Intravenous (IV) Therapy

This is the delivery of fluids, medications, electrolytes, nutrition, or blood products directly into the vascular system through a vascular access device.

Due to the substance's direct entry into the bloodstream: IV therapy has a quick effect and necessitates careful monitoring for side effects.

Common reasons for IV therapy:

- **Replace fluid losses**
- **Correct electrolyte disturbances**
- **Administer medications**
- **Provide blood or blood components**
- **Provide parenteral nutrition**
- **Maintain venous access**
- **Restore or maintain circulating volume**

TYPES OF IV SOLUTIONS

IV Solutions	Examples	Effect on water	Common uses	Watch out for
Isotonic	**0.9% sodium chloride (Normal Saline)**	**Little/ no major shift** of water into or out of cells. Primarily expands the ECF/Intravascular fluid	**Fluid volume deficit**, dehydration, **blood loss,** hypotension, shock	Fluid overload: edema, crackles, dyspnea, Increased BP
	Lactated Ringer's (LR)		Fluid resuscitation, trauma, Burns, Peri-operative fluid replacement, Significant fluid loss	

Hypotonic	**0.45% Sodium Chloride (NaCl)** **D5W isotonic in the bag, but acts as hypotonic in the body. Dextrose is rapidly metabolized, leaving free water.**	**Water moves from the blood stream into cells**	Intracellular dehydration (DKA),Hypernatremia, Situations requiring free-water replacement	Hypotension, worsening Hypovolemia, Cellular swelling, Cerebral edema
Hypertonic	**3% NaCl**	**Water moves from cells to bloodstream**	Severe symptomatic **hyponatremia**, Selected situations involving cerebral edema	Fluid overload, pulmonary edema, Hypernatremia, Cellular dehydration
	Concentrated dextrose solutions	Increases extracellular osmolality and initially pulls water toward the vascular space	Specific clinical situations requiring concentrated glucose	**Hyperglycemia**, fluid shifts, fluid overload depending on solution

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Colloids	**Plasma expanders** **Albumin** **Dextran**	IV solutions containing large molecules, such as proteins, that largely remain within the bloodstream and increase oncotic pressure, drawing water into the vascular space.	Third spacing, selected cases of severe hypoalbuminemia/volume depletion, burns, ascites, and selected shock states	Monitor for fluid/circulatory overload: crackles, edema, ↑ BP, dyspnea

Remember:

- **The only IV fluid compatible with all blood products is 0.9% NaCl (normal saline)**
- **LR contains Na^+, Cl^-, K^+, Ca^{2+}, and lactate; use with caution in kidney/liver disease. Its calcium is why LR is never run with blood.**
- **3% NaCl requires close monitoring. Infuse slowly to prevent rapid sodium increase**

Peripheral Vascular Access Devices

Peripheral IV Catheter

PIVC is inserted into a relatively small peripheral vein, commonly in the hand or arm.
Common adult sites:
dorsal hand veins, forearm veins, cephalic vein, basilic vein

Remember: Upper-extremity sites are recommended for peripheral catheter insertion in adults

Site Selection:

Choose a Site That Is:

- **Intact and easily accessible**
- **Free from infection**
- **Free from edema**
- **Free from bruising or hematoma**
- **Appropriate for the prescribed therapy**

Avoid areas with:

- **Infection, phlebitis, or significant edema**
- **Burns, hematoma, or injury**
- **Areas near joints**
- **The arm on the side of a mastectomy**
- **An AV shunt/fistula (protect the dialysis access)**

General Principle: Start distally when possible. This preserves more proximal veins for later attempts

IV Catheter Gauge- The smaller the gauge number, the larger the catheter

“Oh Good Green Pony, Buy Your Pumpkin, “

Gauge	Typical Consideration
14 (Orange)	Major Trauma, Very rapid fluid resuscitation, massive transfusion
16 (Grey)	Emergency surgery, major blood transfusion, shock
18 (Green)	blood products, surgery, rapid fluids
20 (Pink)	Routine adult IV Therapy
22 (Blue)	Smaller/Fragile veins
24 (Yellow)	Neonates, Infants, Very small or fragile veins
26 (Purple)	Premature infants/neonates (NICU), Very tiny veins

