WHAT HOME PARENTERAL NUTRITION (HPN) IS ALL ABOUT

The purpose of this manual is to help you safely give parenteral nutrition (PN) at home.

Parenteral nutrition means providing nutrition by vein. Parenteral nutrition has nutrients the body normally would get from eating a well-balanced diet.

All of us need nutrients from each of the following:

1. Protein to build and repair body tissues.
2. Carbohydrates to provide energy.
3. Fat to provide a stored energy source and promote healthy skin.
4. Vitamins to help the body properly use fat, carbohydrate, and protein.
5. Minerals to aid in a variety of bodily functions such as muscle contraction, blood clotting, and bone repair.
6. Water to regulate body temperature, transport nutrients, and rid the body of waste.

The goal of the home parenteral nutrition (HPN) program is to safely provide nutritional support for good health and daily activities. Receiving parenteral nutrition at home may improve your quality of life and decrease the number of your hospitalizations. As you read this manual, write down any questions you have. We will answer them during the training period. You may also wish to turn to Appendix A, at the end of this manual, to read some of the most frequently asked questions by patients and their caregivers.

We want you to return to as normal a lifestyle as possible. With advance notice, we can help you return to work or take a vacation, but some modifications in your lifestyle will likely be necessary. We are interested in addressing all your questions and concerns and understanding your own specific needs.
TRAINING

Learning about HPN is something you can do. It will require time, attention to detail, and a lot of practice. We are prepared to help you and your caregiver.

The training period will allow you to learn how to safely infuse your PN at home. The training time varies from person to person. Practicing and reading this manual between lessons will help you remember all the important steps.

It is important to listen and be involved in learning your care. Even when you become familiar with HPN, always be careful to take your time so you do not miss any of the steps. Becoming forgetful or careless may lead to problems such as an infection, which could be very serious and result in coming back to the hospital.

COMMITMENT AND SUPPORT

One of the most important parts of a successful HPN program is your commitment. Support from a family member or friend is also very important. If possible, this person should go through training with you. They can support you if you are sick or need help.

CONVENIENCE

Your health status and nutritional needs will determine your infusion time. Try to infuse your PN solutions at the same time every day. Do not “skip a day” of HPN unless directed to do so by your doctor or HomeMed. You may become dehydrated if you do not infuse.
Parenteral nutrition is usually infused during the night with an infusion pump. This allows you to be free of the pump and tubing during the day and is commonly called “cycling”. We will program the pump to give you the amount of nutrition and fluids over the time period ordered by your physician. Once started, the pump gradually increases the rate of your HPN solution at the beginning and gradually decreases it at the end of the infusion. This will give your body time to adjust to the amount of glucose in your HPN solution.

**PEOPLE WHO ARE CARING FOR YOU**

**HOMEMED**

HomeMed is the Home Infusion Service of the University of Michigan Hospital and Health Centers. We will provide your HPN solution, supplies, and training before discharge. We will also monitor your progress once you are home. The HomeMed Training Team is based in the hospital and is responsible for your training prior to going home. Once discharged, HomeMed pharmacists and nurses will continue to monitor your progress on HPN with your physician. This is done by assessing your labs, checking on your progress over the phone, and coordinating care with your physician and home care nurse.

A HomeMed pharmacy technician organizes the delivery of your supplies and will contact you weekly for your supply needs. Contact a pharmacy technician if, at any time, you need additional supplies or your supplies run low.

A HomeMed Patient Accounts Representative is available should you have questions or concerns regarding your insurance billing.

These individuals at HomeMed are available during regular business hours at 1-800-862-2731.

Outside of business hours, a clinician is available 24 hours a day, 7 days a week, including holidays. An answering service will page the HomeMed clinician on call for you. The answering service will ask for your name, telephone number, and a brief message
explaining what you need. A clinician (pharmacist or registered nurse) will call back as soon as possible. **If you do not receive a call back within 15 minutes, please call again.**

**VISITING NURSE AGENCY**

A visiting nurse will assist you with your HPN therapy once you are home. A nurse from Discharge Planning arranges this before you leave the hospital and will provide the name and telephone number of the Visiting Nurse Agency.

