

CONSIDERATIONS:

1. Total parenteral nutrition (TPN) refers to the intravenous administration of nutrients via central venous access device for a patient who is unable to take adequate nutrition orally or enterally.
2. TPN solutions contain varying amounts of amino acids, dextrose, lipids, electrolytes, trace elements, and vitamins and are highly concentrated, generally ranging from 1800 to 2000 mOsm/kg.
3. Placement of the central line must be verified before being used for TPN. PICC line tip should be in superior vena cava (SVC) and tunneled lines or port a cath should be in SVC or right atrium.
4. TPN must be given using an infusion control device (pump) for safe, accurate delivery.
5. TPN orders should include:
 - a. Formula of solution total daily volume, and infusion cycle or period with taper schedule, if appropriate
 - b. Lipid administration including volume, percentage of lipids, frequency and method of administration (e.g., piggy-back or mixed in a 3-in-1 solution). Rate should be specified if being delivered separately from other nutrients
 - c. Lab work including monitoring of blood sugars, if ordered
 - d. Flushing protocol for saline and, if appropriate, heparin
6. Medications and additives may be added to TPN solution immediately before container is spiked for hanging, e.g., heparin, insulin, MVI (multi-vitamins), etc. It is the responsibility of the mixing pharmacist to determine compatibilities and concentrations prior to dispensing solutions and additives.
7. Solutions are stored in the refrigerator until needed. Solutions should be taken out to warm 30 minutes to 1 hour prior to administration.
8. TPN solutions once hung must be infused or discarded within 24 hours. Separate fat emulsions shall have a hang time not to exceed 12 hours.
9. Administration sets are changed every 24 hours. When intravenous fat emulsions are given intermittently, the administration set should be changed with each new container. When units of intravenous fat emulsions are administered consecutively, the administration set should be changed every 24 hours. Administration sets and containers used for lipid infusion should be free of diethylhexyl-phthalate (DEHP).
10. Filters should be used as follows:
 - a. TPN solution without lipids - 0.2 micron filter
 - b. TPN solution with lipids), or total nutrient admixtures - 1.2 micron filter
11. Strict aseptic technique is MANDATORY in all aspects of TPN administration.
12. No other medication or solution, except intravenous fat emulsion should be infused in the same Central

Venus Access Device (CVAD) lumen while TPN is infusing.

13. TPN solutions should be compounded under a laminar-flow hood and labeled and prepared according to pharmacy law and regulation.
14. Solution labels should be verified against the physician's orders. Integrity of the container and solution should be checked for:
 - a. Clarity
 - b. Contaminants
 - c. Precipitates
 - d. Turbidity
 - e. Leaks
 - f. Brown oily streaks (lipid solutions)
15. Complications of TPN include, but are not limited to, the following:
 - a. Infection/sepsis
 - b. Hyperglycemia/Hypoglycemia
 - c. Circulatory volume excess/deficit
 - d. Electrolyte, mineral and vitamin imbalance
 - e. Allergic reactions
16. Patient/caregiver should be instructed in and return demonstration of competence in all aspects of TPN administration prior to performing independently.
17. Instructions should be verbal and in written form.
18. Initial patient assessment should include:
 - a. Admission height and weight
 - b. Normal weight
 - c. Type of central venous access
19. Use at least 2 patient identifiers prior to administering medications.

EQUIPMENT:

Gloves
Alcohol applicator (wipe/swab/disk/ampule)
TPN solution with fat emulsion
Medications, if ordered
Needles/syringes for adding meds, if ordered
Fat emulsion with tubing, optional if not included in TPN
Heparin/normal saline flushes, as needed
Sharps container
Impervious trash bag
Infusion pump
Battery

PROCEDURE:

1. Adhere to Standard Precautions.
2. Explain the procedure and purpose to the patient/caregiver.
3. Assemble the equipment on a clean surface close to the patient.
4. Place patient in comfortable position, making sure that site is accessible.
5. Ensure adequate lighting.

