



MDP – Better Care, Better Outcomes

Welcome to Infusion Therapy and Peripheral IV Insertions

Presented by
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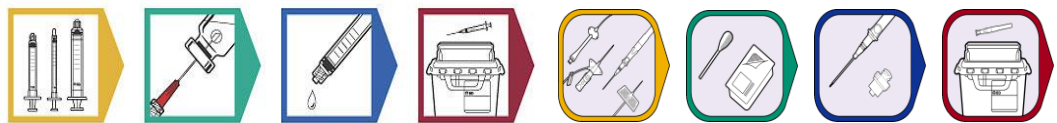


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*Advancing the Practice of
Infusion Therapy*

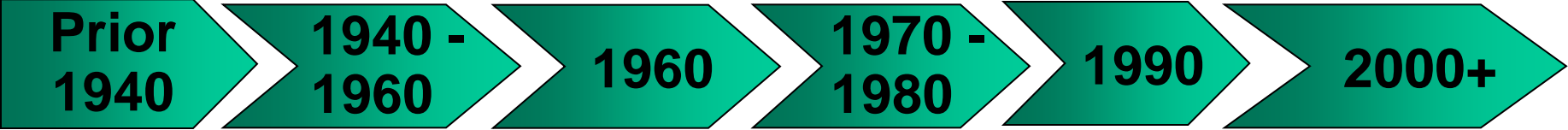
A Process Management Approach





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History of IV Therapy



- MD Practice
- Winged steel needles

- Wars
- Large scale fluid and electrolytic usage
- First PVC catheters

- > 200 IV solutions
- Piggyback medications
- 1964 Deseret Angiocath Teflon catheter
- Shift to RN procedure
- TPN

- CVCs
- Pumps
- Blood component
- Lipids
- Standards and Guidelines

- PICC / Midlines
- Multiple complex therapies
- Safety Initiatives

- Safety legislation
- Interventional radiology
- New drugs and therapies
- Outcomes monitoring
- Pain focus
- HAI focus

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Infusion Therapy Today...the facts

- **Increased patient acuity: most require infusion therapy**
- **More complex therapies**
- **Increasing elderly population**
- **Managed care impacts patient care**
- **Minimal IV therapy education in hospitals/SON**
- **Changes in IV teams; decreasing vascular access resource teams with more focus on CLABSI Prevention, PICCs and other CVCs**
- **Safety legislation**
- **Mandatory reporting of HAIs**
- **Nursing shortage**

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Who Guides Our IV Therapy Practice?

- **Your individual facility's policies and procedures**
- **Regulatory bodies**
 - OSHA, FDA, EPA
 - Individual state NPAs
 - CMS
- **Professional organizations**
 - ANA, AABB, AMA, ASHP, INS, AVA, NANN, NNN, AWHONN, SIR, ONS, APIC, ASPEN



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Desirable Infusion Therapy Outcomes

- **Successful completion of prescribed therapy**
- **Minimize therapy related complications**
- **Minimize number of venipunctures**
- **Minimize supply and labor related costs**
- **Reduce risk of needle stick injuries**
- **Patient satisfaction**

Considerations

Infusion
Selection
Injection

Infusion
Preparation
Injection

Infusion
Administration
Injection

Disposal

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Infusion Therapy

is a

Risky Process!

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Areas of Litigation

- **IV complications**
 - Phlebitis
 - Infiltration
 - Extravasation
 - Infections / CRBSI
- **IV pump monitoring**
- **Patient education**
- **Vascular access device placement / removals**



**NEGATIVE
OUTCOMES!**

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Protect yourself! Protect your patients!

- **Responsibility**
- **Accountability**
- **Examine your IV therapy process**
 - Does it demonstrate best practice?
 - Will it reduce the risk of complications?
 - Does it consider the ‘big picture’?
 - Are there any other options?

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Key Therapy Considerations

- **Purpose of Therapy**
- **Duration of Therapy**
 - Short or prolonged course of therapy ?
 - Is vein preservation critical?
 - Consider long term options early
- **Type of solution to be administered**
 - What is pH?
 - What is Osmolarity?
 - Consequences of infiltration?
- **Flow Rates**
 - Are there therapy requirements?
 - What is the viscosity?

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Duration of Therapy

- **Short-term** **Days**
- **Intermediate-term** **Weeks**
- **Long-term** **Months to years**
- **Considerations**
 - Vein status
 - History of past infusions
 - Patient and Treatment location
 - Reason for Infusions

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Chemical Properties of Solutions

- **Isotonic or near isotonic** **250 - 375 mOsm/l**
- **Hypotonic** **< 250 mOsm/l**
- **Hypertonic** **> 375 mOsm/l**
- **Normal pH** **7.35 - 7.45**
- **Ideal infusate** **pH 6 - 8**
- **Irritant**
 - Destructive effects on the venous endothelium
- **Vesicant**
 - Destructive effects on the venous endothelium and risk of extensive tissue damage and sloughing

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Osmolarity

- **Osmolarity vs. osmolality**
- **Solute concentration in solution expressed in mOsm/l**
- **Normal serum osmolarity = 280 - 295 mOsm/l**
- **Risk for chemically induced phlebitis**
 - Chemically induced phlebitis may lead to infiltration extravasation, thrombophlebitis, and thrombosis

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Osmolality and Phlebitis Risk

< 450 mOsm /L = Lowest risk

450 to 600 mOsm /L = Moderate risk

> 600 mOsm /L = High risk

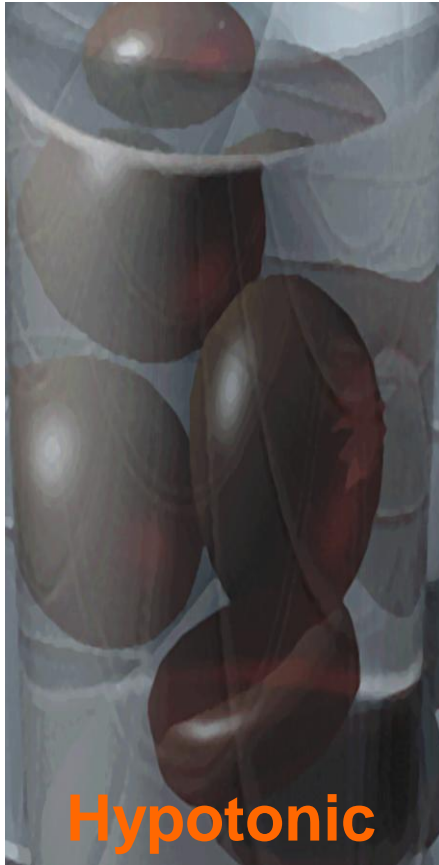
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Osmosis

- **The movement of water across a membrane. It will move to an area of higher concentration of solutes.**
- **The body's homeostatic mechanism**
- **Extended infusion of a hypotonic solution can lead to electrolyte imbalances**

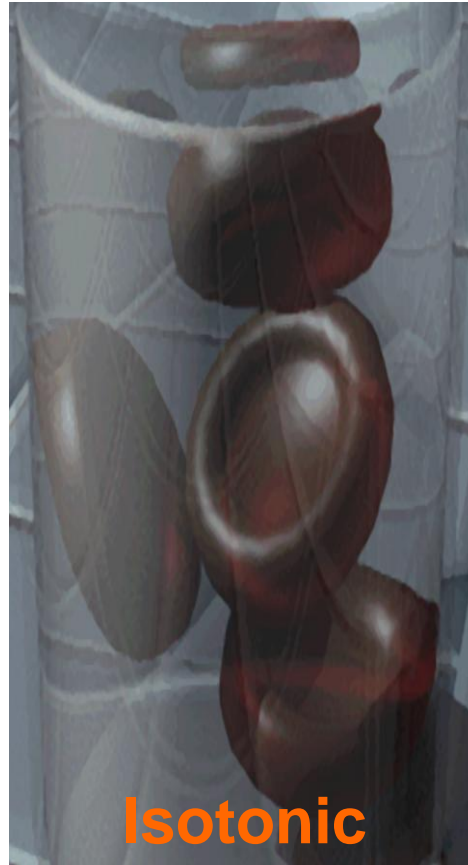
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Osmosis and Cell Volume



Hypotonic

Water moves into cells



Isotonic

Cells are stable



Hypertonic

Water moves out of cells

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Chemical Nature of a Drug or Solution

- Many drugs and solutions can be damaging to the venous endothelium irrespective of their osmolarity or pH (inherently phlebogenic)
- **Irritant drugs and solutions** result in endothelial disruption, without the presence of adequate hemodilution
- **Vesicant drugs and solutions** are phlebogenic by nature and may result in extensive endothelial damage, tissue injury, and sloughing with infiltration or extravasation

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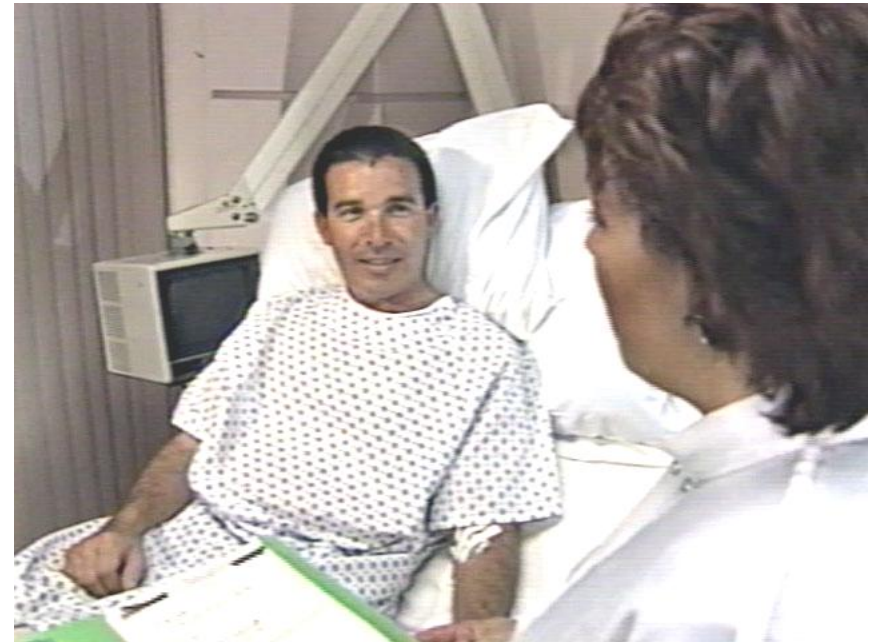
Medications with Vesicant Potential

Antibiotics	Antineoplastic Agents	Electrolytes	Vasopressors	Misc
Nafcillin	Doxorubicin	Calcium Chloride	Dopamine	Dextrose > 10%
Piperacillin	Mitomycin C	Calcium Gluconate	Epinephrine	Diazepam
Vancomycin	Vincristine	Potassium Chloride	Metaraminol	Lorazepam
Doxycycline	Vinblastine	Sodium Bicarbonate	Norepinephrine	Contrast Media

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Allergy Assessment

- **Medication**
- **Latex**
- **Iodine**
- **Alcohol**
- **Chlorhexidine**
- **Food**
- **Needle Phobias**



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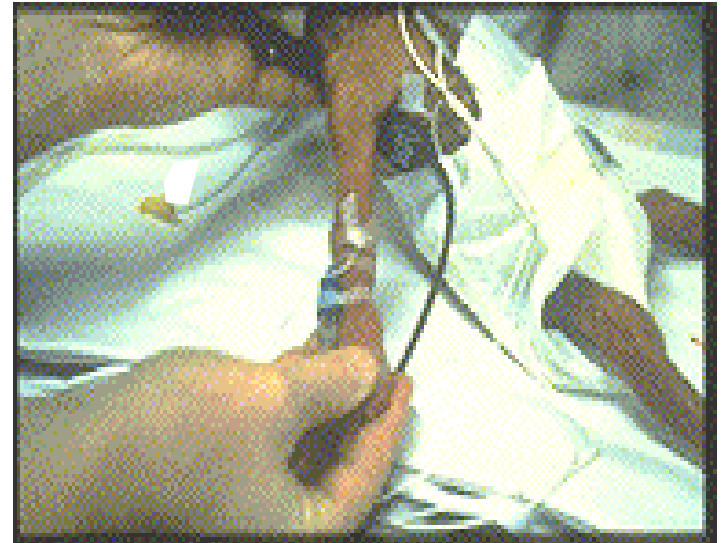
Age Related Considerations



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Newborn/Neonate

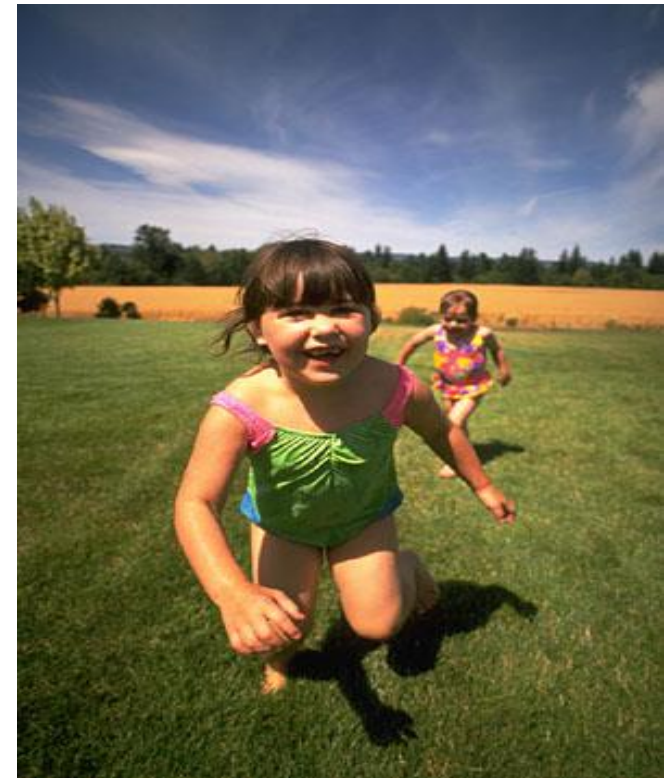
- **Fluid overload risks**
- **Heat loss**
- **<32 weeks minimal SQ tissue**
- **Immature immune system**
- **Threadlike veins**
 - Tunica intima fragile
 - Hypotension, lower blood flow
- **Phlebitis uncommon**
- **Umbilical/Intraosseous**