**HOME NUTRITION SUPPORT & ADVOCACY GROUP**

The Oley Foundation is a non-profit, independent, national group that has been serving patients on home tube feedings or HPN for more than a decade. They provide up-to-date information, outreach services, conference activities and emotional support for patients, their families, caregivers and professionals. Oley programs include a bi-monthly newsletter, regional support groups and a support network for children on home nutrition therapy. All services and educational materials are free to patients and their caregivers. We encourage you to learn more about their services and to join this very important organization. To obtain more information:

The Oley Foundation  
214 Hun Memorial, A-28  
Albany Medical Center  
Albany, NY 12208-3478  
1-800-776-OLEY (Toll free in USA)  
1-518-262-5079 (Outside the USA)  
Fax: 1-518-262-5528  
Web Page: [www.oley.org](http://www.oley.org)
PARENTERAL NUTRITION SOLUTIONS

The HPN solution is prepared by the pharmacist at HomeMed. It contains the appropriate amounts of protein, calories, fluids and other nutrients to meet your body’s needs. These solutions are similar to the parenteral nutrition solutions you received in the hospital. The difference is that home solutions usually have all the ingredients in a single plastic container instead of the fat emulsion and additional IV fluids in separate bags. The fat emulsion in your HPN bag gives it a milky white appearance. The HPN bag contains all of the prescribed nutrients that are stable for 9 days when refrigerated.

STORING HPN SOLUTIONS AND SUPPLIES

A refrigerator will be provided to store your HPN solutions and additives that need refrigeration. Only these items should be stored in this refrigerator. Do not store any food in this refrigerator. Store all other HPN solutions and supplies away from household items. Do not store urine test kits, ostomy supplies, or similar items with any HPN solutions or supplies.

Keep all HPN supplies, especially needles, syringes, and medications out of the reach of children and pets.

DELIVERY OF HPN SUPPLIES

You will receive a packing slip in each of your deliveries so you can keep track of your orders (see sample delivery slip). Count your supplies when each delivery arrives. Make sure each item is sterile by checking for visible signs of contamination such as an open package or
cloudy fluid. Always check for the appearance of oiling, or if the lipids are separating in the bag. **When in doubt, throw it out!**

If you have any concerns or questions about the use of these products please contact HomeMed Pharmacy at 800-862-2731. Any discrepancy between this delivery slip and the contents of your delivery should be reported to HomeMed within 14 days of delivery.

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**Figure 1. Sample Delivery Slip**
A copy of your HPN prescription will be delivered to your home with your supplies. It would be a good idea to check your HPN prescription (figure 2) and bag labels (figure 3) upon receipt to ensure that they match. Remember to also check the expiration date on the label of the HPN solution before infusing it. At home, you will add vitamins and occasionally other medications to the HPN solution as indicated on the prescription. These additives are not stable for long periods of time and cannot be added by HomeMed. The Home Parenteral Nutrition (PN) Mixing Protocol sheet provides step-by-step directions for adding any additional medications to your HPN solution. This will be reviewed in your teaching sessions.

Always read your label and prescription carefully. If they do not match or if you have any questions, call a HomeMed clinician. If for any reason your prescription changes, HomeMed will contact you as needed. A new HPN prescription and, if necessary, a new Home Compounding Protocol Sheet and/or pump program sheet will be sent to you. Throw away your old HPN prescription as changes are made. If you need help with reprogramming your pump, call a HomeMed clinician for assistance.
**Figure 2. Sample PN prescription**
Figure 3. Sample PN bag label
INTAKE AND OUTPUT MEASUREMENT

You may be asked to measure intake and output on a daily basis. This will help your HomeMed clinicians and your doctor estimate the fluid balance within your body. "Intake" includes all fluids taken into the body, both intravenous and oral. "Output" includes urine, diarrhea, vomit, and any other drainage, such as from a wound, ostomy, or fistula that is measurable.

Procedure:
1. Measure all fluid intake, both IV and oral, each day. Use the following table to help you convert from ounces (oz) to milliliters (mL). Record total intake on the form provided in this section.

   Fluid Equivalents
   1 ounce (oz) ....................... 30 mL
   Coffee cup (8 oz).............. 240 mL
   Can of soda (12 oz) .......... 360 mL
   Popsicle (whole) .............. 100 mL
   Water glass (8 oz) ............. 240 mL
   Small juice (4 oz) ............ 120 mL

2. Measure all fluid output, such as urine, diarrhea, vomit, ostomy and fistula drainage. Record the output on the form provided in this section.

