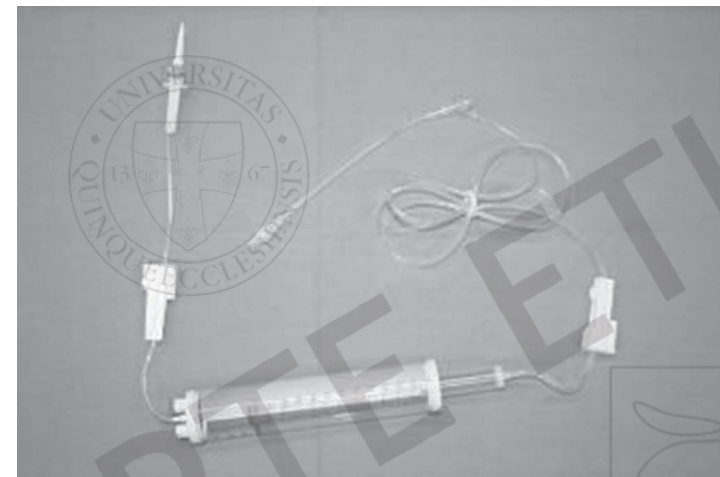
- controlled by gravity
- the drop chamber filters the air bubble
- in-line filter in some tubing
- used 96 hours



Transfusion tubing

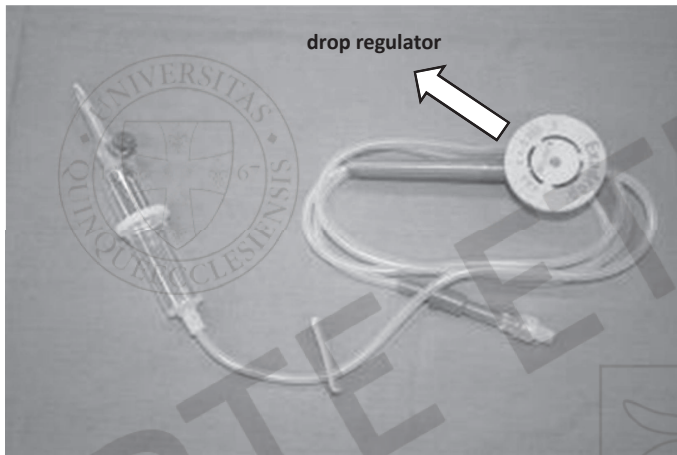


Infusion tubing to volumetric pumps



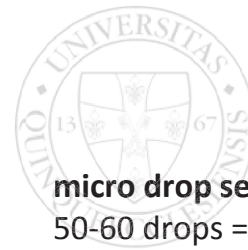
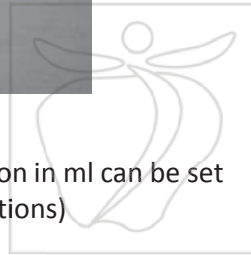
Infusion set applied with dosimeters

- controlled by gravity
- larger chamber (150 ml)
- two roller clamp
- intermittent infusion possible

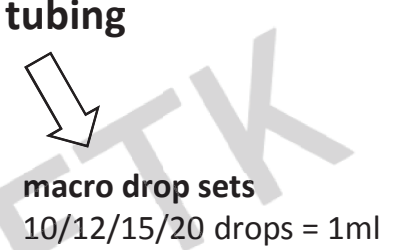


Drop rate infusion set (drip rate)

- the hourly administered volume of the solution in ml can be set
- no high viscosity solution (e.g. blood preparations)

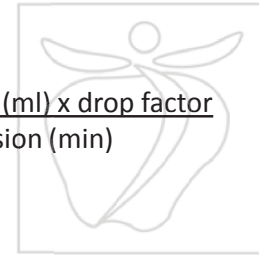


micro drop sets
50-60 drops = 1 ml

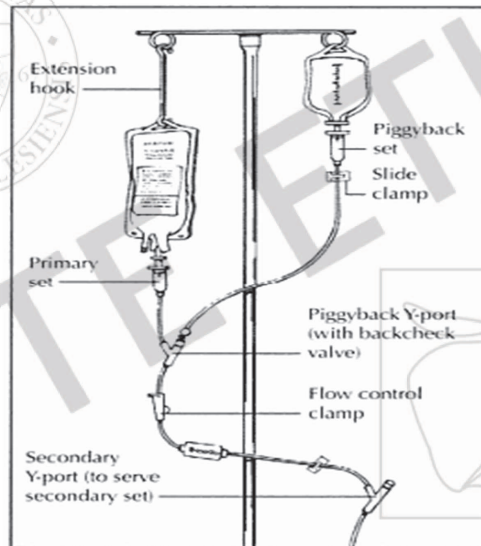


macro drop sets
10/12/15/20 drops = 1ml

$$\text{drop number} = \frac{\text{amount of the infusion (ml)} \times \text{drop factor}}{\text{time of the infusion (min)}}$$