Reminder: Peripheral IV insertion

- **Clean: Wash your hands, put on fresh gloves, cleanse the site with antiseptic (e.g., chlorhexidine) and allow it to dry fully. Avoid touching the skin that has been prepared.**
- **Distend: Place the tourniquet 10–15 cm above the intended site. Request that the client open and close their fist. Avoid slapping or tapping the vein.**
- **Insert: Insert the catheter bevel-up at a 10–30° angle after stabilizing the vein. Reduce the angle and move the catheter forward after blood flashback verifies venous entry.**
- **Thread: Move the flexible catheter forward rather than the needle. After carefully removing the needle and releasing the tourniquet, flush with NS as directed. Pain or swelling on flushing indicates possible infiltration — remove and restart.**
- **Secure: Stabilize the catheter, fasten the IV tubing or extension, and cover it with the proper sterile dressing. Label in accordance with the policies of the facility.**

Remember: 18-20g are preferred for blood transfusions, but 20-24g are also acceptable for non-rapid transfusion.

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Central Vascular Access Devices

A central VAD is inserted into a large vein (subclavian/internal jugular, usually ultrasound-guided); the tip ends in the superior vena cava, confirmed by X-ray

Type of CAD	Where/How it is inserted	Where the tip ends	Common uses
PICC (Peripherally Inserted Central Catheter)	Peripheral vein	Central vein	Long-term IV therapy, Antibiotics, Chemo, TPN
Non-Tunneled CVC	Directly into central vein		Short-term/acute care
Tunneled CVC **Hickman** **Broviac**	Central vein + Tunneled under skin		Long-term therapy (chemo, TPN, dialysis)
Implanted port	Completely under skin		Long-term Intermittent Therapy, Chemo

PERIPHERAL VS. CENTRAL ACCESS

Feature	Peripheral VAD	Central VAD
Location	Peripheral Vein	Central venous circulation
Examples	Short PIV, midline	PICC, CVC, Port
Typical use	Short-term therapy	Long-term/Specialized therapy
Vesicant/Highly irritating therapy	Often inappropriate	Appropriate
TPN (Total Parenteral Nutrition)	Requires central access when highly concentrated	Common indication

Core Principles for Preventing VAD Infection

- **Hand Hygiene**
- **Aseptic Technique**
- **Appropriate skin antisepsis**
- **Proper dressing and catheter-site assessment**

MAJOR VAD COMPLICATIONS

Complication	Definition	Assessment Findings	Interventions
Infiltration	**Non-vesicant** IV fluid leaks into surrounding tissue	**cool, pale, swollen** site; discomfort	• **Stop infusion** • remove catheter per protocol • elevate arm
Extravasation	Vesicant/Irritating medication leaks into surrounding tissue	Burning, pain, swelling, blanching, blistering	• **Stop infusion** • do not flush; instead, aspirate remaining drug • Give antidote if necessary.
Phlebitis	Inflammation of the Vein	Red, warm, painful/tender vein	• **Stop infusion** • remove catheter • warm compress if appropriate
Infection	Microorganisms infect the catheter site or blood stream	redness, warmth, drainage, fever, chills	• **Stop infusion** • remove and preserve catheter tip for culture. • Clean site using aseptic technique

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Hematoma	Blood collects in tissue after vessel injury	Bruising, swelling, pain	• Apply pressure • Assess site
Occlusion	Catheter becomes blocked, preventing normal flow	resistance, poor/no flow, pump alarm	• Never force flush • Assess cause
Air embolism	Air enters the bloodstream and obstructs circulation	sudden dyspnea, chest pain, hypotension, tachycardia	• Clamp catheter; LEFT side, Trendelenburg; 100% O_2; notify provider/RRT
Thrombosis	blood clot forms around or near the catheter	swelling, pain, redness	• Assess site • Do not force flush • notify provider/follow protocol

Blood Transfusion

Administration of whole blood or a specific blood component through an IV route to replace a deficient blood component, improve oxygen-carrying capacity, or restore circulating volume.