3. Bring all records of intake and output with you when you come for a clinic visit. Refer to the section "Notify Your Doctor" for concerns about fluid balances.

DAILY WEIGHTS

Daily weights will help HomeMed clinicians and your doctor determine if you are receiving too much or too little fluid. Weigh yourself at the same time each day wearing similar clothing. Infants should be weighed without clothes, on an infant scale. If you do not have an infant scale, be sure your baby is weighed at every clinic visit or by the visiting nurse.
Record your weight daily on the form provided in this section. Bring this information each time you come into the clinic so that your physician can review your progress.

**GROWTH CHARTS**

If your child is on HPN it is important to plot his or her weight, length and head circumference (if less than 1 year of age) on a growth curve. These measurements are usually done at your clinic appointment. This will assist your doctor and HomeMed clinician to provide the nutrients needed for your child to grow appropriately.

**URINE FRACTIONALS**

You may need to test your urine for sugar. If there is more sugar in the bloodstream than your body can handle, your body will get rid of the extra sugar in the urine.

**Key Points:**

1. Urine fractionals should be checked approximately 3 to 4 hours after you have started your PN infusion. You may also be asked to check your urine if you are experiencing signs or symptoms of high blood sugar (see Appendix B).

2. If your urine fractional is not negative, notify HomeMed or your doctor.

3. Keep a record of your urine fractionals (FX) and the approximate time the urine was checked on your monitoring form.

**URINE FRACTIONAL TEST PROCEDURE FOR ADULTS**

**Supplies:**
- Urine test strip
- Urine specimen
- Clean container such as a paper cup

1. Collect urine sample in clean container.

2. Wash your hands.

3. Remove one test strip from the container. Close the cover tightly.
4. Dip test strip into the urine specimen and then remove immediately.

5. Draw the edge of the strip along the rim of the specimen container to remove excess urine.

6. Follow directions on the container and wait the proper time, then compare the color on the test strip while holding it next to the color chart on the container.

7. If the result is not negative, call HomeMed or your doctor the next business day.

6. Record the results on your monitoring form.

**Urine Fractional Test Procedure for Infants and Children With Diapers**

**Supplies:**
- Urine test strip
- Urine specimen
- Gloves
- Cotton balls
- Syringe

1. Place 2 dry cotton balls into a dry diaper to obtain the urine.

2. Wash your hands.

3. Remove one (1) test strip from the container. Close the container cover tightly.

4. Put on a "clean" pair of gloves.

5. Remove the plunger from the syringe.

6. Remove the cotton balls from the wet diaper and place them in the syringe.

7. Replace the plunger, remove the syringe cap and squeeze a small amount of urine onto the test strip by pressing down on the plunger.

8. Follow directions on the container and wait the proper time, then compare the color on the test strip while holding it next to the color chart on the container.

9. Record the results on your monitoring form. If the result is not negative, notify your clinician.
**DAILY MONITORING FORM**

Call HomeMed or your doctor if:

1. For adults, if weight is up or down (increases or decreases) by 3 pounds or more for 2 days in a row. For infants, if weight loss or gain is greater than 50 grams a day (1.8 ounces).

2. For adults, if urine output is less than 800 mL a day for 2 days in a row. For infants, if there has been no urine output for greater than 8 hours, or if they have puffy eyes, or a full or depressed soft spot.

3. You have an increase in vomiting, diarrhea, ostomy or fistula output.

4. If your urine fractional (FX) is not negative, or your blood sugar is greater than 200.

When added together, your intake should be close to the total output.

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INFUSION PUMP GUIDE

Many features are built into the pump to protect you during the delivery of your HPN solution. The display screen provides information to you. You may hear an occasional beep coming from the pump. This beep lets you know that a correction may be needed. You can read the display screen to see what is causing the alarm. You will also be given a pump manual, which gives you more detail about the pump.

INFUSION PUMP CARE AND MAINTENANCE

1. **DO NOT** place the pump in any fluids or cleaning solutions.

2. **AVOID** dropping or hitting the pump. If the pump is dropped or hit, always recheck the program.

3. HomeMed will check your pump once a year. Please call if you believe it has been longer than a year without being serviced.

