PURPOSE:
To safely and effectively administer total parenteral nutrition (TPN) in the homecare setting.

CONSIDERATIONS:
1. Prior to instituting therapy, the nurse should describe the care required of the patient/caregiver in the absence of the nurse.
2. TPN usually refers to high-calorie formulas of the following concentrations:
   a. Amino Acids - 8.5% or greater.
   b. Glucose - 15% or greater (final concentration).
   c. Lipids may be added in varying amounts.
3. Final glucose concentrations of 10% or less may be given via a peripheral vein for short-term therapy.
4. TPN should always be given via a central venous access device (central line) to prevent severe thrombophlebitis. Placement of the catheter tip in the superior vena cava (SVC) should be verified by x-ray before the catheter is used.
5. TPN must be given using an infusion control device (pump) for safe, accurate delivery.
6. Initial orders for TPN should include:
   a. Formula of solution, total daily volume 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).
   c. Lab work ordered and whether labs can be drawn from central line.
   d. Routine site care:
      (1) Dressing change frequency.
      (2) Type of dressing to be used.
      (3) Flush protocol (heparin and saline).
   e. Standing orders for catheter repair, declotting, and a protocol for pump malfunctions, etc.
7. Medications and additives may be added to TPN solution 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.
8. Solutions are stored in the refrigerator until needed. Solutions should be taken out to warm at least 2 hours prior to administration. Cold solutions may cause the patient to have an elevated temperature due to the autonomic response of the body to warm the blood.
9. Solutions, tubing and filters are changed every 24 hours in an established order.
10. Filters should be used as follows:
    a. TPN solution without lipids - 0.22 micron filter.
    b. TPN solution with lipids (3-in-1) - 1.2 micron filter.
11. Strict aseptic technique is MANDATORY in all aspects of TPN administration.
12. Unless specifically ordered, the TPN catheter or port should not be used for any other therapy. It should be a DEDICATED line and labeled TPN only.
13. Solutions should be compounded under a laminar-flow hood with pharmacy supervision. Labels should include the following:
   a. Patient name.
   b. Mixing date.
   c. Physician's name.
   d. Expiration date.
   e. Formula components.
   f. Pharmacist's initials.
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.
15. Complications of TPN include, but are not limited to, the following:
   a. Metabolic:
      (1) Infection/sepsis.
      (2) Hyperglycemia/Hypoglycemia.
      (3) Circulatory volume excess/deficit.
      (4) Electrolyte, mineral and vitamin imbalance.
      (5) Allergic reactions.
   b. Mechanical:
      (1) Catheter occlusion.
      (2) Catheter displacement/infiltration.
      (3) Central vein thrombosis/occlusion.
      (4) Air embolism.
      (5) Catheter embolism.
      (6) Infusion pump malfunction/failure.
16. Efforts to prevent mechanical complications include:
   a. Keeping scissors and serrated clamps away from catheter site.
   b. Opening clamp before flushing.
   c. Closing (clamping) catheter before opening the system except for the Groshong. (See Groshong Catheter Maintenance.)
17. Patient/caregiver should be instructed and/or demonstrate competence in all aspects related to administration of TPN.
18. Patient/caregiver will be instructed and observed for return demonstration before performing independently. Instructions will be verbal and in written form. Patient/caregiver instructions should include:
   a. Home monitoring parameters.
   b. Signs and symptoms of metabolic as well as mechanical complications.
   c. Preparation of additives.
   d. Storage and care of supply and solutions.
   e. Operation of mechanical infusion device.
   f. Infusion catheter maintenance.
   g. Reporting mechanisms for patient.
h. Catheter complications including sepsis, air embolism and catheter occlusion.

19. Initial patient assessment should include:
   a. Admission height and weight.
   b. Normal weight.
   c. Type of infusion pump.
   d. Type of central venous access.

20. Use at least 2 patient identifiers prior to administering medications.

21. Per Joint Commission recommendations, all tubes and catheters should be labeled to prevent the possibility of tubing misconnections. Staff should emphasize to all patients the importance of contacting a clinical staff member for assistance when there is an identified need to disconnect or reconnect devices.

