

Cheat Sheets

Table of Contents:

1. IV Therapy
2. Peripheral VADs
3. Central VADs
4. VAD Complications
5. Blood Transfusion
6. Transfusion Reactions

IV Therapy & Transfusions

1. IV Therapy

- **Intravenous (IV)** therapy involves the administration of **fluids, electrolytes, medications, or nutrients** directly into the bloodstream to:
 - Maintain hydration
 - Correct imbalances
 - Deliver treatment
- IV fluids are **administered** using a **peripherally** or **centrally** inserted venous access device (VAD).
- IV fluids are classified as **hypotonic, isotonic, or hypertonic** based on their **solute concentration** relative to **blood plasma (TABLE 1)**.
- **Remember: Water** moves by **osmosis** from areas of **lower solute concentration** → Areas of **higher solute concentration** (i.e., **low** → **high osmolality**) (**FIGURE 1**).

FIGURE 1. OSMOSIS

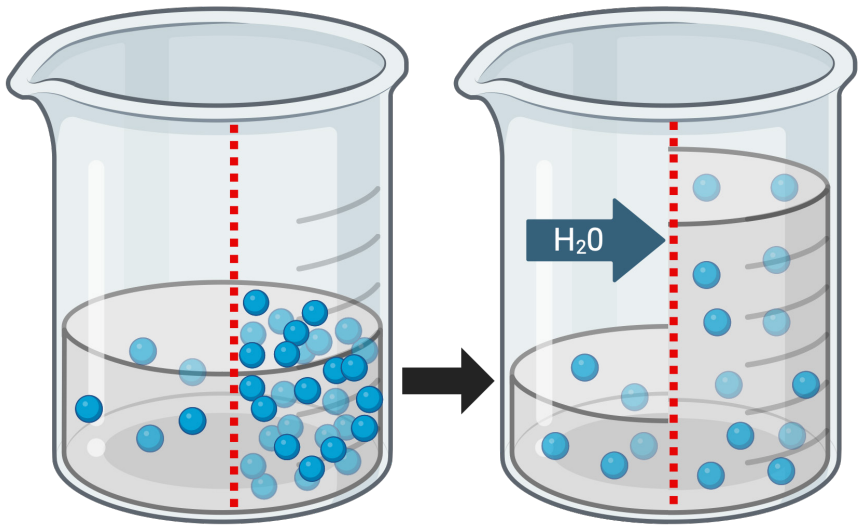
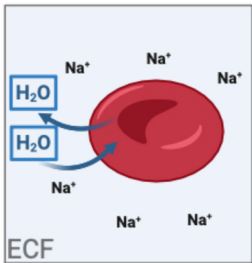
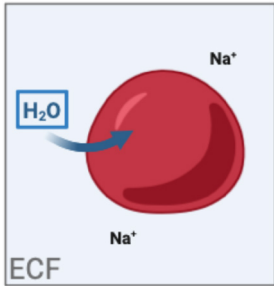


TABLE 1. IV FLUID SOLUTIONS

Solution Type	Examples & Major Indications	Nursing Considerations
Crystalloids		
Isotonic Same solute concentration as blood → No net fluid shifts → Fluid stays in the vascular space. 	Examples • 0.9% sodium chloride (normal saline [NS]) • Lactated Ringer's (LR) Indications • Blood volume replacement (dehydration, blood loss, shock)	• NS is the only IV fluid compatible with blood products. • LR contains K⁺ and lactate; therefore, avoid in clients with: • Kidney disease (impaired K⁺ clearance) • Liver disease (impaired lactate metabolism)