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Pediatrics

- **Electronic monitoring devices**
- **Solution container volume**
- **Volume control chambers**
- **Monitor at least every 2 hours**
- **Increased Sub-q tissue**
 - Difficult access
 - Difficult to recognize infiltration



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Pediatrics

- **Varying developmental stages requiring varied methods of approach**
- **Utilize visual aids to prepare child for treatment**
- **Allow as much participation as possible by the child**

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Elderly

- **Skin changes**
 - Loss of subcutaneous tissue
- **Vein wall changes**
- **Dehydration**
- **Muscle wasting**
- **Bleeding problems**
- **Medication use**



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Medications Affecting Vein/Skin Integrity

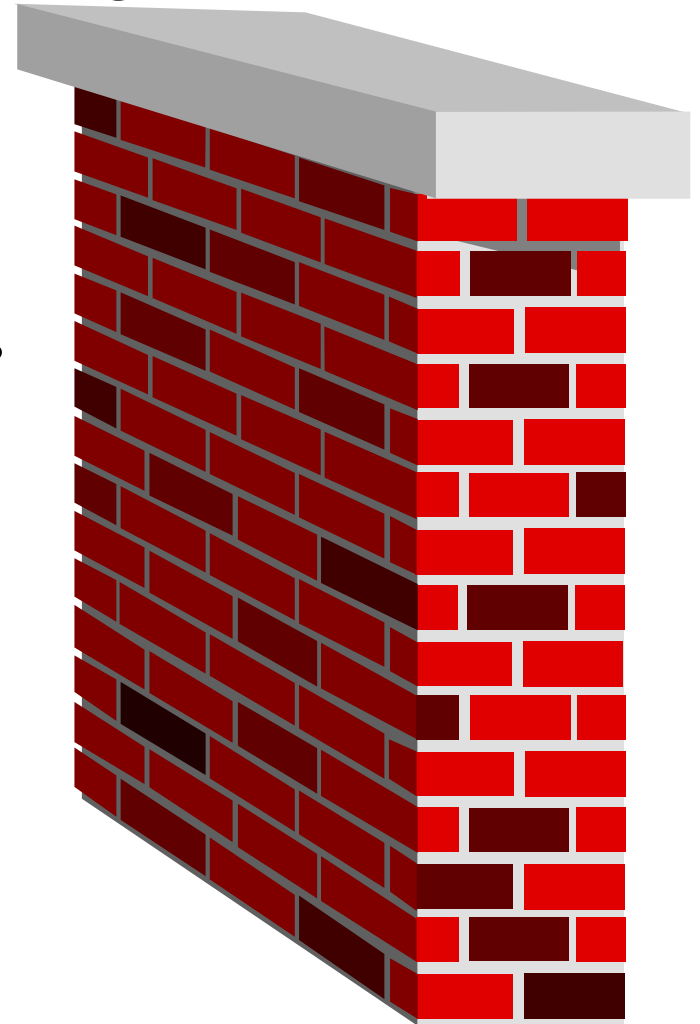
- **Corticosteroids**
 - Vein wall fragility
 - Thin and fragile skin
- **Anticoagulants**
- **Chemotherapy**
 - Irritants
 - Vesicants



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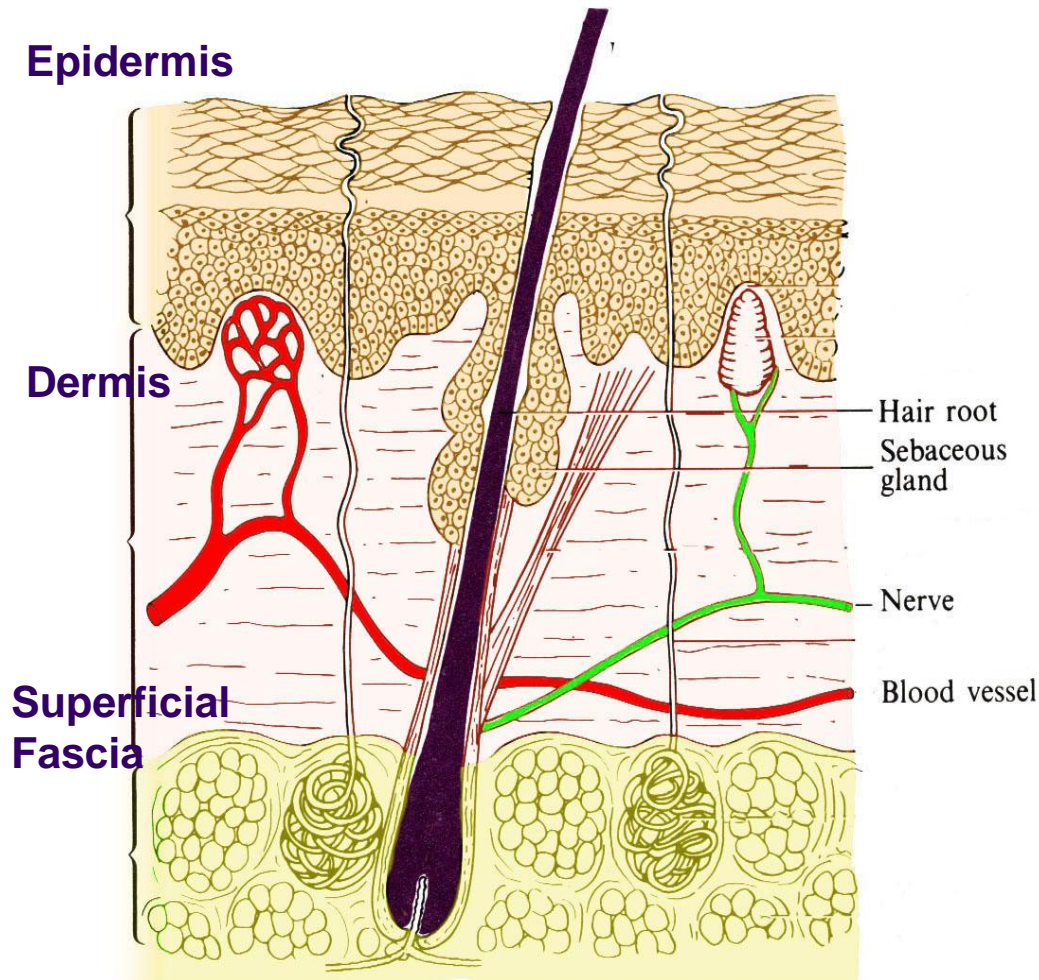
Skin Assessment

- **Functions of the Skin**
 - Barrier to the outside
 - Defense against microorganisms



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Skin Assessment



- **Layers of the Skin**
 - Epidermis
 - Dermis
 - Superficial Fascia (subcutaneous tissue)

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Alterations in Skin Integrity

- **Thickening**
 - Excessive sun exposure
 - Abrasions
 - Medications
 - Disease states/conditions
- **Implications**
 - Increased insertion angle
 - Two-step insertion process

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Alterations in Skin Integrity

- **Thinning**

- Aging process
- Medications
- Disease states/conditions

- **Implications**

- Lower insertion angle
- Hypoallergenic products
 - skin preparation
 - tape, dressings
 - adhesive remover

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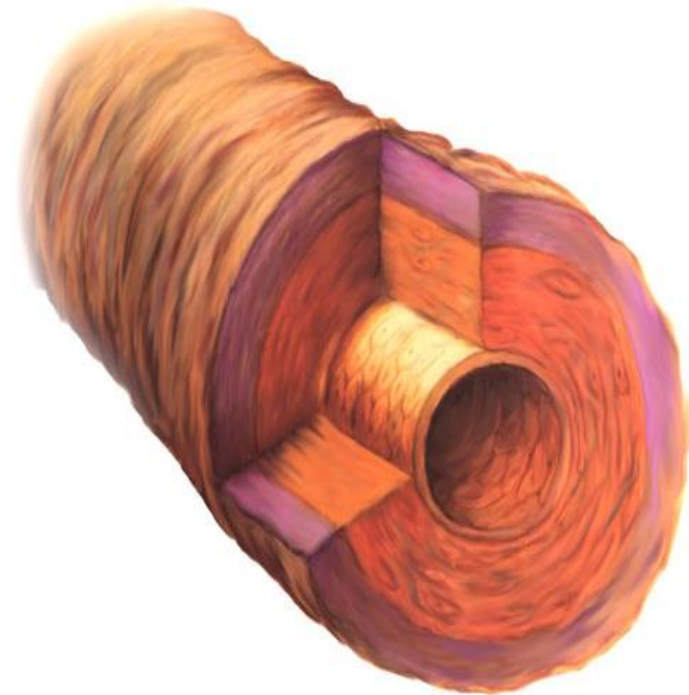
The Vascular System

- **Four primary functions**
 - Delivery of oxygen & nutrients
 - Removal of CO₂, and other waste products
 - Delivery of hormones and other chemicals
 - Delivery of white cells to areas of injury

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The Circulatory System

- **Arteries**
 - Transport blood from the heart out to the tissues
 - High pressure system
 - Strong elastic walls, non-collapsible



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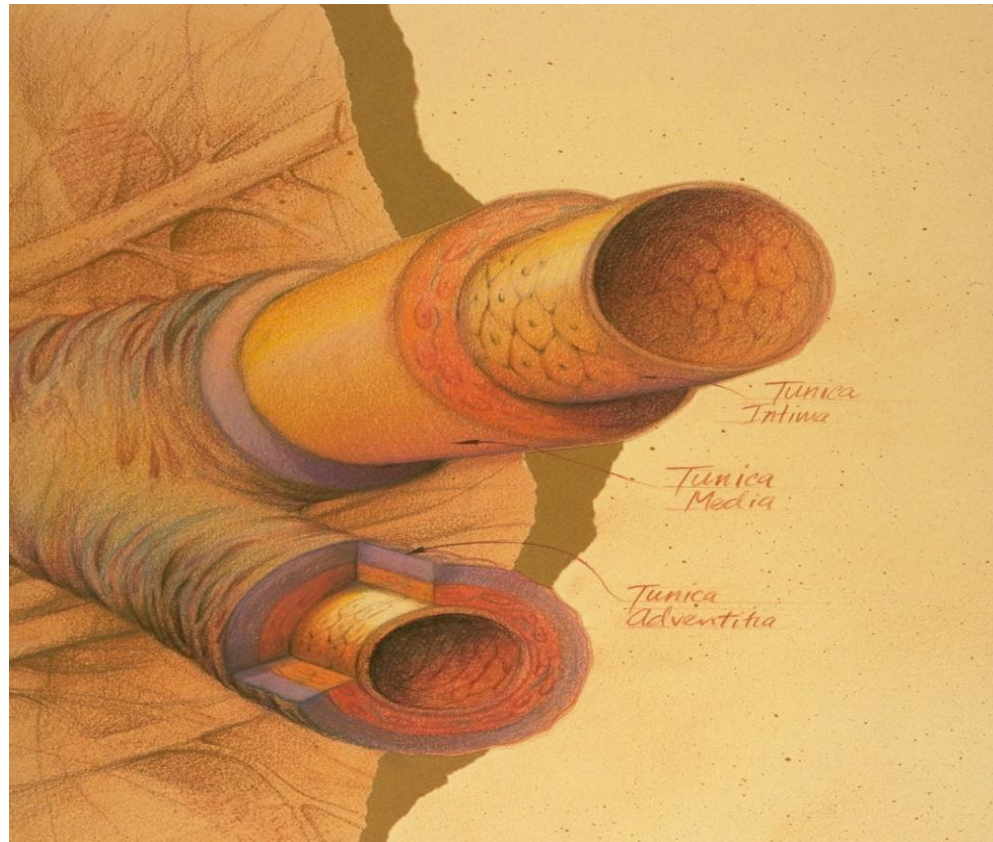
The Circulatory System

- **Veins**
 - Collect and carry blood back to the heart
 - Low pressure systems
 - Valves present



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Layers of the Vein

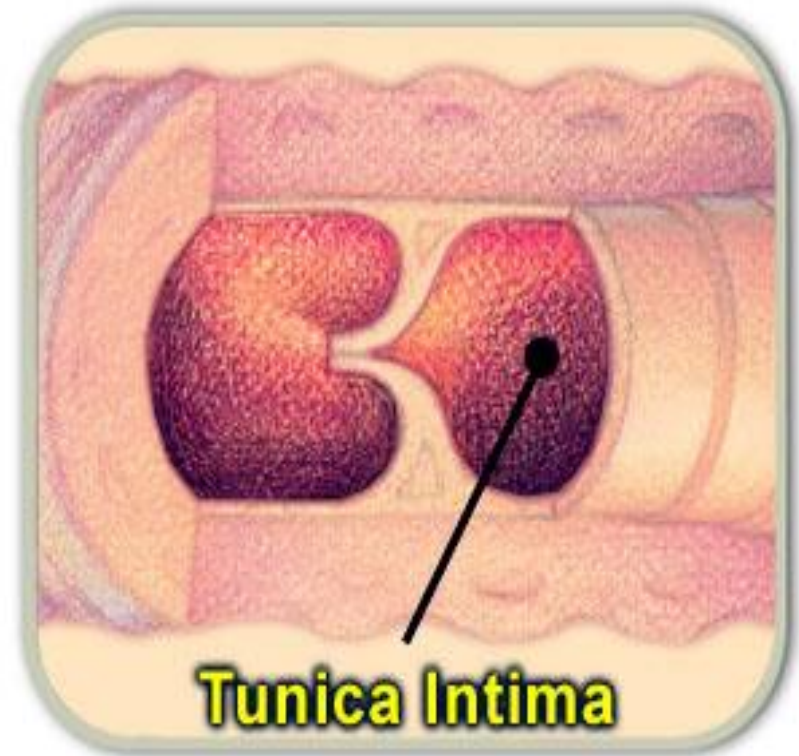


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Tunica Intima

- **Characteristics**

- Innermost layer
- Smooth, elastic endothelial lining
- Single cell layer
- Recognizes foreign bodies
- Mechanical, chemical and bacterial damage