EQUIPMENT:

- Gloves
- Alcohol applicator (wipe/swab/disk/ampule)
- TPN solution
- Fat emulsion with tubing (optional)
- Heparin/normal saline flushes, as needed
- 21- to 23-gauge, 1-inch needle or needle less adaptor or non-coring needle with extension for IVAD
- 10 mL syringes (2)
- Clamp (optional)
- CVC dressing, as ordered
- Tape
- Puncture-proof container
- Impervious trash bag

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. Prime tubing.
7. Connect tubing to pump per manufacturer's instructions.
9. Insert needle-locking device or needle less adaptor into intermittent injection port.
10. Program pump and start per manufacturer's instructions.
11. Administer piggyback lipid solution (optional when lipids are not in TPN):
   a. Attach tubing to lipid solution.
   b. Attach needle or needle less adaptor to tubing.
   c. Prime tubing.
   d. Clean Y-connector below the filter, on the main line, closest to the insertion site with alcohol applicator. Allow to dry.
   e. Insert needle or needle less adaptor into Y-connector.
   f. Slowly open clamp and regulate drip rate, as ordered. May infuse with pump, if provided.
   g. Disconnect when solution finished.
12. Discontinuing TPN infusion:
   a. Turn off pump and close tubing clamp.
   b. Remove needle-locking device or needle less adaptor from intermittent injection port.
   c. Clean intermittent injection port with alcohol applicator.
   d. Flush venous access device per physician's order/manufacturer's recommendation.
13. Change Dressing. (See Infusion Therapy-CVC: Transparent Permeable Adhesive Dressing or CVC: Intermittent Injection Port Change).
14. Discard soiled supplies in appropriate containers.

A. 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)
- Antimicrobial applicator (wipe/swab/disk/ampule)
- Medications in single or multi-dose containers
- Syringes of appropriate sizes with 21-gauge needles or needle less adaptors
- TPN solution (warmed to room temperature)
- Puncture-proof 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.
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. Repeat using antimicrobial applicator, if applicable. Let air dry. DO NOT blot.
10. Choose the appropriate-sized syringe with needle or needle less adaptor, remove the needle cover and draw the appropriate amount of air into the syringe.
11. Insert the needle or needle less 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 needle less adaptor from the vial, insert into the TPN bag injection port and inject the medication.
14. Remove the needle or needle less adaptor from the port, and drop into the needle disposal 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.

B. STARTING THE TPN INFUSION

Total volume to be infused: ____________ mL
Initial rate: ____________ mL/hour
Increase to ____________ mL/hour after _______ hours
Then ____________ mL/hour after _______ hours

EQUIPMENT:
Gloves
Alcohol applicator (wipe/swab/disk/ampule)
Antimicrobial applicator (wipe/swab/disk/ampule)
TPN solution (warmed to room temperature, with additives added)
Administration set
Filter, 0.22 micron for TPN, 1.2 micron if 3-in-1
21-gauge needle in protective “click-lock” device or needle less adaptor
Infusion pump on IV pole
Catheter clamp (optional)
Tape
Puncture-proof 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. Wash hands. Don gloves.
6. Attach the filter and the needle or needle less adaptor to the administration set.
7. Remove the cover from the port on the TPN bag and the cover from the administration set, and insert the spike securely into the bag.
8. Fill the drip chamber half way and expel air from the tubing, filter and needle or needle less adaptor, if applicable.
9. Insert the administration set into the infusion pump according to the manufacturer's instructions.
11. Insert the needle or needle less adaptor directly into the center of the injection cap.
12. Make sure all tubing and catheter clamps are open before starting the infusion.
13. Set the infusion pump rate and volume as prescribed by the physician, according to pump manufacturer's instructions, and turn the pump on.
14. Check the infusion at intervals for proper rate prior to the patient going to sleep.
15. Discard soiled supplies in appropriate containers.