Component	Primary Purpose
Packed RBCs	Increase oxygen-carrying capacity **RBC=Oxygen**
Platelets	Prevent/Treat bleeding caused by low/dysfunctional Platelets **Platelets=Bleeding control**
Fresh Frozen Plasma (FFP)	Replace Multiple clotting factors **FFP = Clotting factors**
Cryoprecipitate	Replace fibrinogen and selected clotting factors **Cryo=Fibrinogen**

Whole blood	Replaces RBCs, Plasma, and Volume Used mainly in **major/life threatening hemorrhage** when indicated

Blood Types and Compatibility

ABO System

Blood type is determined by the antigens present on RBCs and corresponding antibodies in plasma.

Blood Type	RBC Antigen	Plasma Antibody	Can receive RBCs from
A	A	Anti-B	A, O
B	B	Anti-A	B, O
AB (Universal recipient)	A + B	None	A, B, AB, O
O (Universal Donor)	None	Anti-A + Anti-B	O only

Remember: "Universal donor/recipient" terms refer specifically to RBC transfusion, and not every blood component. Plasma compatibility follows different rules.

Rh Factor

Recipient	Compatible RBCs
Rh-positive	Rh+ or Rh-
Rh-negative	Rh-
Example: O+ can receive both O+ and O-, but O- can only receive from O-	

Nursing Considerations

Before Blood Transfusion

- **Check the necessary lab results, prescription, indication, and consent.**
- **Perform the required client–blood-product identification. Check client's identity using at least two identifiers. Two licensed nurses verify client identity, product, ABO/Rh, unit number, and expiration at the bedside.**
- **Verify ABO/Rh typing, compatibility testing, and cross-match.**
- **Acquire baseline vital signs.**
- **Evaluate IV access and make sure the right equipment is on hand (Y-type blood administration set with in-line filter). Use large-bore IV catheter for administration to prevent cell damage.**
- **Prime the tubing using 0.9% sodium chloride ONLY.**
- **Examine the blood product for any anomalies such as discoloration, clots, leaks, or expiration.**

During Blood Transfusion

- **Infuse slowly (about 2 mL/min) for the first 15 minutes; most acute reactions occur then.**
- **Start transfusion within 30 minutes of obtaining product. Blood products not used within that time frame should be returned to the blood bank.**
- **Stay with the client during the first 15 minutes**
- **Keep an eye on vital signs. Take it 15 minutes after starting transfusion and then every 30 minutes (or per facility policy) throughout the transfusion.**
- **Keep an eye out for symptoms such as fever, chills, flushing, rash, itching, dyspnea, back or chest pain, hypotension, tachycardia, or anxiety.**
- **Finish infusion of RBCs within four hours.**

TRANSFUSION REACTIONS

Reaction	Cause	Key Manifestations	Priority Nursing Actions
Acute Hemolytic	**ABO incompatibility,** usually from identification/administration error	Fever, Chills, **flank/back pain,** hypotension, tachycardia, hemoglobinuria	• **STOP transfusion** • Maintain IV with 0.9% NS using new tubing. • Notify provider/blood bank. • Save the bag and tubing for analysis.
Febrile, Non-Hemolytic	Immune response to donor leukocytes/cytokines	**Fever, chills,** headache, flushing, malaise	• **STOP transfusion** • **Antipyretics** • Notify provider and monitor vital signs

Allergic	Hypersensitivity to proteins in donor plasma	Pruritus, urticaria, flushing, rash	• STOP transfusion • notify provider • Administer prescribed antihistamine • Restart slowly as ordered
Anaphylactic	Severe hypersensitivity; may be associated with IgA deficiency and anti-IgA antibodies	**Wheezing, dyspnea, angioedema, hypotension,**possible loss of consciousness	• **STOP transfusion** • maintain airway • Oxygen/emergency treatment as ordered
Septic	Bacterial contamination of the blood product	**High fever, severe chills, hypotension,** nausea/vomiting	• **STOP transfusion** • maintain IV with 0.9% NS • Notify provider • prepare for culture/antibiotic
Transfusion-AssociatedCirculatoryOverload (TACO)	Excessive intravascular volume from transfusion	Dyspnea, crackles, hypertension, JVD, pulmonary edema	• **STOP transfusion** • position upright • provide oxygen • anticipate diuretic therapy

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