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Tunica Intima

- **Practice Considerations**

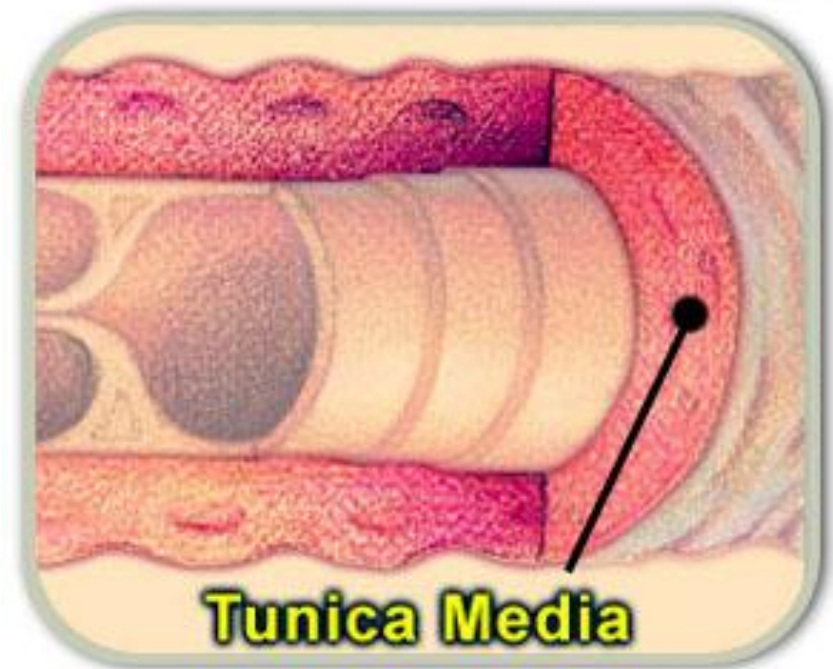
- Smallest, shortest catheter possible
- Stabilize catheter
- Isotonic infusions in smaller veins
- Longer infusion times



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Tunica Media

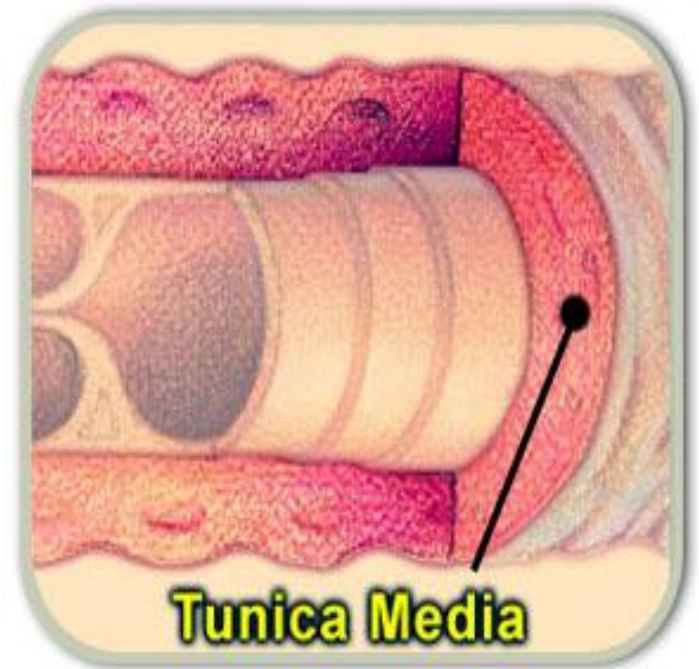
- **Characteristics**
 - Consists of muscle and elastic tissue
 - Comprises the bulk of the vein
 - Nerve fibers for vasoconstriction and vasodilation are here



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Tunica Media

- **Practice Considerations**
 - Avoid cold infusates
 - Apply heat above site to reduce venospasm
 - Do not apply tourniquet for over 2 minutes
 - Reduce patient anxiety



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Tunica Adventitia

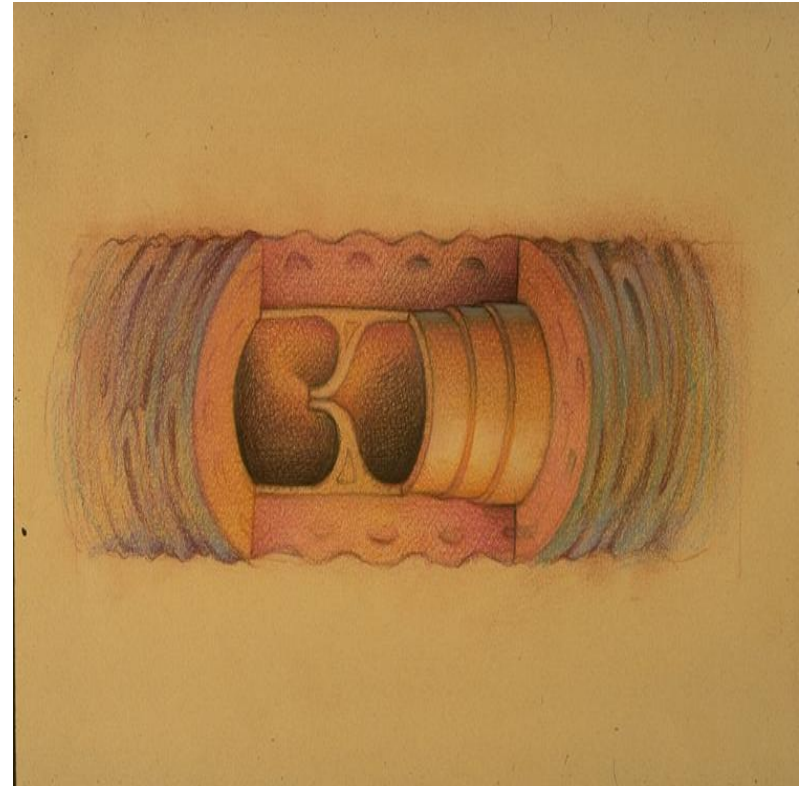
- **Characteristics**
 - Consists of connective tissue and nutrient vessels
 - Provides support and protection
 - “Pop” may be felt here



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Valves

- **Characteristics**
 - Formed by the tunica intima
 - Maintain upward flow
 - Damage increases risk of thrombus formation
 - May prevent blood withdrawal



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Which vein do you choose?

- **Therapy and Patient Considerations**
 - What type of therapy will the patient receive?
 - How long will the therapy last?
 - How has the patient responded to previous therapy?

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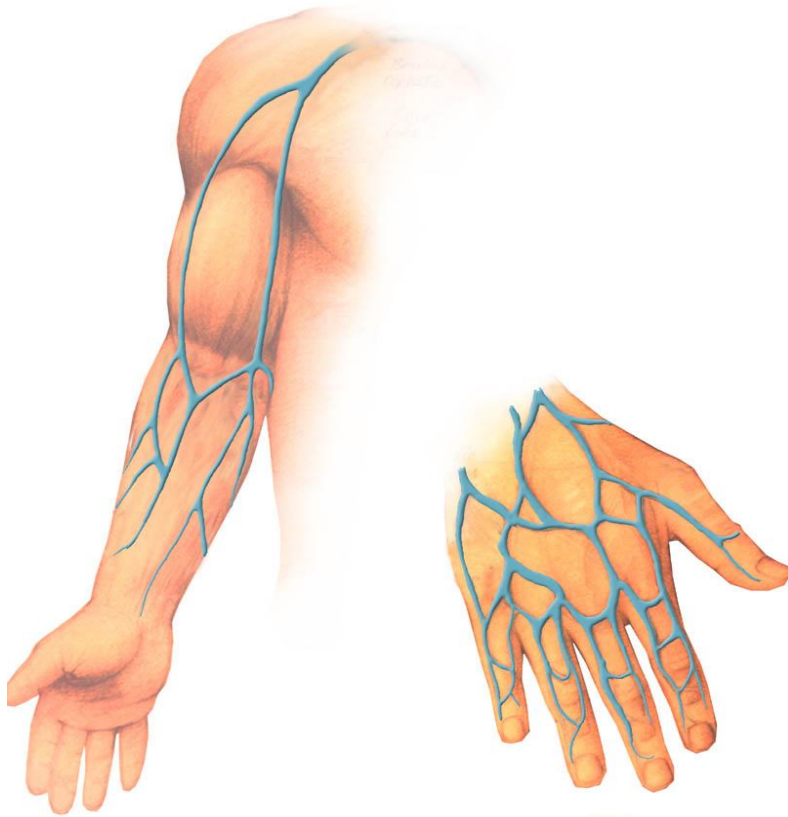
Optimal Vein Conditions

- **Characteristics**
 - Soft, straight, elastic
 - Supported by intact, elastic skin
 - Springy, easily palpated
 - Easily stabilized



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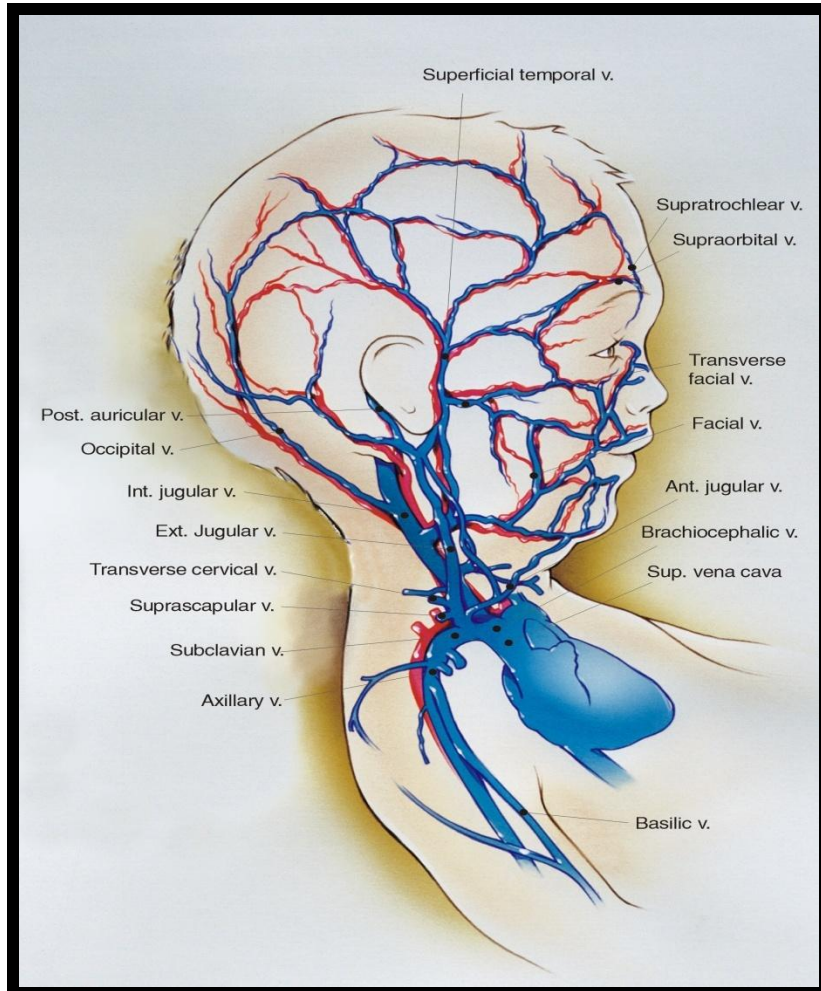
Veins of the Upper Extremities



- **Forearm**
 - Basilic
 - Median Antebrachial
 - Cephalic
- **Hand**
 - Dorsal digitals
 - Metacarpals
 - Dorsal venous arch
 - Cephalic

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Scalp Veins

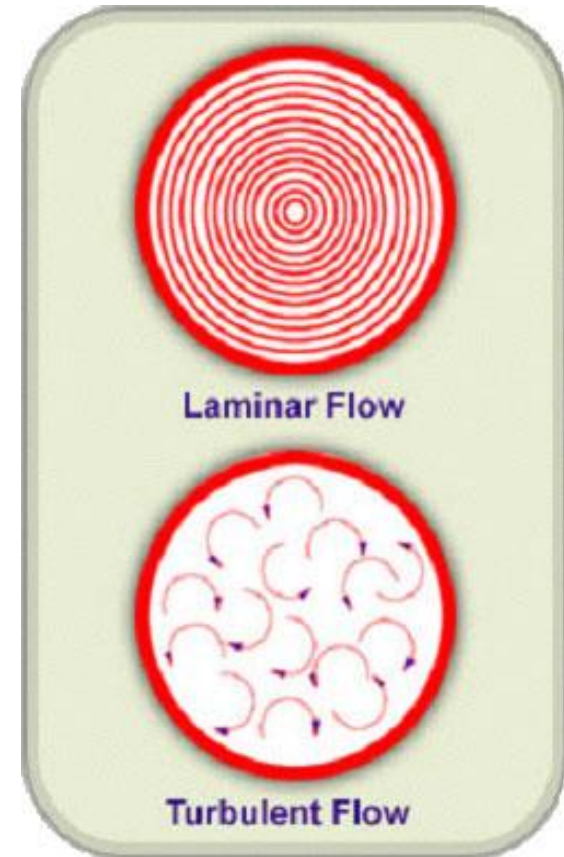


- **Frontal**
- **Temporal**
- **Posterior auricular**
- **Occipital**

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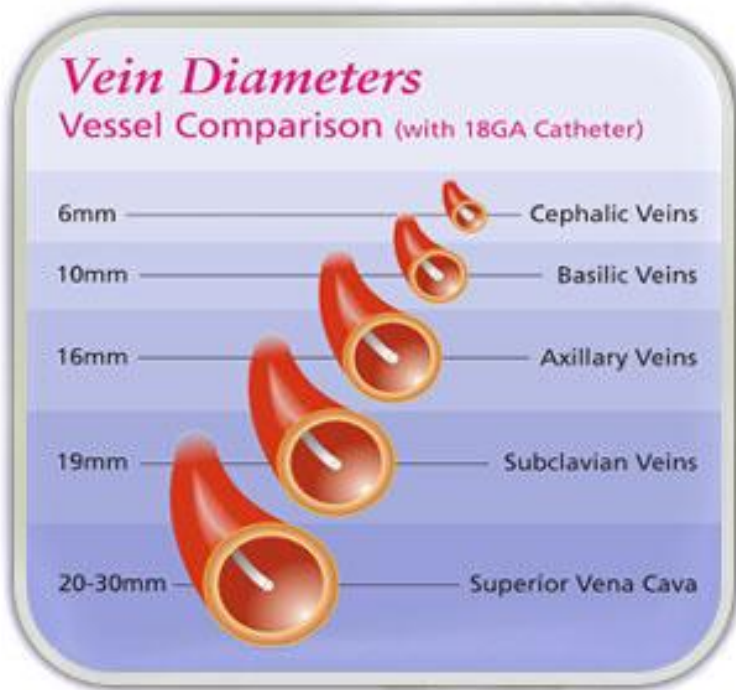
Hemodilution and Catheter Tip Location