C. DISCONTINUING THE TPN INFUSION

Taper the rate to ____________ mL/hour
Beginning at _______ hour before discontinuing
Then decrease the rate to ____________ mL/hour
For the final _______ hour

EQUIPMENT:
Gloves
Alcohol applicator (wipe/swab/disk/ampule)
Antimicrobial applicator (wipe/swab/disk/ampule)
Heparin solution (100 units/mL or as prescribed)
Syringe with 25-gauge needle or needle less adaptor
Tape
Puncture-proof container
Impervious trash bag
Normal saline

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. Wash your hands.
7. Don gloves.
8. Turn the pump off.
9. Remove the (protected) needle or needle less adaptor from the injection cap and drop it into the puncture-proof container.
10. Clean the injection cap with alcohol applicator. Allow to air dry.
11. Insert the saline flush syringe, making sure the catheter clamp is open before instilling. Close the clamp, remove the syringe and drop it into the needle disposal container. Repeat with heparin flush as ordered.
12. Discard soiled supplies in appropriate containers.

D. CHANGING THE DRESSING
Change the dressing ________ times a week on a regular schedule and any time it becomes damp, soiled or loosened.

EQUIPMENT:
Gloves, sterile and non-sterile
Alcohol applicator (wipe/swab/disk/ampule)
Antimicrobial applicator (wipe/swab/disk/ampule)
Povidone-iodine ointment (or other, as prescribed)
Sterile gauze or transparent semi-permeable adhesive dressing
Tape
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. Wash hands; don non-sterile gloves.
6. Remove existing dressing and tape and discard in the trash. Never use scissors near the catheter.
7. Remove gloves and don sterile gloves.
8. Inspect area for redness, swelling, tenderness, rash or drainage. If present, notify the nurse.
9. Clean skin with an alcohol applicator (wipe, swab, disk or ampule). Using a circular motion, work from the inside out for 2 to 3 minutes. Allow skin to air dry. DO NOT blot. Repeat procedure using antimicrobial applicator.
10. Apply a small amount of ointment at site of catheter entry, if ordered. (If transparent, semi-permeable, adhesive dressing is to be used, ointment should be omitted.)
11. Cover with sterile gauze or transparent, semi-permeable, adhesive dressing.
12. Remove your gloves, and secure the dressing and catheter with tape.
13. Discard soiled supplies in appropriate containers.

E. 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 given directly into the catheter, before or after TPN, or may be infused "piggy-back" into the tubing while the TPN is infusing. If your physician has instructed you to give lipids separately, follow the same procedures used to start and discontinue TPN.
4. If your physician has instructed you to give lipids into the tubing with your TPN, an infusion pump will be needed for the lipids.

EQUIPMENT:
Gloves
Alcohol applicator (wipe/swab/disk/ampule)
Antimicrobial applicator (wipe/swab/disk/ampule)
Lipid emulsion, as prescribed
Administration set
20- or 21-gauge needle
Infusion pump on IV pole
Scissors
Puncture-proof 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, volume and expiration date. Examine the liquid and bottle for discoloration, particulates or cracks.
3. Wash your hands and don gloves.
4. Remove the cover from the top of the lipid bottle and clean with antimicrobial applicator. Allow to air dry.
5. Attach the sterile needle or needle less adaptor to the end of the administration set.
6. Insert the spike of the administration set into the lipid bottle and hang the bottle on the IV pole. Expel air from the tubing and needle, filling the drip chamber half way. Insert the administration set into the infusion pump according to instructions.
7. Clean the injection port on the TPN administration set with alcohol applicator and allow to air dry.
8. Remove the protective cover from the needle and insert into the injection port.
9. Set the infusion pump for the correct volume and rate and turn the pump on.
10. Remove gloves. Wash hands.
11. When the infusion is completed, wash hands and don gloves.
12. Remove the needle or needle less adaptor from the injection port, insert into the needle disposal container and cut the tubing to allow the needle to fall into the needle disposal container, if applicable.
13. Discard the solution and container and administration set in the trash.

F. IF THE CATHETER DEVELOPS A LEAK OR HOLE
1. To prevent air from entering the catheter:
   a. Clamp the catheter between chest and the damaged place.
   b. Call the physician.
   c. If physician is not available, call 911.

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. Document in patient's record:
   a. Date, time, procedure and observations.
   b. Type and volume of solution, medication added.
   c. Time infusion started, discontinued and hourly infusion rate.
   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, when necessary.