1. IV Therapy, Continued

TABLE 1. IV FLUID SOLUTIONS, CONTINUED

Solution Type	Examples & Major Indications	Nursing Considerations
Crystalloids, Continued		
Hypotonic Lower solute concentration than blood → Water moves into cells → Cells swell. 	Examples 0.45% sodium chloride (½ NS) 5% dextrose in water (D5W) - Isotonic in the bag but acts hypotonic in the body after dextrose is rapidly metabolized from the bloodstream Indications Intracellular dehydration (diabetic ketoacidosis)	Risk for cell lysis: Water shifts into cells → Swelling and rupture. ⚠ Avoid in cases of cerebral edema or burns (can worsen brain swelling and fluid shifts in already vulnerable tissues).  Remember the Hypotonic Hippo cells (cells swell!) → Not safe for fragile brains or burns.
Hypertonic Higher solute concentration than blood → Water moves out of cells → Cells shrink 	Examples 3% sodium chloride (hypertonic saline) 10% dextrose in water (D10W) Indications 3% NaCl: Hyponatremia - D10W: Prevent hypoglycemia	⚠ 3% NaCl: Infuse very slowly to prevent rapid sodium increase and fluid shifts, which can lead to: Osmotic demyelination → Irreversible neurological damage D10W: Monitor for hyperglycemia.
Colloids		
Colloids (plasma expanders) Contain large molecules (proteins) that remain in blood plasma → ↑ oncotic pressure, which “pulls” fluid from edematous tissues into vascular space	Examples - Albumin - Dextran Indications Third spacing (fluid accumulates outside bloodstream and in edematous tissues) - Ascites (liver failure) - Burns - Septic shock	Monitor for circulatory overload (crackles, edema, hypertension).

2. Peripheral VADs

Peripheral venous access devices (VADs), or peripheral IVs, enable infusion of IV fluids, medications, and blood products directly into the bloodstream (**FIGURE 2**).

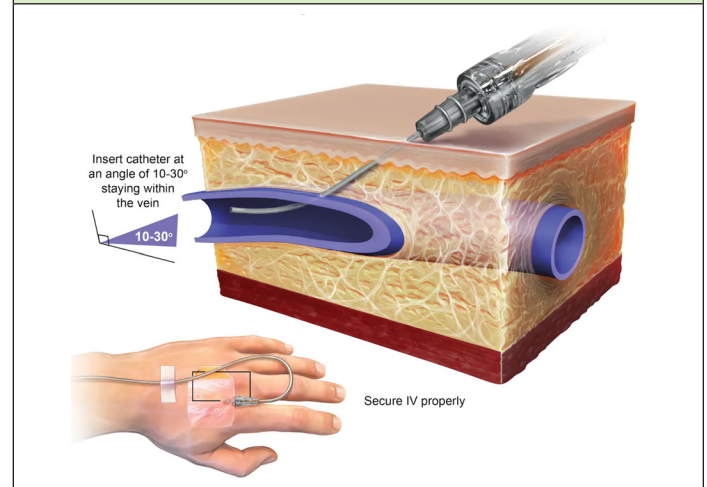
Site selection

- ★ Choose the **most distal** accessible vein, preferably the **forearm** of the **nondominant** arm.
- ★ **Avoid** these sites:
 - Near **joints** (antecubital space): ↑ risk for **dislodgement**, irritation, and discomfort
 - **Lower extremities**: ↑ risk for **thrombophlebitis** and **DVT**
 - Do **not** use an arm on the side of a **mastectomy** or **AV shunt/fistula**: ↑ risk for impaired perfusion

Insertion:

1. **Cleanse site**:
 - Perform **hand hygiene** and don **gloves** (standard precautions).
 - ★ Scrub site with antiseptic solution using a **back-and-forth motion** for **≥30 s** and allow it to dry.
 - **Do not touch** skin after cleansing.
2. Enhance **vein visibility**:
 - Apply tourniquet **4-6 inches (10-15 cm)** above site.
 - ★ Ask client to **open** and **close fist** to ↑ venous distention.
 - **Do not tap** vein (causes **irritation**).
3. **Insert**:
 - **Anchor** the vein with your **nondominant** hand by pulling skin taut below the desired insertion site.
 - ★ Insert the needle **bevel-up** at a **10-30° angle** and advance until **blood return** is seen (confirms vein access).
 - Once **blood return** is seen (“flash”), lower the needle so it is **nearly parallel** with the skin, then advance slightly further into the vein.
 - **Thread the catheter** into the vein and **withdraw the needle completely** (leaving the flexible plastic catheter in place).
 - **Flush with NS** to confirm patency (**swelling** indicates **infiltration**).
 - If **two** insertion attempts **fail**, **stop** and seek help.
4. **Secure**:
 - Use a **securement device** to **prevent dislodgement** (adhesive strips, armboard).
 - Apply a **transparent dressing** to the insertion site and **label** it with the **date**, **time**, and **initials**.

FIGURE 2. PERIPHERAL VAD INSERTION



3. Central VADs

CVADs (central lines) are **invasive** lines used for **high-risk** or **long-term** IV therapy, including:

- ★ **Vesicants** (antineoplastics, vasopressors): Central placement allows for **rapid hemodilution** ↓ risk of **tissue damage**.
- ★ **Chemotherapy** or **prolonged IV antibiotics**

CVADS are inserted using ultrasound guidance into a **large central vein** (subclavian, jugular) and terminate in the **superior vena cava** near the heart (**FIGURE 3**).

CVADS must be placed by a **trained provider** using **sterile technique**, and precautions must be taken to ↓ risk of **health care-associated infection** (**TABLE 2**).

TABLE 2. CLABSI RISK AND PREVENTION

Central line-associated bloodstream infection (**CLABSI**) is a bloodstream infection caused by contamination of a central line → Sepsis, shock, and death.

CLABSI Prevention

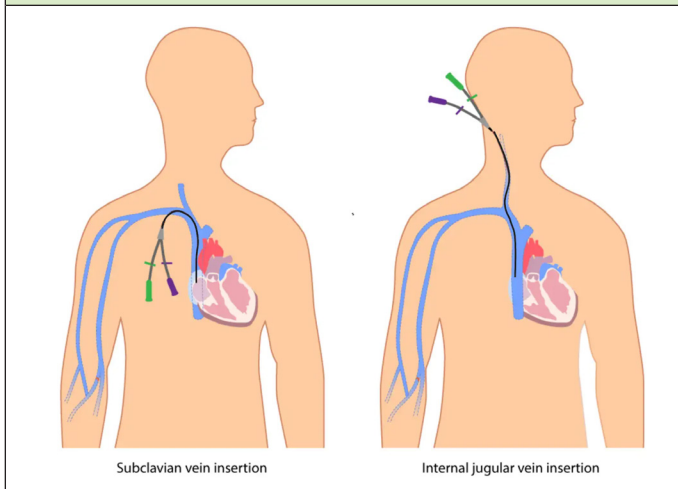
- ★ Use **strict sterile technique** during insertion and dressing changes.
- ★ Perform **hand hygiene** before touching the line.
- ★ **Scrub the hub** vigorously for **15 s** with an alcohol-based antiseptic before accessing.
 - Cleanse insertion site with **chlorhexidine** during **line insertion** and every **dressing change** (provides broad-spectrum, long-acting protection from pathogens).
 - **Assess the site daily** for redness, swelling, or drainage.
 - Remove line **as soon as it is no longer needed**.

3. Central VADs, Continued

Types of central lines

- **Central venous catheter (CVC):** Inserted through the **subclavian** or **jugular** (femoral vein should be avoided, if possible, due to ↑ risk of infection)
- **Peripherally inserted central catheters (PICCs):** Inserted through the upper arm
- **Implanted ports:** Surgically implanted under the skin and accessed with a specialized needle.

FIGURE 3. CENTRAL VADS



Accessing and flushing

- ★ **Confirm catheter placement** via X-ray **before** first use.
- **Disinfect catheter hub/port** (“Scrub the hub” for **15 s**) with alcohol or chlorhexidine before accessing.
- ★ Use only **10 mL syringes** or larger (smaller syringes generate too much pressure → ↑ risk of **catheter rupture**).
- ★ Flush with **saline before** and **after** medications.
 - Flush using the **push-pause technique** (alternating short pushes and pauses) to create turbulence that **dislodges platelets, fibrin, and medication residue, preventing catheter occlusion**.
- ★ If **resistance** is felt, **do not force flush** as this could rupture the catheter → **Emboli**.

Dressing changes and site care

- ★ Use **aseptic technique** throughout the procedure.
- ★ Use **sterile gloves** for **site care** and **application** of new dressing to **prevent CLABSI**.
- Cleanse site with a **chlorhexidine-based solution** using a **back-and-forth motion**, and allow it to **air dry completely**.
- Use a **transparent** dressing to allow for continuous observation of the site.
 - Change **weekly** or sooner if loose, wet, or soiled.
- **Label dressing** with date, time, and initials; document in the medical record.

Central VAD removal

- ★ When removing the central VAD, instruct the client to **hold breath** or perform the **Valsalva maneuver** during withdrawal to ↑ intrathoracic pressure and ↓ risk of **venous air embolism**.
- **Immediately** cover the site with **sterile gauze** and apply **firm pressure** to prevent bleeding and air entry.
- **Inspect the catheter** for intactness to ensure no fragments remain in the vein.

4. VAD Complications

Proper **assessment** of VADs is essential to **preventing complications** of IV therapy (**TABLE 3**).

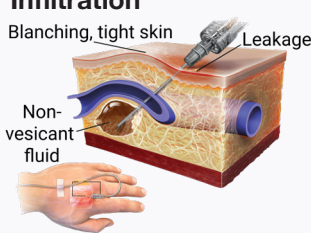
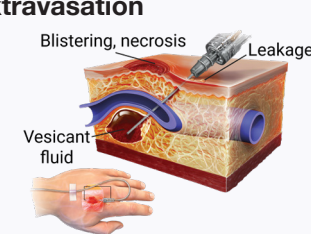
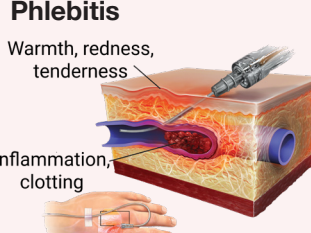
- Frequently **inspect** the insertion site for **redness, swelling, or drainage**.
- Monitor for signs of **catheter-related bloodstream infections (CRBSIs)**, such as fever, chills, or tenderness at the site.
- ★ Monitor for signs of catheter **dislodgement** or **occlusion** (↓ patency, unable to aspirate, change in catheter length).
- For **local VAD complications** (infiltration, extravasation, phlebitis):
 - ★ **Stop the infusion, discontinue** the affected VAD (after giving antidote as prescribed), and **place a new VAD** at a different site (proximally or on the opposite arm).
 - Apply a **warm or cold compress** as indicated for pain relief (**warm compress** preferred for **phlebitis**).

NCLEX Star Points

- 1 **Flushing central lines:** When **flushing a central line**, use a **≥10 mL syringe** and the **push-pause technique** to prevent occlusion and **avoid rupturing** the catheter; **do not force** a flush if resistance is felt.

4. VAD Complications, Continued

TABLE 3. COMPLICATIONS OF INTRAVENOUS THERAPY

	Complication	Definition	Signs	Action
	Fluid overload	Fluid enters the bloodstream too quickly → Circulatory overload.	• Dyspnea, crackles • ↑ BP • Edema, JVD	1. Slow the infusion rate. 2. Elevate HOB. 3. Notify HCP.
Fluid Leakage	★ Infiltration Blanching, tight skin 	Leakage of a non-vesicant solution into surrounding tissue	★ Cool, pale, edematous skin at VAD site • Infusion may slow (from ↑ resistance)	1. Stop infusion. 2. Discontinue VAD. 3. Elevate the extremity.
	Extravasation Blistering, necrosis 	Leakage of a vesicant solution (chemotherapy, vasopressor), which damages surrounding tissue	Signs of infiltration plus tissue damage • Pain • Blistering, necrosis	1. Stop infusion. 2. Aspirate remaining drug from the line. 3. Administer antidote as prescribed through the affected VAD, then discontinue.
Irritation & Infection	★ Phlebitis Warmth, redness, tenderness 	Inflammation and irritation of the vein (risk for thrombosis)	★ Warm, red, tender skin at VAD site • Streaked, cord-like vein	1. Stop infusion 2. Discontinue VAD. 3. Apply warm compress as needed for pain.
	Site infection	Infection at catheter insertion site	Site appears: • Red, swollen, and warm • Tender • Purulent drainage	1. Stop infusion. 2. Discontinue VAD. 3. Save catheter tip for culture. 4. Cleanse site with alcohol and apply a sterile dressing.

★ NCLEX Star Points

- ② **IV therapy complications:** **Infiltration** causes **cool, pale, edematous** skin at the IV site; **phlebitis** causes **warm, red, and tender** skin. Both require **stopping the infusion** and **VAD removal**.

5. Blood Transfusion

Blood components are collected from a **donor** and transfused into a **recipient** to treat conditions such as blood loss, anemia, or coagulopathy.

The specific type of blood component transfused varies based on client needs (red blood cells for anemia, platelets for thrombocytopenia) (TABLE 4).

TABLE 4. TYPES OF BLOOD PRODUCTS

Product	Indication
Packed Red Blood Cells (PRBCs)	Replace red blood cells in hemorrhage or anemia
Fresh Frozen Plasma (FFP)	Replaces clotting factors in coagulation disorders (DIC)
Platelets	Replace platelets in thrombocytopenia

Safe blood product administration focuses on **preventing complications** and ↓ risk for **transfusion reactions** through proper **verification, preparation, and monitoring**.

1. Verification:

- Confirm client identity using **two identifiers** (name, DOB).
- ★ **Cross-check** the client's **identity**, blood **type**, and product **expiration date** with another **licensed professional (RN)** at the bedside.
- Confirm **ABO compatibility** (TABLE 5).
 - **Donor** and **recipient** blood types must be **compatible** to prevent **life-threatening immune reactions** from mismatched antigens and antibodies.

2. Preparation:

- ★ Use a large-bore IV catheter (**20-gauge** or larger) for **RBC administration** to **prevent cell damage**.
- ★ Prime tubing using **only 0.9% sodium chloride (NS)**.
 - Do **not** use **lactated Ringer's** or **dextrose** (causes **hemolysis**).
 - **No other medications** should be infused through the same tubing as the blood product.
- **Inspect** the blood product for **clots, discoloration, or leaks**.

3. Administration:

- ★ Obtain **baseline vital signs**.
- ★ **Start** transfusion within **30 min** of obtaining the product.
 - Products **not used** within **30 min** should be **returned** to the **blood bank**.
- ★ **Stay with the client** for the **first 15 min** to monitor for signs of a **transfusion reaction**.
- Obtain vital signs **15 min after** starting transfusion and **≤30 min intervals** throughout the transfusion.
- **Complete PRBC** infusions within **4 hr** to ↓ risk of bacterial contamination.

TABLE 5. COMPATIBILITY FOR RBC TRANSFUSIONS

Recipient	Can receive RBC transfusions from:
A	A and O
B	B and O
AB (universal recipient)	A, B, AB, and O
O	O (universal donor)
Rh-compatibility • Rh-negative clients can only receive Rh-negative blood. • Rh-positive clients can receive either Rh-positive or Rh-negative blood.	

NCLEX Star Points

③ **Blood product verification:** Two licensed professionals must verify **client identity**, **blood type**, and **expiration date** before administering blood products.

④ **Blood transfusion:** Only **0.9% normal saline** is compatible with blood transfusions; do **not** use other solutions such as dextrose or LR.

7. Transfusion Reactions

Transfusion reactions are life-threatening complications of blood administration. Rapid recognition and intervention are critical to preventing shock or organ damage (**TABLE 6**).