6. Prepare equipment:
 - a. Check TPN solution and container for proper solution, leaks, particulate matter, clarity and turbidity
 - b. Add medication(s) as ordered
 - c. Connect tubing to solution container.
 - d. Connect tubing to pump per manufacturer's instructions. Prime tubing.
7. Insert new battery in pump.
8. Clean needleless connector on the distal end of patient's CVAD with alcohol. Wipe for at least 15 seconds. Allow to air dry. Flush line with 10 cc normal saline, or as ordered.
9. Attach primed TPN solution tubing to needleless connector.
10. Verify that pump is programmed per physician's order and start per manufacturer's instructions.
11. Administer piggyback lipid emulsion (optional when lipids are not in TPN):
 - a. Attach tubing to lipid solution
 - b. Attach tubing to pump per manufacturer's instructions and prime tubing
 - c. Verify the pump settings are as ordered by physician
 - d. Clean Y-connector below the filter, on the TPN administration set with alcohol applicator. Allow to air dry
 - e. Attach lipid emulsion tubing to needleless connector of Y-connector
 - f. Start pump and begin infusion
 - g. When emulsion infused, turn off pump, close tubing clamp, and disconnect emulsion tubing
12. Discontinuing TPN infusion:
 - a. Turn off pump and close tubing clamp
 - b. Disconnect tubing from needleless connector
 - c. Clean needleless connector with alcohol applicator. Allow to air dry
 - d. Flush venous access device with 10 mL saline or per physician's order
13. Discard soiled supplies in appropriate containers
14. Remove gloves. Perform hand hygiene.

Mixing and Adding Medication

Just before starting the infusion, add the following medications prescribed by your physician:

- 1 _____
- 2 _____
- 3 _____
- 4 _____

EQUIPMENT:

Gloves
Alcohol applicator (wipe/swab/disk/ampule)

Medications in single or multi-dose containers
Syringes of appropriate sizes with 21-gauge safety needles or needle less adaptors
TPN solution
Sharps container
Impervious trash bag

PROCEDURE:

1. Adhere to Standard Precautions.
2. Carefully read the name, dose and expiration date on each medication label.
3. Inspect the TPN bag for patient name, correct formula, expiration date and leaks and the solution for cloudiness, discoloration, sediment, particles and/or brown oily streaks (lipid solutions).
4. Place the TPN bag on a clean surface with the injection port handy.
5. Ensure adequate lighting.
6. Wash hands. Don gloves.
7. Clean injection port with alcohol applicator. Allow to air dry.
8. Place the first medication container near the bag, away from the others. Check the medication label again.
9. Clean top of vial with alcohol applicator. Allow to air dry.
10. Choose the appropriate-sized syringe with needle or needleless adaptor, remove the needle cover and draw the appropriate amount of air into the syringe.
11. Insert the needle or needleless adaptor into the vial below the fluid level.
12. With the needle below the fluid level, withdraw the prescribed amount of medication.
13. Remove the needle or needleless adaptor from the vial, insert into the TPN bag injection port and inject the medication.
14. Remove the syringe with needle or needle less adaptor from the port, and drop into the sharps container.
15. Gently rock the TPN bag to thoroughly mix the added medication.
16. Discard the used medication vial, and place the next one near the bag.
17. Repeat steps 9 - 15 for each medication additive.
18. Discard soiled supplies in appropriate containers.
19. Remove gloves. Perform hand hygiene.

Starting the TPN Infusion

Total volume to be infused: _____ mL
Infusion period: _____ Rate: _____ l
Taper up: _____ Taper down: _____

EQUIPMENT:

Gloves
Alcohol applicator (wipe/swab/disk/ampule)

TPN solution (warmed to room temperature, with additives added)

Administration set

Filter, 0.2 micron for TPN, 1.2 micron if 3-in 1

Infusion pump

Sharps container

Impervious trash bag

PROCEDURE:

1. Adhere to Standard Precautions.
2. Place the TPN bag on a clean surface or hang on the IV pole, as you prefer for ease of handling.
3. Identify patient and place in a comfortable position, making sure that site is accessible.
4. Ensure adequate lighting.
5. Perform hand hygiene. Don gloves.
6. Attach the filter if not already part of the administration set.
7. Remove the cover from the port on the TPN bag and the cover from the administration set spike, and insert the spike securely into the bag.
8. Insert the administration set into the infusion pump according to the manufacturer's instructions and prime the tubing.
9. Clean needleless connector attached to the patient's CVAD with alcohol applicator. Allow to air dry.
10. Attach the TPN tubing to the needleless connector.
11. Make sure all tubing and catheter clamps are open before starting the infusion.
12. Verify the infusion pump settings are as ordered by the physician, and start the pump.
13. Discard soiled supplies in appropriate containers.
14. Remove gloves. Wash hands.