- **Affected by blood flow**
 - Laminar flow
 - Turbulent Flow
- **Vein size (diameter)**
- **Catheter tip location**
 - Risk of mechanical damage to the venous endothelium



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Vessel Size & Flow Rate



Vein	Diameter	Blood Flow ml/min
cephalic	6mm	40
basilic	8mm	95
axillary	16mm	250
subclavian	19mm	800
SVC	2 to 3 cm	2,500

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Access Limitations

- **Mastectomy**
- **Arteriovenous shunts**
- **Sclerotic veins**
- **Altered vein integrity**
- **Altered skin integrity**
- **Obesity**
- **Dehydration**



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Hypodermoclysis

- **Alternative method of administering isotonic fluids into the subcutaneous tissue**
 - Back
 - Abdomen
 - Thigh
 - Upper arm
- **Volume limitations**



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“The Right Device to Start”

- **Greatest likelihood of surviving anticipated length of therapy**
- **Accommodates therapy requirements**
- **Least invasive**
- **Utilizes the fewest number of catheters**
- **Meets a benefit vs risk assessment**

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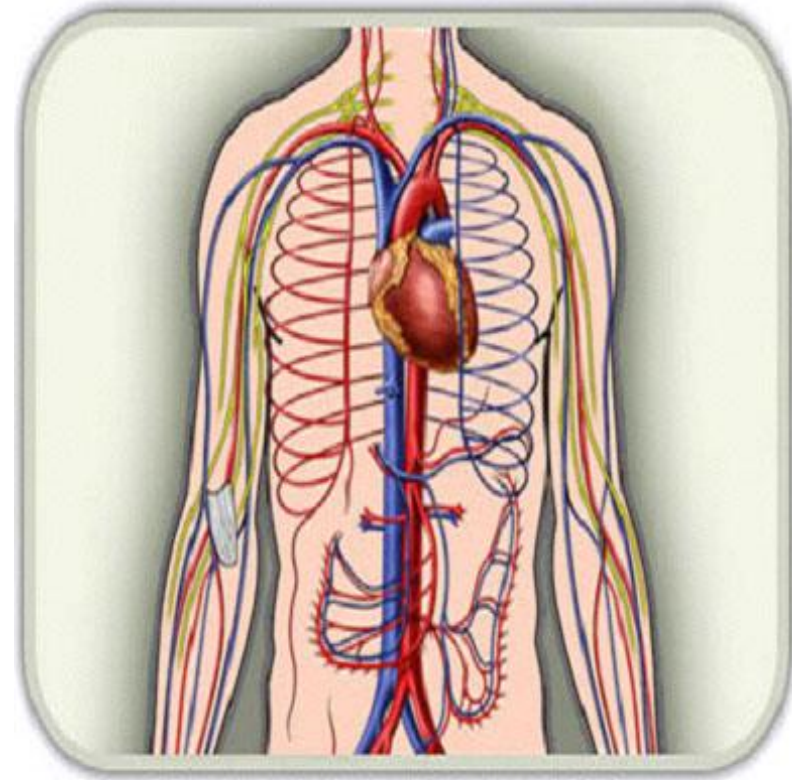
Medical Conditions Affecting Device Selection

- **Immunosuppression**
- **Blood Dyscrasias**
- **Obesity**
- **Diabetes**
- **Steroid Use**
- **Circulatory Conditions**
- **Confusion**
- **CVA**
- **Dehydration**
- **Fluid Restriction**
- **IV Drug Abuse**

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Peripheral vs Central Device Selection

- **Peripheral catheter**
 - tip of catheter terminates outside the superior/inferior vena cava
- **Central catheter**
 - tip of catheter terminates within the superior/inferior vena cava



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Short Peripheral Catheter

- **Advantage**

- Easily inserted
- Economical
- Multiple product choices
- Minimal training
- Continuous or intermittent



- **Disadvantages**

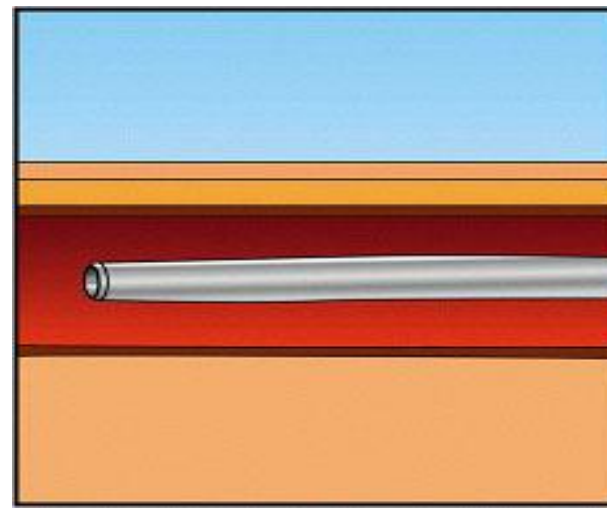
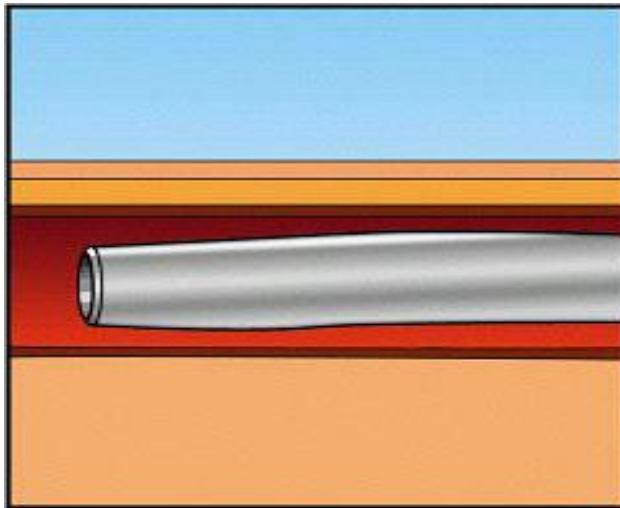
- Easily dislodged
- Frequent monitoring



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Catheter Size

- **Smallest gauge, shortest length that will accommodate prescribed therapy**
 - Increase hemodilution
 - Decrease endothelial damage



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The Facts

- **Healthcare Acquired Infections¹**
 - 1.7 Million patients get Healthcare Acquired Infections (HAIs) each year
 - 33,269 Newborns in High Risk Nurseries
 - 19,059 Newborns in Well Baby Nurseries
 - 417,946 Adults and Children in ICUs
 - 1,266,851 Adults and Children Outside the ICU

¹ Klevens, R. Monina. Estimating Health Care-Associated Infections and Deaths in U.S. Hospitals, 2002. Public Health Reports. Vol. 122, March-April 2007.

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Infection Facts

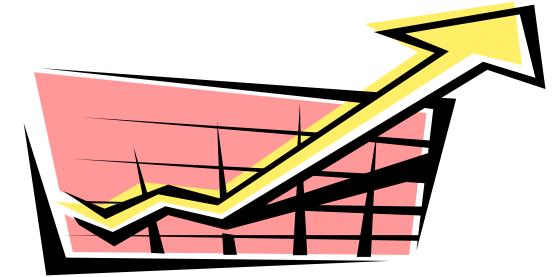
- **Bloodstream Infections (BSIs)**
 - 87% of primary bacteremia attributed to vascular access
 - Crude mortality 10% to 40%
 - Prolonged hospitalization 5 to 20 days
 - Attributable cost \$34,000 to \$56,000 per stay
 - 80,000 CVC related BSIs occur in US hospital ICUs each year
 - Annual cost to the healthcare system is \$296 million to \$2.3 billion (US)

Source: William R. Jarvis, M.D., "Preventing Central Venous Catheter (CVC)-Associated Bloodstream Infections in 2005: Is Zero Realistic?" Oral presentation at the Infusion Nurses Society Annual Meeting (May 2005, Ft. Lauderdale, FL).

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Infection Facts

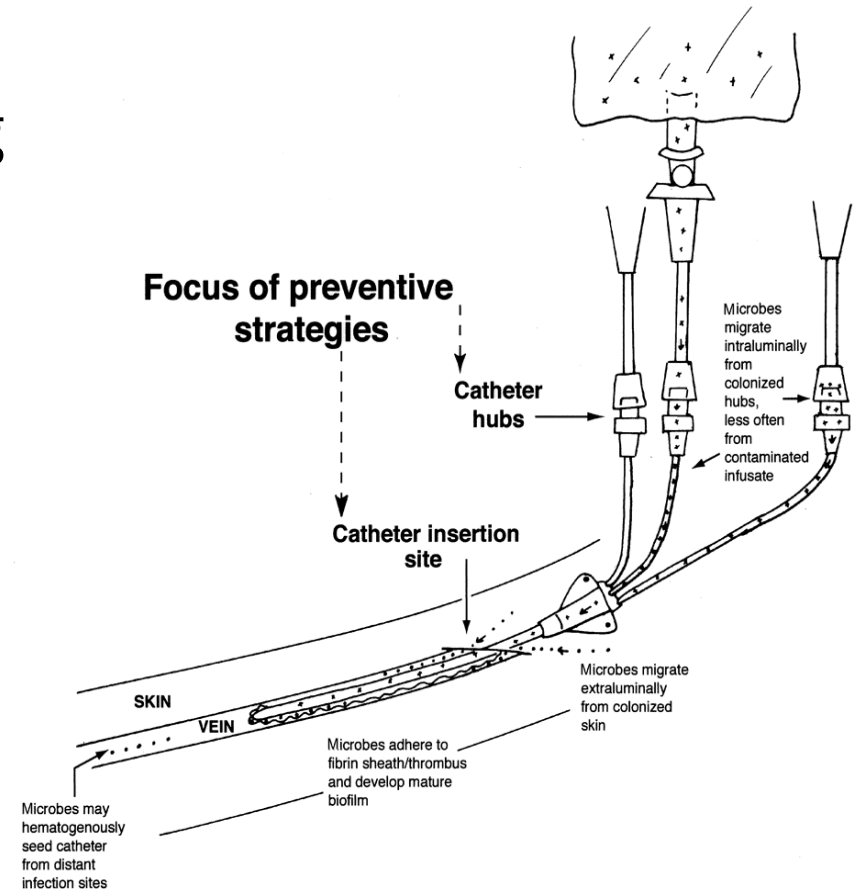
- **CDC reports of vascular access related infection rates**
 - Peripheral – rarely associated with BSI
 - Central ~2.9 to 11.3/1000 catheter days
- **Vascular access is the most invasive procedure that nurses do**
- **Peripheral venous catheters are the most frequently used vascular access device**
 - 250 million sold annually vs 5 million CVCs



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Risk Factors

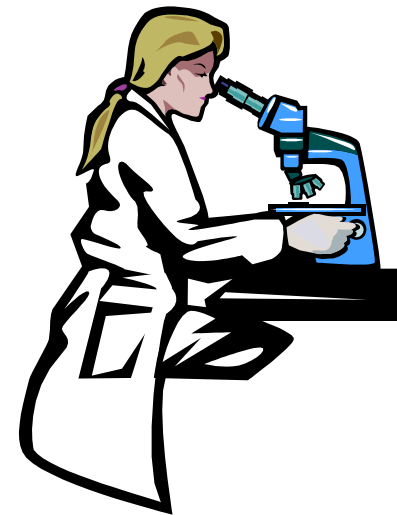
- Inadequate hand washing
- Insertion experience
- Disinfection of skin site
 - What to use
 - How to apply it
- Contaminated infusate
- Field or ER insertion
- Multiple entries into the system (hubs, injection ports, stopcocks)



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Potential Sources of Contamination

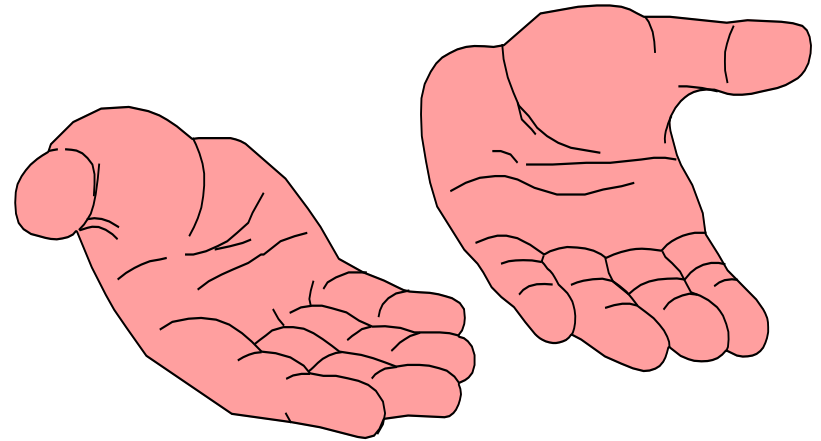
- **Tourniquets**
 - Single patient use
- **Multiple Use Tape Rolls**
 - Only sterile tape should be used under transparent dressing!
- **Stethoscopes**
 - Clean between patients



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Preventative Measures

- **Practice good hand hygiene**
 - minimizes transient flora
 - resident flora inhibited by antimicrobial soaps and alcohol based gels
- **Follow standard precautions**
- **Adhere to aseptic technique practices**



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Hand Hygiene

- **48% adherence to recommended hand hygiene procedure**
 - Gloves do not eliminate need to wash hand
 - 15 second hand vigorous wash with soap and running water
 - Use an alcohol based product



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Aseptic Technique

- **Precautions taken to decrease risk of infectious contamination**
 - Conscientious, careful attitude with
 - Site preparation
 - IV access site disinfection
 - Tubing changes
 - Dressing changes
 - Medication administration
 - Routine care and maintenance



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Hair Removal

- **Excess hair should be clipped not shaved**
 - INS Standards of Practice, S35.1C, 2011
- **Shaving creates microabrasions of the skin**
- **Predisposes patient to infection**



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Local Anesthetics

- **INS Standard S34, 2011**
 - Use least invasive and carries the lowest risk of reaction
- **Intradermal injection**
 - Lidocaine
 - Buffered lidocaine
 - Normal Saline
- **Topical transdermal agents**



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Antimicrobials used for Skin Preps

- **INS Standard S34.G 2011**
 - Alcohol
 - Povidone-Iodine
 - Chlorhexidine Gluconate
 - Tincture of Iodine
- **Combination products preferred**
 - Alcohol (ethyl or isopropyl) with either
 - Povidone-Iodine
 - CHG



Considerations

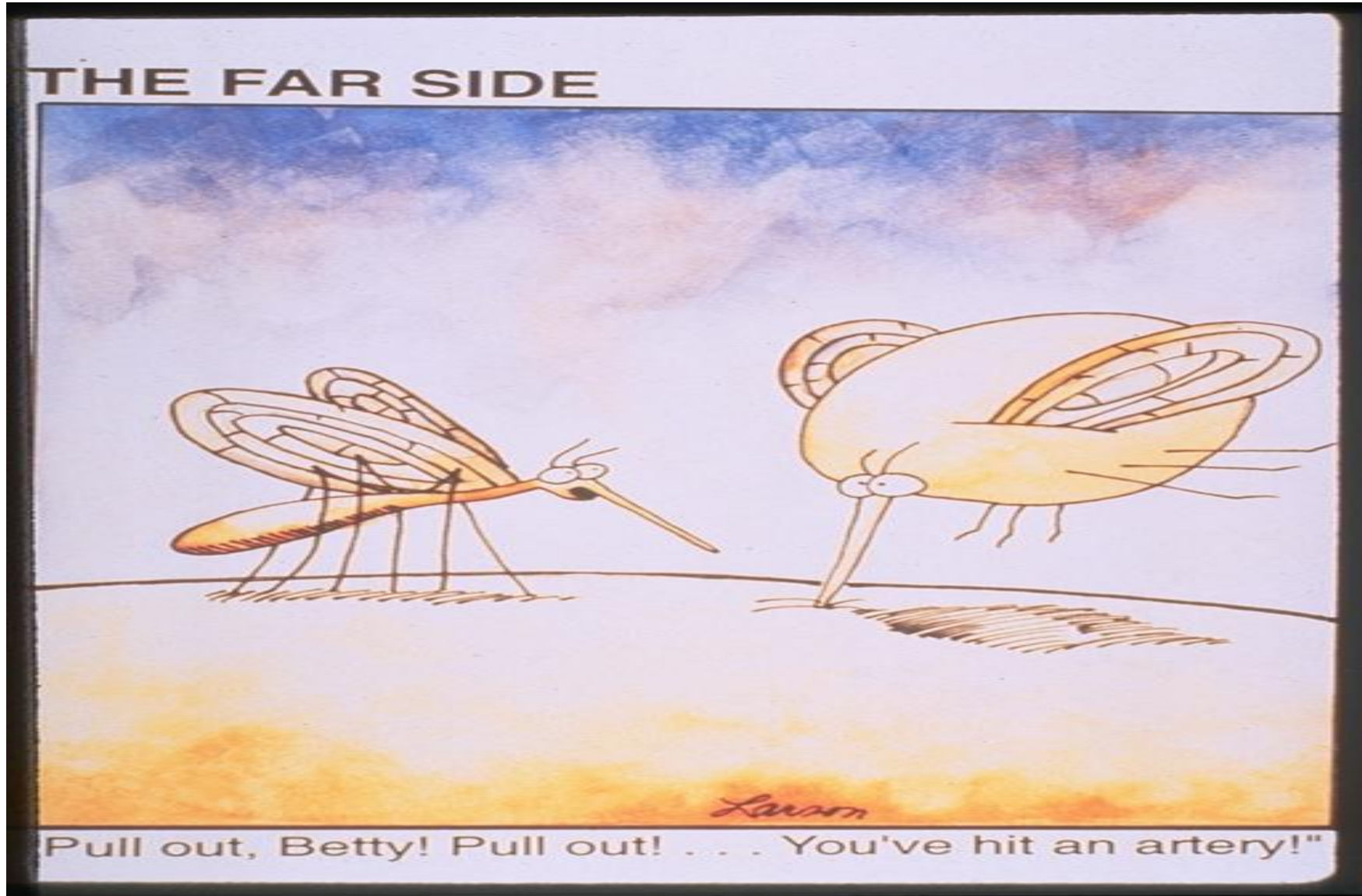
Infusion
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Patient Assessment

- **Venous Status**
- **Vascular Surgery or Injury**
- **Skin Conditions**
- **Musculoskeletal Conditions**
- **Systemic Factors**
- **Allergies**
- **Hydration Status**



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Preparing for Venipuncture

- **Review chart**
 - Physician order
 - Prescribed Therapy
 - Allergies
- **Verify patient's identity**
- **Gather Supplies**
- **Patient Preparation**
 - Explanation
 - Consider local anesthetic

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Vein Assessment and Site Selection

- **Assess the extremities for contraindications**
 - Complications from recent venipunctures
 - Dependent edema
 - Localized infection near the proposed insertion site
 - Prior injuries, surgeries, vascular access device complications that have altered venous anatomy or venous return
 - Presence of dialysis grafts or fistulas
 - Impaired neurologic function

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Selecting a Venipuncture Site

- **Location**
- **Veins to Avoid**
- **Palpation**
- **Duration**
- **Purpose**



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Location, location, location

- **AVOID**
 - Flexion & extension areas
 - Compromised areas
 - Sites below recent venipunctures
 - Lower extremities
 - Restrained areas



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Vein Dilation

Factors affecting dilation

- **Blood pressure**
 - high or low
- **Cold**
 - vasoconstriction
- **Shock**
 - vasoconstriction
- **Sclerotic veins**
 - loss of elasticity
- **Time**
 - allow enough
- **Dehydration**
 - flattened veins
- **Anxiety/apprehension**
 - vasoconstriction
- **Tourniquet application**
 - too tight or too loose

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Vein Enhancement Techniques

- **Gravity**
- **Fist clenching**
- **Warmth and Heat**
- **Skin stimulation**
- **Infant stimulation**



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Tourniquets

- **Types**
 - Rubber tubing
 - Rubber band
 - Velcro strap
 - Blood pressure cuff
 - Latex free
- **Cross contamination**
 - Single use
- **Placement 6 - 8 inches above site**
 - Hypotensive
 - Hypertensive



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Vein Stabilization

Skin Traction

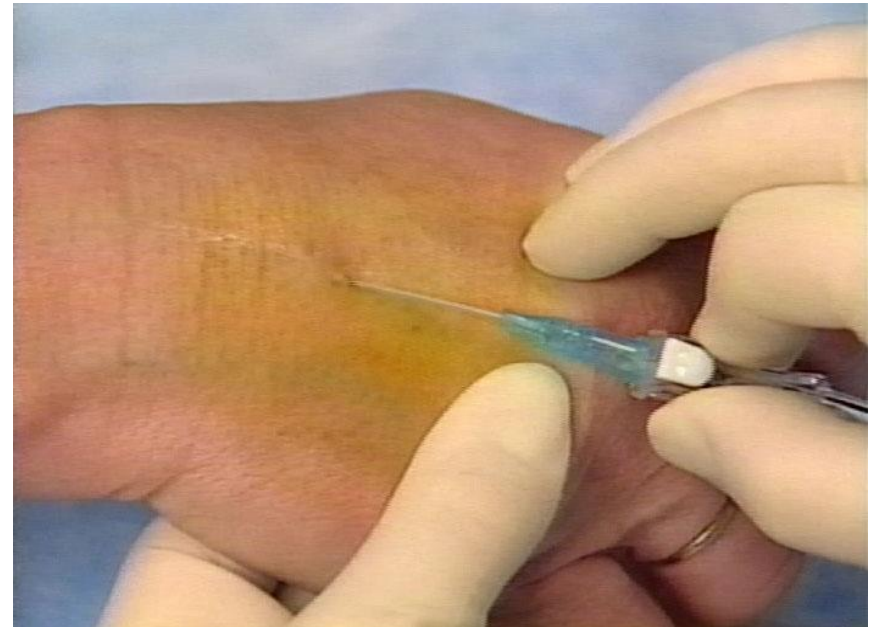
- **Used to prevent the vein from rolling away**
- **Accommodates threading of the catheter**
- **Straightens curved or twisting veins**



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Insertion Methods

- **Direct**
 - on top of vein
 - directly through the skin and into the vein in one motion
- **Indirect**
 - usually side of vein
 - insert through the skin and then pause prior to venipuncture



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Insertion - Skin Penetration

- **10-30 degree insertion angle**
- **Quick, firm action when piercing the skin**



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Insertion - Venipuncture

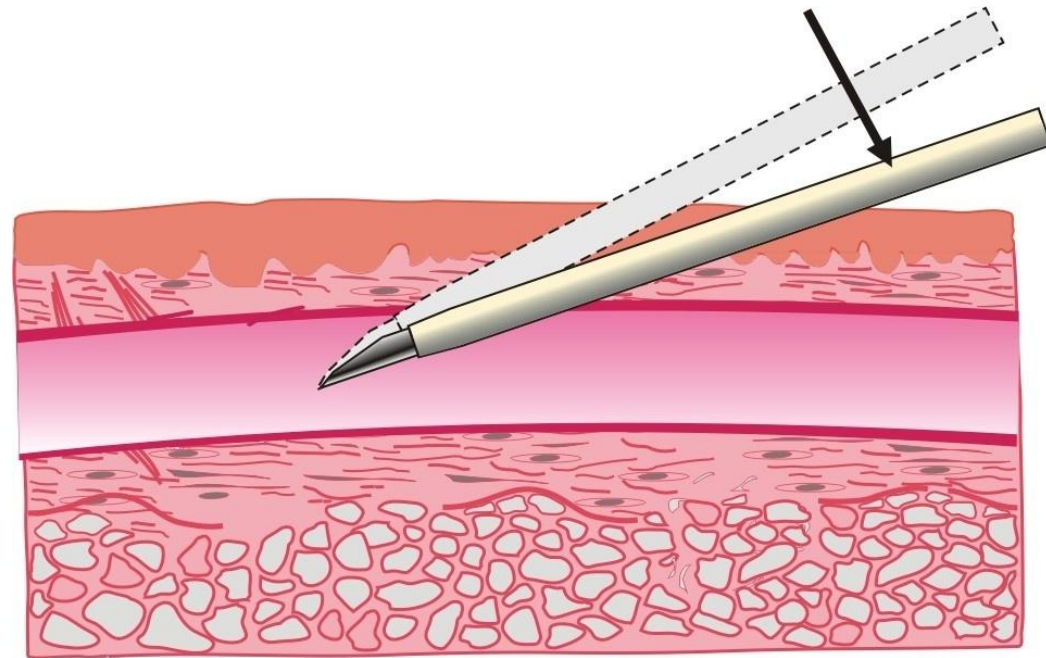
- **Slowly enter the vein, watching for blood return**



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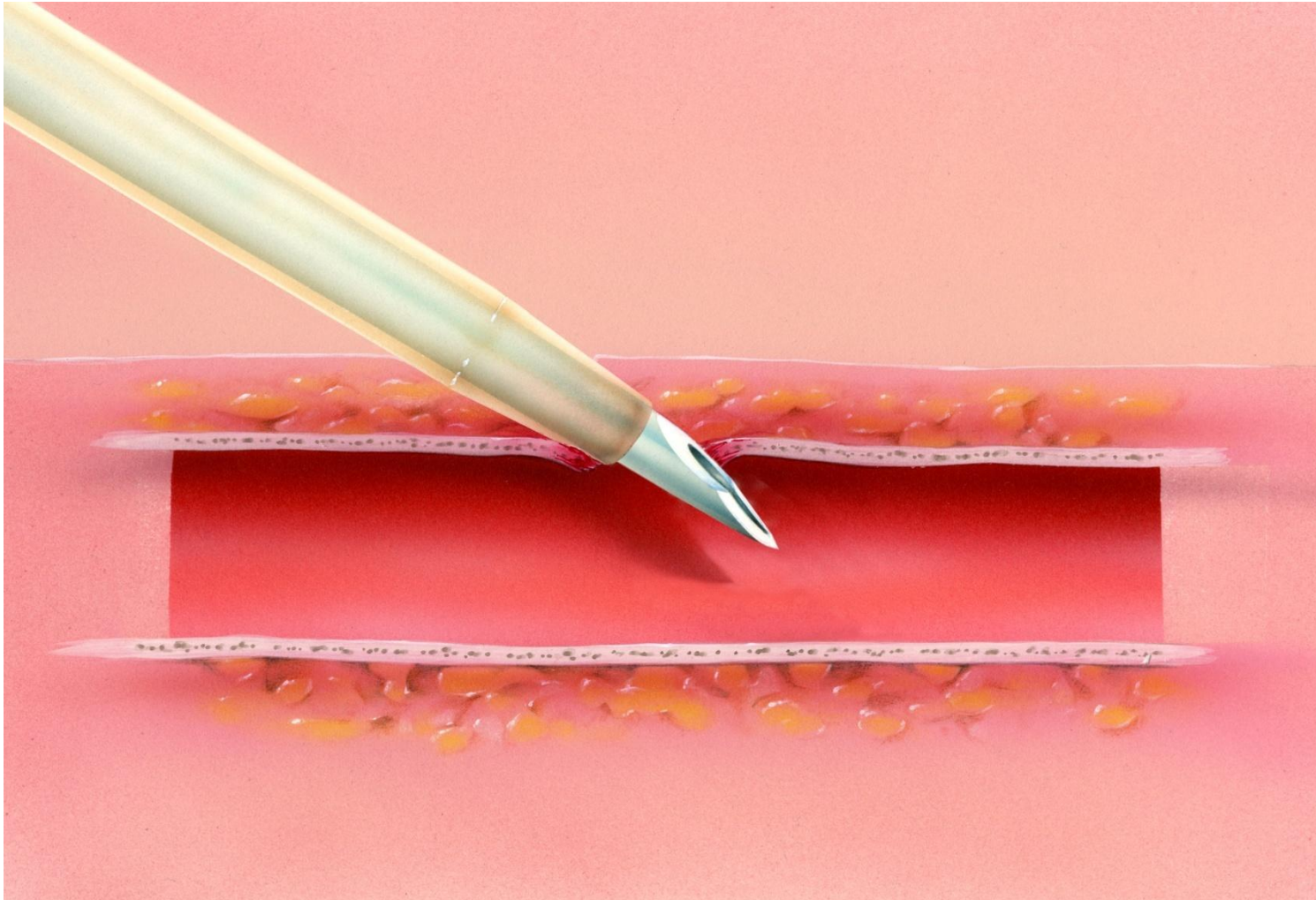
Insertion - Advancement

- **Lower insertion angle and advance entire unit**
- **Thread catheter into vein**



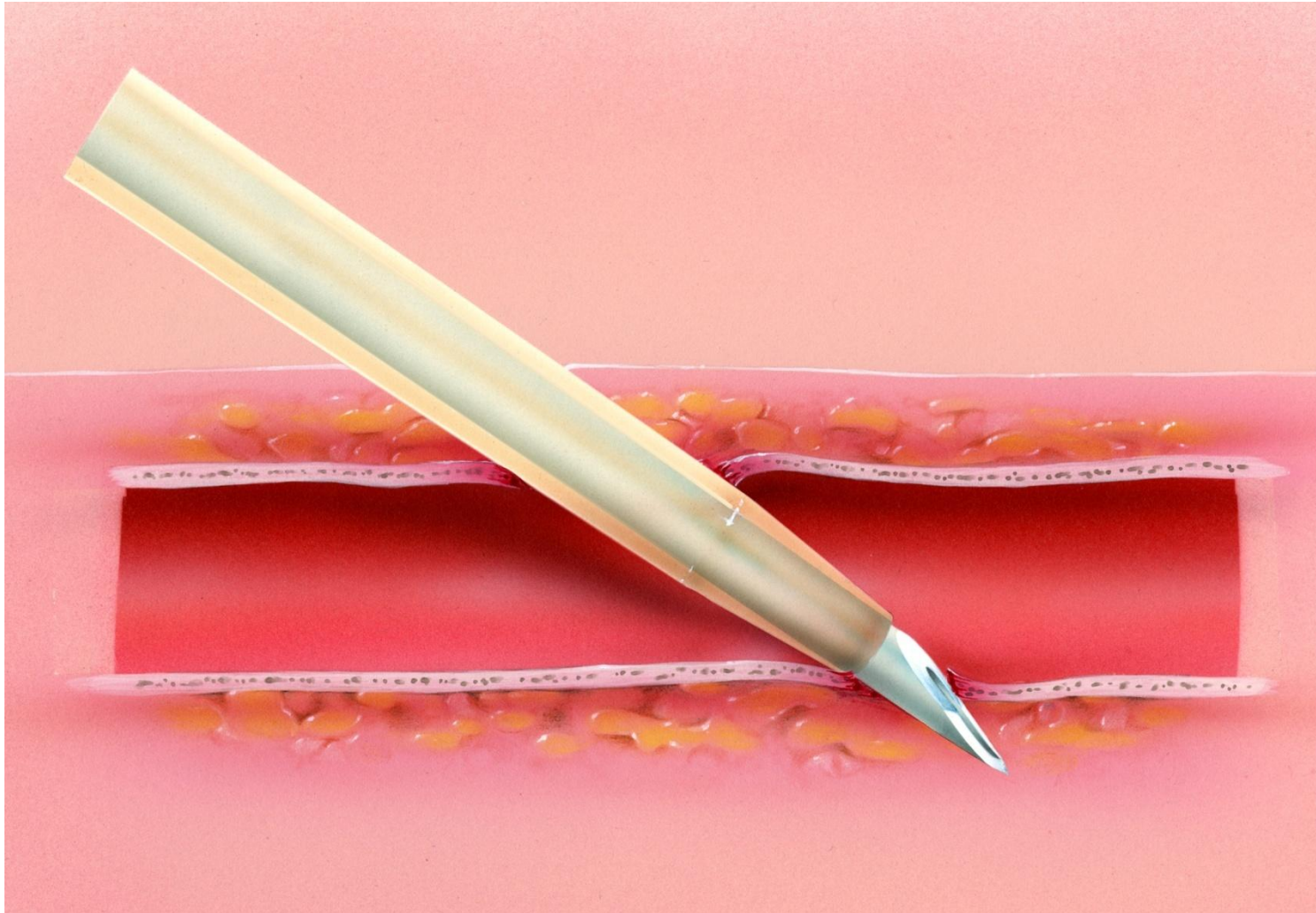
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Incomplete Venipuncture



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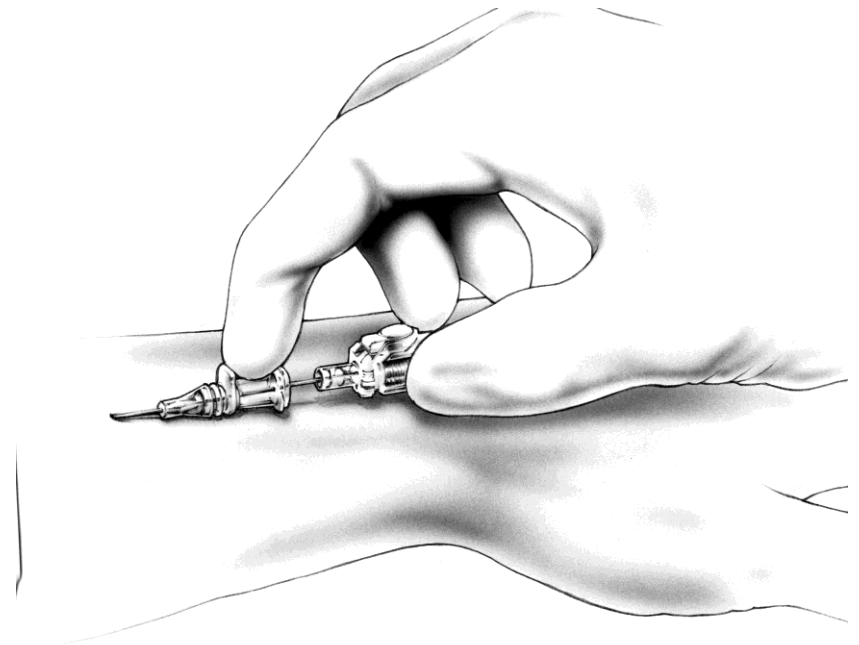
Back Wall Penetration



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Catheter Threading Techniques

- **One-handed**
 - Hooded
- **Two-handed**
 - Corkscrew
- **Floating**



Considerations

Infusion
Selection
Injection

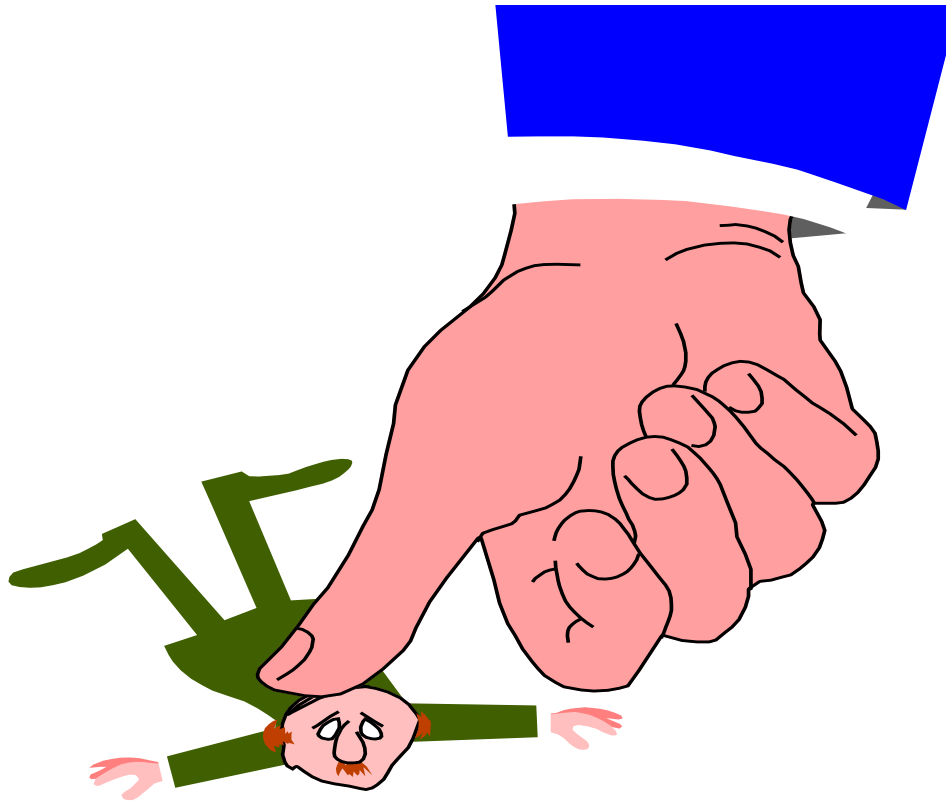
Infusion
Preparation
Injection

Infusion
Administration
Injection

Disposal

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Digital Pressure



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Digital Pressure

- **Prior to removing needle**
- **Apply light pressure beyond catheter tip**
- **Stabilize hub**
- **New technologies may eliminate the need for digital pressure**



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Initiate Therapy

- **Confirm placement**
- **Flush device**
- **Initiate infusion or lock with needleless adapter**
- **Secure catheter**
- **Documentation**



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Sharps & Waste Disposal

- **Approved sharps container**
- **Contaminated waste containers**
- **Policies and procedures**



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Tips for Success

- **Reduce anxiety and mentally prepare**
- **Distract with conversation**
- **Warm extremity if necessary**
- **Assess hydration status**
- **Maximize lighting & raise the bed**
- **Solicit help as needed**
- **Be prepared with necessary equipment**
- **Stabilize vein adequately**

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Stabilizing the Site

- **INS Standards of Practice S36, 2011**
 - Catheter stabilization shall be used to preserve the integrity of the access device minimize catheter movement and loss of access.
 - Catheter shall be stabilized using a method that it does not interfere with assessment and monitoring of the site or impede vascular circulation or delivery of the prescribed therapy.
 - Nurse shall be competent in proper use and application of device.

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Stabilization

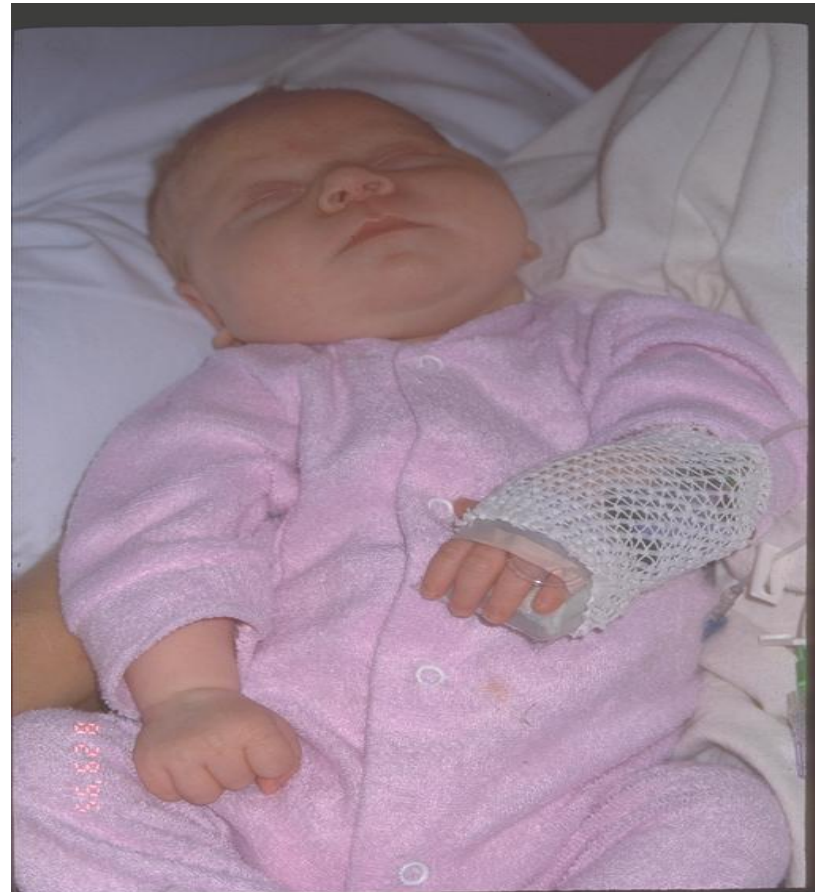
- **Stabilization**
 - Manufactured stabilization device
 - Sterile tapes
 - Surgical strips
- **Taping Techniques**
 - Chevron
 - H-method
 - U-method



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Arm Boards

- **INS Standard S37 2011**
 - Facilitate infusion delivery placed in or adjacent to an area of flexion
 - Single-patient use devices
 - Used for the purpose of stabilization at an area of flexion, and is not considered a restraint



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Dressings

- **INS Standards S 46, 2011**
 - Sterile dressings are recommended
 - Gauze & Tape
 - Must be changed every 48 hours
 - Transparent semi-permeable membrane (TSM)
 - Changed with site rotation on peripheral catheters
 - Gauze used under a TSM is considered a gauze/tape dressing





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Catheter Flushing

- **Definition:**

- Catheter flushing is the periodic administration of a bolus of saline and/or heparinized saline through a vascular access device.