4. If the pump needs cleaning, use a soft cloth dampened with 70% isopropyl alcohol. Make sure the pump is disconnected from the patient and power supply, and turned off before and during cleaning. Never use sharp objects to clean the pump.

5. You may wash the backpack in regular detergent in your washing machine. After washing, dry under low heat in your dryer.

6. **NEVER** use the pump in the presence of flammable or explosive vapors.

7. **ALWAYS** avoid sources of high intensity electromagnetic radiation such as large electric motors or MRI machines.

8. **DO NOT** shower or tub bathe when infusing your HPN with the pump.

CHARGING THE BATTERY

The pump can operate while it is being charged. To preserve battery life, connect the pump to a wall outlet using the supply cord whenever possible.

To charge the battery:
1. With the white arrows facing up, plug the plastic end of the power supply cord into the Sapphire pump power socket. If you were supplied with a pump cradle, plug the cord into the bottom of the cradle.
2. Plug the other end of the power supply cord into a wall outlet.
3. On the front of the pump, verify that the Charge LED status indicator is ON (blinking yellow light). The yellow LED will remain lit when battery is fully charged.
   • An alarm is triggered when there are 30 minutes left until battery depletion.
   • If the “Battery Depletion” alarm sounds, immediately connect the pump to the wall outlet using the power supply cord.

ALERTS, ALARMS AND TROUBLESHOOTING

Alarms: When an alarm sounds, pump will immediately provide message with the error and suggested solution. Follow suggested alarm resolution, and then press OK key. To silence the auditory alarm, press the MUTE key.

What do I do if the pump alarms?
1. When an alarm sounds, the pump will immediately provide a message with the error and suggested solution.
2. Press [Mute].
3. Follow the suggested solutions and then press [OK]
5. Keypad appears. Enter password “8880.”
8. Press [Continue] then [OK] to restart the infusion.
10. Contact HomeMed if you are unable to resolve the alarm.
### TROUBLESHOOTING GUIDE:

<table>
<thead>
<tr>
<th>Screen Display</th>
<th>Solution</th>
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<tr>
<td>• Cassette Misplaced</td>
<td>• The cassette on the IV tubing is not loaded correctly. Open the safety door, remove cassette, and reload the cassette.</td>
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<tr>
<td>• Check for Occlusion</td>
<td>• Verify all clamps are open and IV tubing is not kinked.</td>
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<td>• Downstream Occlusion</td>
<td>• To clear occlusions check:</td>
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<td>• Upstream Occlusion</td>
<td>o All clamps are open;</td>
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<tr>
<td>• Occlusion</td>
<td>o Cassette on IV tubing is inserted correctly;</td>
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<td>o IV tubing is not kinked;</td>
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<td></td>
<td>o No occlusion at the connection to your catheter.</td>
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<td></td>
<td>o Once all occlusions are cleared press OK key to continue.</td>
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<tr>
<td>• Flow Error</td>
<td>• Check cassette on the IV tubing is inserted correctly. Check to be sure if battery is sufficiently charged. If not, connect pump to power supply cord and wall outlet. If alarm reoccurs contact HomeMed.</td>
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<tr>
<td>• Internal Error</td>
<td>• Pump will automatically shut down in 3 minutes. Contact HomeMed to replace pump.</td>
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<td>• Mechanism Error or Pump Fault</td>
<td>• A pump fault has occurred. Contact HomeMed to replace pump.</td>
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<td>Screen Display</td>
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| ![Air in Line](image) | • Mute: Silences the auditory alarm for 2 minutes.  
  • Check to be sure all line connections are tight. Check IV tubing for air bubbles. If there is air, disconnect IV tubing from patient and press the Prime key to remove the air from IV tubing,  
  • Reconnect the IV tubing to the patient’s catheter.  
  • Clean **Bubble Detector** with a damp Q-Tip (use water only).  
  ![Diagram](image)  
  • Press OK key to resume infusion. |
| ![Insufficient Battery](image) | • Low battery voltage for current rate. Connect pump to power supply cord and wall outlet. |
| ![Battery Depleted](image) | • Pump will automatically shut down in 3 minutes. Connect pump to power supply cord and wall outlet. |
| ![Battery Reminder](image) | • End of battery life. Contact HomeMed to replace pump. |
ADMINISTRATION OF HPN

KEY POINTS:

1. