IV therapy and central lines

IV fluids, sites and site checks, peripheral complications, central lines, CLABSI, flushing and parenteral nutrition

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1 AT A GLANCE

An IV is a direct line into the bloodstream, and a direct line for harm. A central line carries some of the highest infection risks in the hospital.

Three kinds of IV fluid

Type	Examples	What it does	Watch
★ **Isotonic**	0.9 percent saline, lactated Ringer's	Expands blood volume without shifting water into the cells. Replaces losses from bleeding, dehydration, shock, burns or diarrhea; raises blood pressure	Overload: caution with high blood pressure, heart failure, kidney disease
Hypotonic	0.45 percent saline; dextrose 5 percent once its sugar is used	Moves water into cells: treats dehydrated cells. Diabetic ketoacidosis starts with isotonic fluid	Too much can cause brain swelling and low pressure
★ **Hypertonic**	3 percent saline	Pulls water out of cells into the vessels: brain swelling or severe low sodium, usually in intensive care. **Hypertonic saline isn't used to rehydrate in diabetic ketoacidosis**	Overload: check blood pressure, breathing and the sodium level

IV fluids are drugs: Check the rights, allergies, expiration and compatibility. IV electrolytes need the correct rate: potassium given too fast can stop the heart.

Equipment

- A pump is the safest way to give an exact amount. Gravity sets: macro-drip, 10, 15 or 20 drops per mL; micro-drip, 60, for children.
- Prime all tubing before connecting it, to keep air out. Keep the drip chamber a third to half full.
- A piggyback bag hangs higher than the primary bag, so it runs first.
- Lower gauge, wider catheter, faster flow. Usually 18 or 20 gauge for adults; 22 for frail older adults and children.

Sites and site checks

- Hand or arm, away from joints, under a clear dressing. Avoid an arm with a dialysis fistula, lymphedema, a clot, a fracture or heavy scarring.
- ★ **Breast surgery alone isn't a ban**: assess axillary lymph-node treatment, existing lymphedema, access needs, policy, and any limb alert band.
- ★ Site checks depend on the client, the therapy and the local standard; **4 hours is not a universal minimum**. Check more often for children, vesicants, and clients who can't report symptoms.

Peripheral IV complications

Problem	Signs	Action
★ **Infiltration**	Fluid leaking into the tissue: swelling, coolness, tight skin, leaking, slowed flow or pump alarms	**Stop the infusion and remove the catheter**; restart at a new site. Flushing pushes more fluid into the tissue
★ **Extravasation**	A vesicant leaking into the tissue: burning, blisters, or tissue death	Stop it, disconnect the tubing, and **draw back from the hub** before removing the catheter; then follow the drug's policy
Phlebitis, infection	Inflamed vein: redness, pain, warmth, swelling, sometimes a hard cord. Infection: pus	Pus: remove the catheter and culture it
Fluid overload	Falling oxygen saturation, fast breathing, crackles, restlessness, pink frothy sputum	Slow or stop the infusion per protocol, raise the head of the bed, give oxygen, check vital signs, and **call the provider at once**
★ **Suspected venous air embolism**	Sudden shortness of breath, coughing, chest or shoulder pain	**Clamp to stop the air**, give oxygen, call a rapid response; if allowed, turn left side, head down. Positioning differs for arterial or cerebral air

Removing an IV: Clamp the line, loosen the dressing toward the site, and pull parallel to the skin. Hold pressure until the bleeding stops, then reassess; clients on anticoagulants may need longer. Check that the tip is intact: a missing piece can travel in the bloodstream, so report it at once.

Central venous access devices

Device	Key points
★ **PICC**	An arm vein, as long as clinically indicated: **no universal 6-month maximum**. Not in end-stage kidney disease, to save veins for dialysis
Non-tunneled	Days to weeks. Subclavian lowers infection, but weigh insertion risks and **avoid it in hemodialysis or advanced kidney disease**. Adults: avoid the femoral vein
Tunneled	Runs under the skin to an exit site, which helps keep germs out. Long-term therapy, like chemotherapy
Implanted port	A small reservoir under the skin below the collarbone, reached with a **noncoring needle**

Before first use: Insertion needs informed consent. The tip's position is confirmed, often by chest X-ray, before the line is used.

Educational use only. Not a substitute for clinical judgment, your facility's policy or the provider's orders. Where practice varies, follow facility policy and state law. No patient information.