ALL IV Catheters are flushed during the dwell time.

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Catheter Flushing

INS Standard S 45, 2011

- **Flush prior to use to assess catheter function.**
- **Single-use flushing systems**
- **Preservative free NS**
- **Positive fluid displacement**
- **NS is recommended for PIVs**



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Catheter Flushing

- **Locking Volume Considerations**
 - Minimum volume = twice the volume capacity of the catheter and add-on devices.
 - Common Protocols
 - PVA 1-3mL
 - CVC 2-5mL

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Catheter Flushing

- **SAS or SASH**
 - This flushing method is used to ensure that medication incompatible with heparin or other drugs are not mixed
 - saline
 - administer medication
 - saline
 - heparin

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Flushing Techniques

- **Turbulent flushing**
 - Controversial issue
- **Positive fluid displacement techniques**
 - Clamp before disconnect
- **Positive fluid displacement devices**
 - Clamp after disconnect

Site Rotation - Standard

- **INS Standard (Standard 44 (2011))**
 - The nurse should consider replacement of the short peripheral catheter when clinically indicated and when infusion treatment does not include peripheral parental nutrition. The decision to replace the short peripheral catheter should be based on assessment of the patient's condition...
 - VADs placed in an emergent situation shall be replaced as soon as possible and not later than 48 hours.

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Site Rotation – Standard 44 (2011)

- The frequency of short peripheral catheter removal for the purpose of site rotation shall be established in organizational policies, procedures, and/or practice guidelines.
- The nurse should not routinely replace short peripheral catheters in pediatric patients.

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Site Rotation - Guidelines

- **CDC Guidelines (2011)**
 - At least every 72-96 hours (Category 1B)
 - If limited access and no evidence of phlebitis or infection present can be left in place for longer periods (closely monitor)
 - *Pediatrics: Leave in place until IV therapy is completed unless a complication occurs (Category 1B)*

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Peripheral IV Complications

- **Arise and typically surround venipuncture site**
- **Rarely serious**
- **May result in increased LOS and cost**
- **May result in liability**
- **Often preventable**

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Hematoma

- **Nicking vein during insertion**
- **Tourniquet above previous attempt**
- **Poor vascular integrity**
- **Discontinue without adequate pressure**



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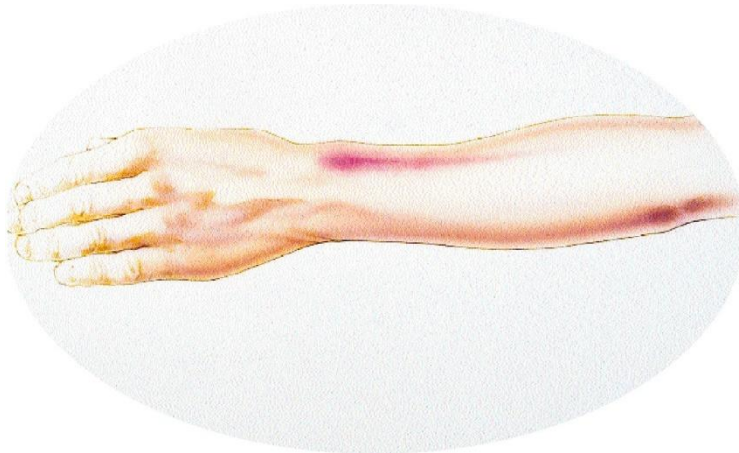
Types of Phlebitis

- **Chemical**
 - Irritation from fluids/medications and/or site preparation agents
- **Mechanical**
 - Factors that cause irritation to vein wall
- **Bacterial**
 - Related to introduction of contaminants

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Phlebitis

- **Progressive complication**
- **Inflammation of intimal lining of vein wall**
- **Signs & Symptoms**
 - Tenderness
 - Erythema
 - Swelling
 - Sluggish flow rates
 - Palpable cord
 - Warmth
 - Streak formation
 - Purulent drainage



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Phlebitis Scale

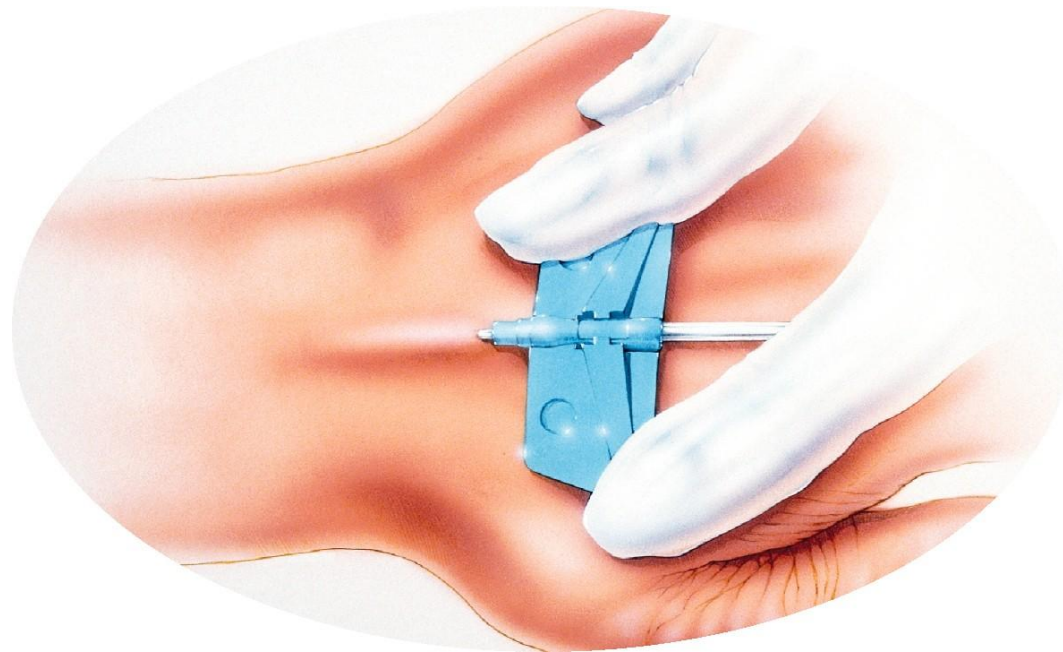
INS Standard 65 (2011)

0	No Symptoms
1	Erythema at access site with or without pain
2	Pain at access site with erythema and/or edema
3	Pain at access site with erythema and/or edema Streak formation Palpable venous cord
4	Pain at access site with erythema and/or edema Streak formation Palpable venous cord >1” Purulent drainage

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Phlebitis

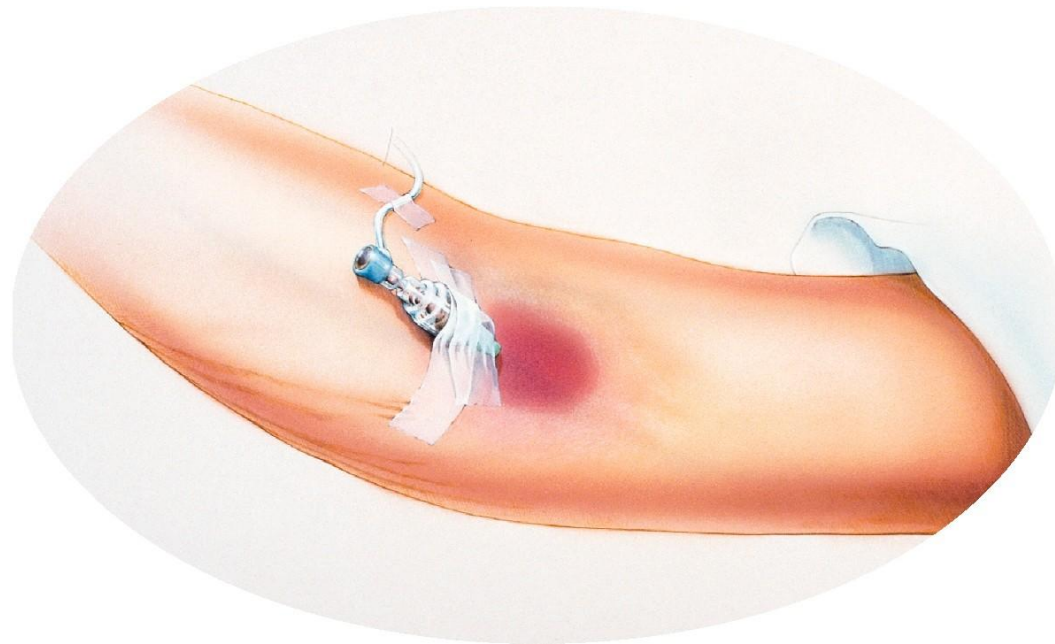
- **Grade 0**
 - No symptoms



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Phlebitis

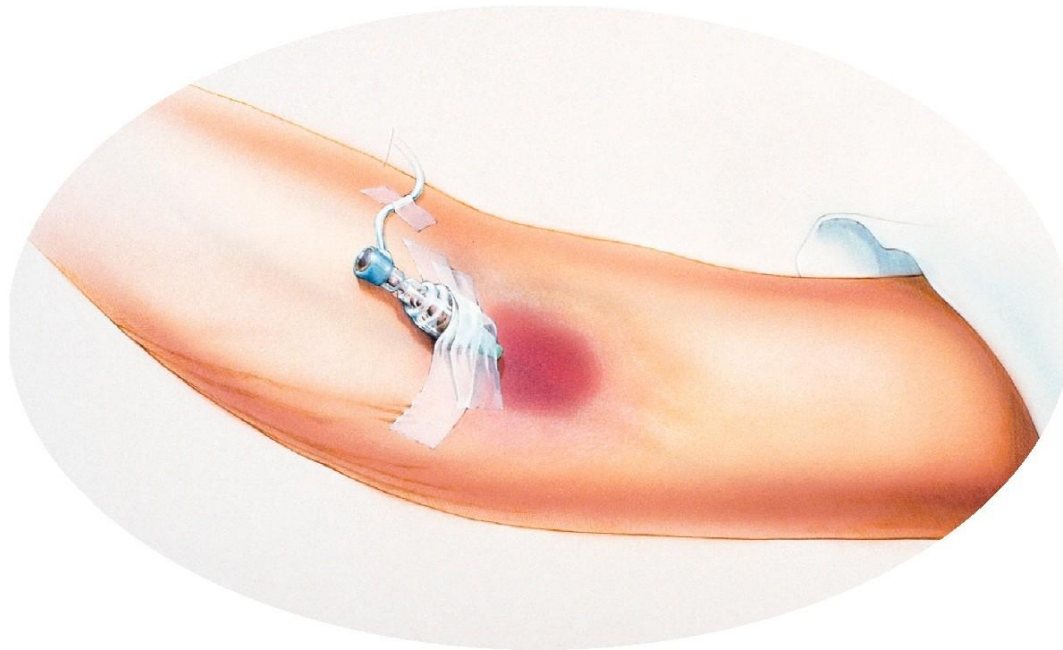
- **Grade 1**
 - Erythema with or without pain



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Phlebitis

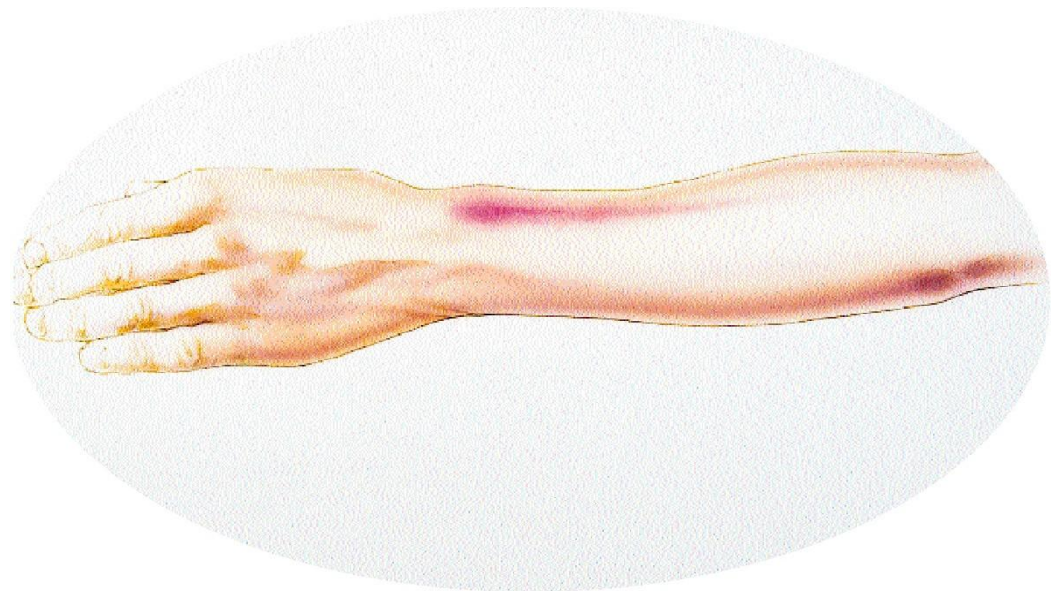
- **Grade 2**
 - Pain at access site with erythema and or edema