TABLE 6. TRANSFUSION REACTIONS

Reaction Type	Cause	Signs	Actions
★ Acute hemolytic reaction	ABO incompatibility	Fever, chills, back pain , ↓ BP, hematuria	★ First priority = stop transfusion. • Notify HCP immediately. • Maintain IV access with NS using new tubing (to avoid infusing more incompatible blood). • Save the blood bag and tubing and send to the blood bank for analysis.
Febrile reaction (non-hemolytic)	Recipient has antibodies against donor WBCs (more common in clients with multiple transfusions)	Fever, chills, headache, flushing	• First priority = stop transfusion. • Administer antipyretics. • Notify HCP.
Allergic reaction	Hypersensitivity to donor plasma proteins	Hives, itching, wheezing	• First priority = stop transfusion. • Administer antihistamines (epinephrine if symptoms progress). • Notify HCP. • Restart slowly if ordered.
Circulatory overload	Too rapid transfusion	Dyspnea, crackles, ↑ BP, jugular vein distention	• Slow infusion. • Elevate HOB. • Administer diuretics if prescribed.

★ NCLEX Star Points

- ⑤ **Transfusion reaction:** If **fever, chills, or back pain** occurs during a **blood transfusion**, suspect a **transfusion reaction** and **immediately stop** the transfusion.

NCLEX Top 5 Targets

- ① When **flushing a central line**, the nurse should use a _____ (**what size?**) **syringe** and the _____ technique. If **resistance** is felt, the nurse _____ (**should or should not?**) apply more pressure.
- ② **Cool, pale, edematous** skin at VAD site indicates _____, and **warm, red, tender** skin at the VAD site indicates _____. For both cases, **the nurse should _____ and _____ (what two actions?)**.
- ③ What **three things** should the nurse verify with **another licensed professional** before administering a **blood product**?
- ④ What **solution** should be used to **prime the IV tubing** before **blood product administration**?
- ⑤ Symptoms of a **transfusion reaction** associated with a **blood transfusion** include _____, _____, and _____ **pain**. If these symptoms are observed, what is the nurse's **first priority**?

Answers: 1. ≥10 mL, push-pause; should not 2. infiltration, phlebitis; stop the infusion, remove the VAD. 3. Client identity, blood type, and blood product expiration date 4. 0.9% sodium chloride (normal saline) 5. fever, chills, back pain; Stop the infusion.

References:

- Astle, B., Duggleby, W., Potter, P. A., Stockert, P. A., & Hall, A. M. (2024). *Potter and Perry's Canadian fundamentals of nursing* (7th ed.). Elsevier.
- Berman, A. B., Snyder, S. J., & Frandsen, G. (2021). *Kozier & Erb's fundamentals of nursing: Concepts, process, and practice* (11th ed.). Pearson.
- Harding, M. M., Kwong, J., Hagler, D., & Reinisch, C. (Eds.). (2023). *Lewis's medical-surgical nursing: Assessment and management of clinical problems* (12th ed.). Elsevier.
- Ignatavicius, D., Heimgartner, N., & Rebar, C. (Eds.). (2024). *Medical-surgical nursing: Concepts for clinical judgment and collaborative care* (11th ed.). Elsevier.

- Potter, P. A., Perry, A. G., Stockert, P. A., & Hall, A. M. (Eds.). (2023). *Fundamentals of nursing* (11th ed.). Elsevier.
- Tyerman, J., Cobbett, S., Harding, M. M., Kwong, J., Roberts, D., Hagler, D., Reinisch, C. (Eds.). (2023). *Lewis's medical-surgical nursing in Canada: Assessment and management of clinical problems* (5th ed.). Elsevier.

Attributions:

- **Osmosis:** Created with [BioRender.com](https://www.biorender.com/)
- **Cell Osmolality:** Created with [BioRender.com](https://www.biorender.com/)
- **Central VADs:** [Glynda Rees Doyle and Jodie Anita McCutcheon, from Clinical Procedures for Safer Patient Care, CC BY 4.0](#), via Wikimedia Commons