Discontinuing the TPN Infusion

EQUIPMENT:

Gloves

Alcohol applicator (wipe/swab/disk/ampule)

Antimicrobial applicator (wipe/swab/disk/ampule)

Saline and Heparin flushes

Sharps container

Impervious trash bag

PROCEDURE:

1. Adhere to Standard Precautions.
2. Assemble the equipment on a clean surface close to the patient.
3. Identify patient and place in a comfortable position, making sure that site is accessible.
4. Ensure adequate lighting.
5. When the TPN infusion has been completed, prepare to disconnect.
6. Perform hand hygiene.
7. Don gloves.

8. Turn the pump off.
9. Clamp the tubing and disconnect the TPN solution tubing from the needleless connector attached to the patient's CVAD.
10. Clean the needleless connector with alcohol. Allow to air dry.
11. Flush CVAD with 20 ml saline or per physician's order.
12. Discard soiled supplies in appropriate containers.
13. Remove gloves. Wash hands.

Administering Lipid Emulsions

Administer _____ mL of _____%

Lipids _____ times a week at _____ mL per hour

CONSIDERATIONS:

1. Lipid emulsions are available in 10% and 20% concentrations. Rates of infusion should not exceed 50 mL/hour for 20% or 100 mL/hour for 10%. Lipid emulsions will not pass through intravenous filters.
2. Side effects can include nausea, vomiting, fever and rash and should be reported to your physician.
3. Lipids may be administered as a separate infusion, before or after TPN, or may be given "piggy-back" into the tubing while the TPN is infusing. If the physician has ordered lipids to be given separately, follow the same procedures used to start and discontinue TPN.

EQUIPMENT:

Gloves

Alcohol applicator (wipe/swab/disk/ampule)

Antimicrobial applicator (wipe/swab/disk/ampule)

Lipid emulsion, as prescribed

Administration set

Infusion pump on IV pole

Sharps container

Impervious trash bag

PROCEDURE:

1. Adhere to Standard Precautions.
2. Assemble the above equipment. Check the label of the lipids for the correct name, percentage, and volume and expiration date. Examine the liquid and bottle for discoloration, particulates or cracks.
3. Perform hand hygiene and don gloves.
4. Remove the cover from the top of the lipid bottle and clean with alcohol or antimicrobial applicator. Allow to air dry.
5. Insert the spike of the administration set into the lipid bottle and hang the bottle on the IV pole. After filling the drip chamber half way, prime the tubing. Insert the administration set into the infusion pump according to instructions.
6. Clean the needleless connector on the Y-connector below the filter on the TPN administration set with alcohol and allow to air dry.

7. Attach the lipid tubing to the needleless connector.
Open all clamps.
8. Verify the infusion pump has the correct volume and rate as ordered by physician and start the pump.
9. Discard soiled supplies in appropriate containers.
10. Remove gloves. Perform hand hygiene.

AFTER CARE:

1. Initiate intake and output record, if applicable.
2. Record daily weight and blood sugar, if applicable, on daily monitoring sheet.
3. Record laboratory results, if ordered, on lab flow sheet.
4. Patient/caregiver should be instructed in:
 - a. Home monitoring parameters
 - b. Signs and symptoms of metabolic complications and side effects
 - c. Preparation of additives
 - d. Storage and care of supplies and solutions
 - e. Operation and troubleshooting of infusion pump
 - f. Central venous access device maintenance and complications including sepsis, air embolism, and occlusion
 - g. Physician/nursing and emergency contact information
5. Document in patient's record:
 - a. Date, time, procedure and observations
 - b. Type and volume of solution and medication added
 - c. Time infusion started, discontinued, hourly infusion rate, taper up, and taper down
 - d. Amount of saline and heparin flush solution, including strength of heparin
 - e. Type and appearance of venous access site
 - f. Patient's response to procedure, side effects and management
 - g. Instructions given to patient/caregiver
 - h. Communication with physician

REFERENCE:

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- Phillips, L. (2010). *Manual of I.V. Therapeutics* (5th Ed.). Philadelphia: FA Danes.

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