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Phlebitis

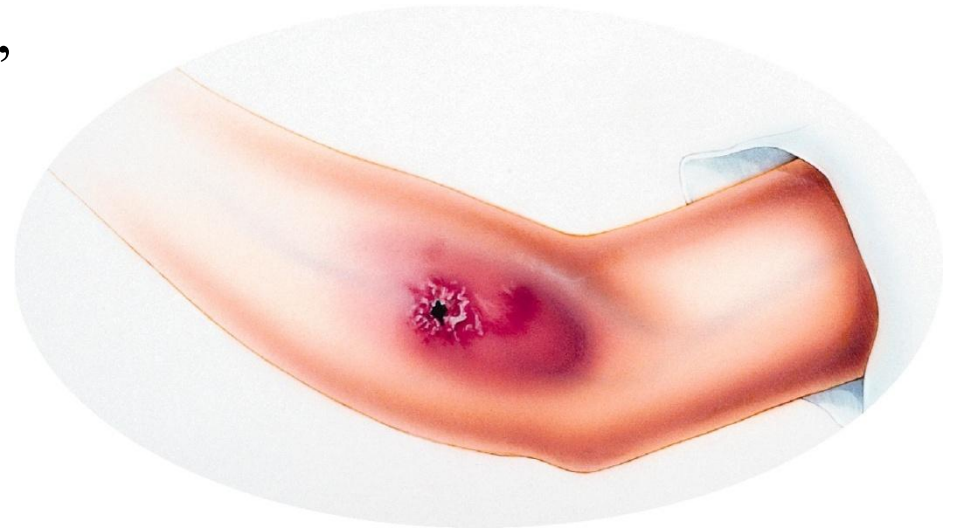
- **Grade 3**
 - Pain at access site with erythema and or edema
 - Streak formation
 - Palpable cord



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Phlebitis

- **Grade 4**
 - Pain at the access site with erythema and or edema
 - Streak formation
 - Palpable venous cord >1'
 - Purulent drainage



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Chemical Phlebitis

- Examples of Osmolality**

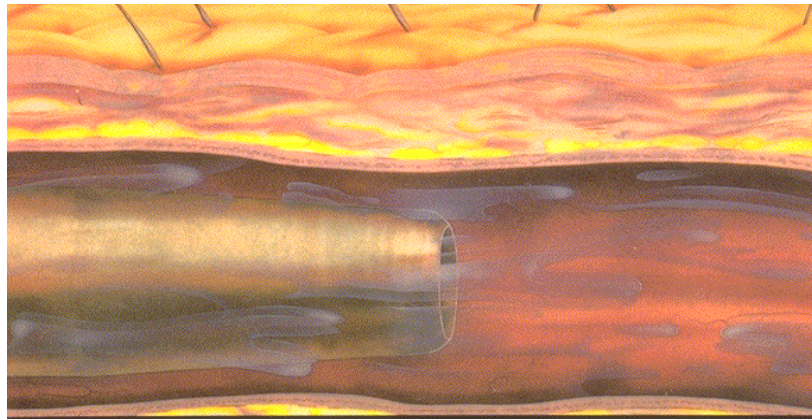
3gm Ticarcillin	
50ml of D5	558mOsm/Kg
50ml of NS .9%	730mOsm/Kg
Sterile Water	298mOsm/Kg

- PPN 813 mOsm/Kg**
- TPN 1400 mOsm/Kg**

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Chemical Phlebitis

- **Other Contributing Factors**
 - Prolonged duration of infusion
 - Inadequate hemodilution
 - Prepping agents not allowed to dry
 - Failure to flush following irritating medications



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Mechanical Phlebitis

Irritation from physical factors

- **Contributing Factors**

- Pistoning of the catheter
- Manipulation of the catheter
- Large catheter, small vein
- Poor skin traction during insertion
- Microparticulate contamination



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Bacterial Phlebitis

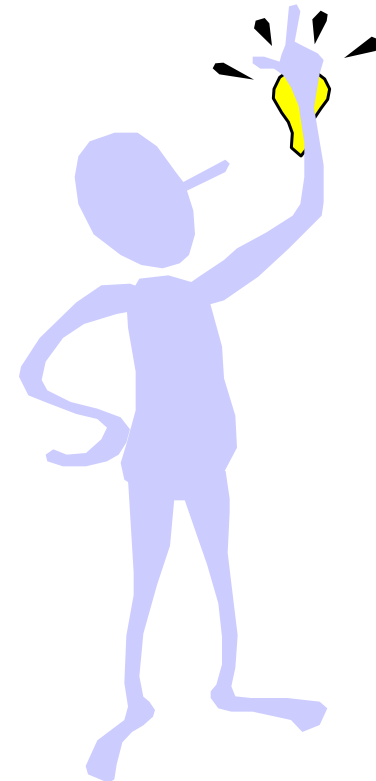
Introduction of bacteria or fungi

- **Least frequently recognized phlebitis**
- **Can lead to catheter related bloodstream infection**
- **Contributing factors**
 - Poor handwashing
 - Breaks in aseptic technique
 - Improper skin preparation/application of preps
 - Nonocclusive dressings, dirty or wet
 - migration of bacteria along catheter entry site
 - Shaving the skin - microabrasions

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Bacterial Phlebitis

- **Contributing Factors**
 - Contaminated equipment & solutions
 - Catheter insertion techniques
 - Inadequate site monitoring
 - Multiple entries into the IV system



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Infiltration

- **Inadvertent administration of non-vesicant medication or solution into the surrounding tissue**

- Signs and Symptoms

- Cool
- C/O pain
- Blanching
- Slowed infusion rate



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Extravasation

- **Inadvertent administration of vesicant medication or solution into the surrounding tissue**
 - **Signs and Symptoms**
 - Swelling
 - Reddened area
 - Tenderness
 - Change in skin color
 - Absence of blood return
 - Tissue feels like a wet sponge



Considerations

Infusion
Selection
Injection

Infusion
Preparation
Injection

Infusion
Administration
Injection

Disposal

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Extravasation Examples



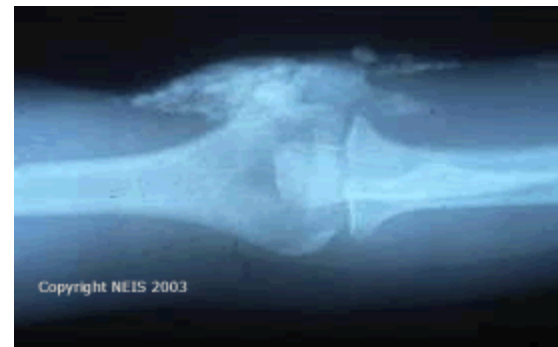
Dopamine



Taxotere



Epirubicin



Calcium Gluconate

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Infiltration Scale

INS Standard 66 (2011)

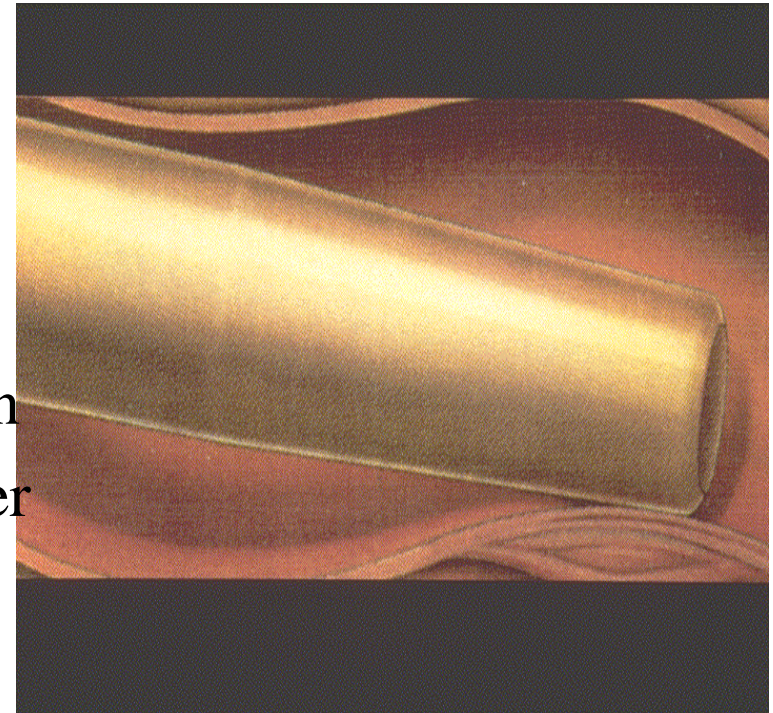
0	No Symptoms
1	Skin blanched, Edema <1” in any direction, Cool to touch, With or without pain
2	Skin blanched, Edema 1”- 6” in any direction, Cool to touch, With or without pain
3	Skin blanched, Translucent, Gross edema >6” in any direction, Cool to touch, Mild to moderate pain, Possible Numbness
4	Skin Blanched, Translucent, Skin tight, Leaking, Skin discolored, Bruised, Swollen, Gross edema >6” in any direction, Deep pitting tissue edema, Circulatory impairment, Moderate to severe pain. Infiltration of any amount of blood product, irritant, or vesicant

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Infiltration/Extravasation

- **Contributing Factors**

- Poor catheter/vein ratio
- Inappropriate vein selection
- Impaired vasculature
- Poor venipuncture technique
- Improper taping and stabilization
- Over manipulation of the catheter
- Catheter material



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Infiltration/Extravasation

- **Common Misconception**
 - The infusion rate will slow or stop
 - Interstitial pressure must overcome gravity pressure
 - A blood return signals no infiltration
 - An infusion pump will immediately detect an infiltration
- **Technique to diagnosis**
 - Lightly compress vessel above catheter tip
 - if flow stops, catheter is in the vein
 - Compare with opposite extremity



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Catheter Occlusion

- **Signs & Symptoms**
 - Resistance when instilling solution/drug
 - Inability to flush catheter or obtain blood return
 - Rate of infusion slows or stops
 - Leaking from insertion site

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Catheter Occlusion

- **Causes**

- Kinked catheter or tubing
- Closed clamps
- Drug precipitate
- Blood occlusion
- Position of catheter tip

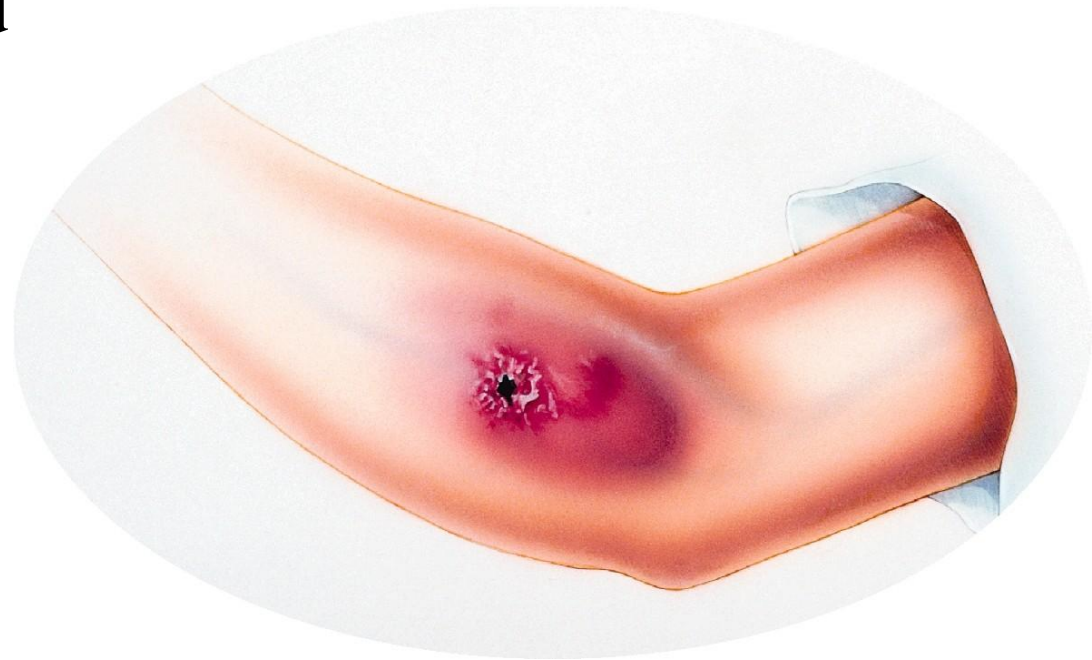
- **Treatment**

- Remove catheter

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Site Infection

- **Signs & Symptoms**
 - Redness & swelling
 - Increased white blood count
 - Elevated temp
 - Purulent drainage



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Site Infection

- **Contributing Factors**

- Long dwell times
- Insertions performed in emergent situations
- Poor insertion techniques
- Loose or contaminated dressings
- Inadequate monitoring

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Site Infection - Prevention

- **Aseptic technique**
- **Site maintenance**
- **Handwashing**
- **Single use supplies**



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Site Infection

- **Treatment**
 - Discontinue peripheral access
 - Culture any drainage (per physician order)
 - Apply sterile dressing
 - Monitor



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Documentation

- **Site rotation**
- **Administration set changes**
- **Therapy changes**
- **Complications**

Considerations

Infusion
Selection
Injection

Infusion
Preparation
Injection

Infusion
Administration
Injection

Disposal

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Questions ?