IV therapy and central lines

1 AT A GLANCE, CONTINUED

Preventing CLABSI

- Bundle: hand hygiene, full barrier precautions at insertion, chlorhexidine skin prep.
- ★ **Ask every day whether the line is still needed**, and remove it promptly when it isn't.
- ★ Before every access, **scrub the hub with friction for at least 15 seconds**, then let it dry.
- Dressings: gauze every 2 days, transparent every 7, or sooner if damp, loose or soiled.

Flushing

- Draw back for a blood return, then flush with sterile 0.9% saline.
- ★ **10 mL or larger syringe**: smaller syringes create more pressure, which can rupture the catheter.
- ★ **Never flush against resistance.** Blocked? Check kinks and clamps, then reposition: raise the arm, cough and breathe deeply, or stand and sit. A thrombolytic may be ordered.

Central line complications

Problem	Action
Infection: redness, swelling, drainage or tenderness at the site, or a rising white count	Notify the provider, expect blood cultures, follow the sepsis protocol. The line may be removed and its tip cultured
Slipped out partway	Measure the external length. **Never push it back in**; notify the provider
★ **Out all the way**	Press firmly; an **air-occlusive sterile dressing**; a colleague calls rapid response
Catheter breaks	Clamp near the insertion site; cover with sterile gauze; keep scissors away
★ **Suspected venous air embolism: sudden shortness of breath, coughing, chest pain, or confusion**	Stop the air entry, call rapid response, give high-flow oxygen; if allowed, left side, head down. Prevent it: hubs closed, clamps engaged
Pneumothorax after a neck or chest insertion: sharp chest pain on breathing in, breathlessness, dry cough	Call rapid response, give high-flow oxygen, and expect a chest tube

Parenteral nutrition (PN)

- Glucose, amino acids, electrolytes and vitamins, often with lipids, pumped usually through a central line. Used when the gut can't be used, like a prolonged ileus, or can't meet needs; if the gut works, enteral feeding comes first.
- ★ **Too much dextrose: high glucose**, hyperosmolar coma, and death. Check glucose, and give insulin as ordered. Severe malnutrition: refeeding syndrome can drop potassium, phosphorus and magnesium, so levels are checked and feeding starts slowly.
- ★ **A dedicated line**, a 1.2 micron filter when lipids are included, no other drugs added. Don't draw blood from the PN lumen. Bag with additives: used within 24 hours; lipid through a Y-connector: within 12.

2 PRIORITY AND SAFETY CALLS

★ Swollen, cool, tight site with pump alarms: **stop the infusion and remove the catheter**, then restart at a new site. Don't flush it.

★ Sudden shortness of breath and chest pain after a bag change or an open hub: **stop air entry, give oxygen, call a rapid response**.

Resistance when flushing a central line: stop, check kinks and clamps, reposition, and report it if it stays blocked.

PN glucose of 286 mg/dL: report it, and expect glucose checks and insulin as ordered.

3 EXAM ANCHORS

1. Isotonic replaces volume, hypotonic hydrates cells, hypertonic pulls water into the vessels.
2. Traps: hypertonic fluid in diabetic ketoacidosis, flushing an infiltrated line, an IV in a restricted arm.
3. Infiltration and extravasation: stop and remove. Overload: slow or stop it, sit up, oxygen, call.
4. Traps: flushing against resistance, a small syringe, pushing a slipped catheter back in, labs from PN lumen.
5. Poorest PICC candidate: end-stage kidney disease, to preserve arm veins for dialysis.

4 SELF-QUIZ

1. 3 percent saline is _____, and it isn't used to rehydrate in diabetic ketoacidosis.
2. Flush a central line with a _____ mL or larger syringe.
3. Scrub the hub with friction for at least _____ seconds.
4. An implanted port is reached with a _____ needle.
5. PN with lipids runs through a _____ micron filter.

ANSWER KEY 1. hypertonic · 2. 10 · 3. 15 · 4. noncoring · 5. 1.2

5 SOURCES

1. Open RN, Nursing Skills 2e, 23.2 IV Therapy Basics. wtcs.pressbooks.pub/nursingskills/chapter/23-2-iv-thera…
2. Open RN, Nursing Skills 2e, 23.4 IV Therapy Site Assessment and Complications. wtcs.pressbooks.pub/nursingskills/chapter/23-4-iv-thera…
3. Open RN, Nursing Advanced Skills, 4.2 Basic Concepts (central lines). wtcs.pressbooks.pub/nursingadvancedskills/chapter/4-2-b…
4. CDC, Intravascular catheter-related infections: summary of recommendations. cdc.gov/infection-control/hcp/intravascular…

Built from RN PocketPal course lessons: IV therapy and peripheral lines (c05-l16); Central lines and parenteral nutrition (c05-l17). Every line on this sheet comes from those lesson scripts.

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