Piggy Back set



Transfusion therapy
heater



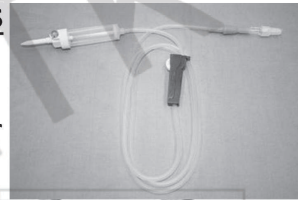
Pressurized set



Infusion dosing devices

non-mechanically controlled sets

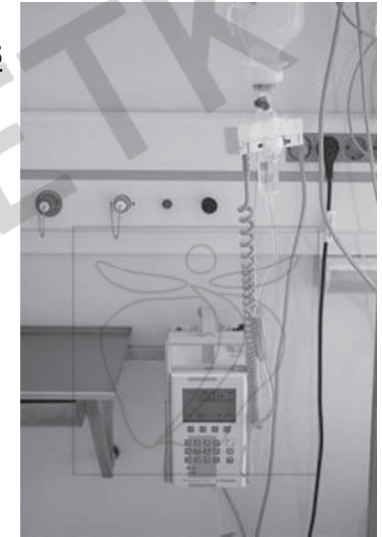
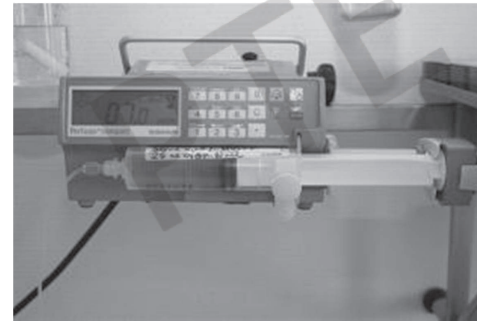
- controlled by gravity
- controller on the drop chamber
- drip rate controller



Infusion dosing devices

mechanically controlled sets

- volumetric infusion pumps
- syringe infusion pumps

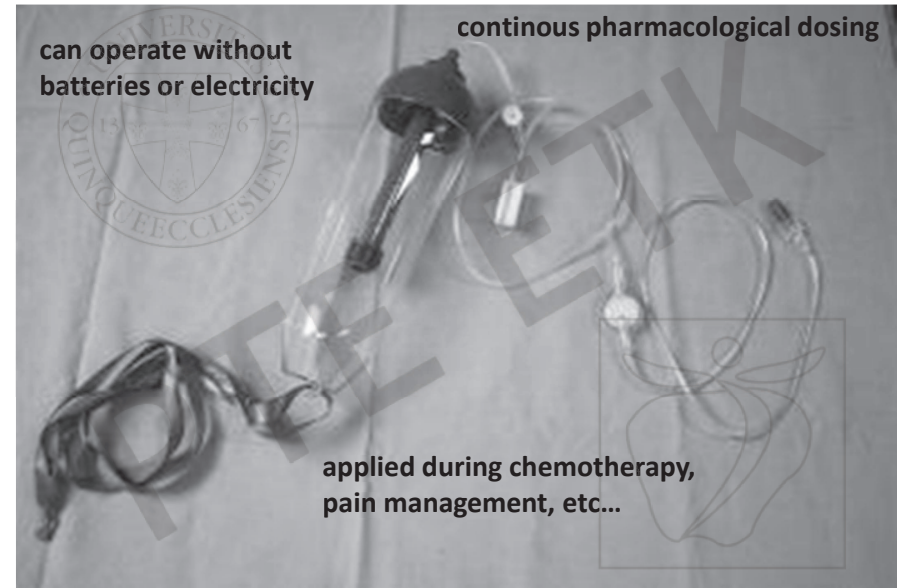


single use, portable, elastometric infusion pump



can operate without
batteries or electricity

continuous pharmacological dosing



applied during chemotherapy,
pain management, etc...

Patient Control Analgesia - PCA

- small-sized infusion pump
 - battery
 - cleaning
 - setting

continuous pharmacological dosing

- by the patient
- patient can increase the amount of the drugs
- no risk of overdosing

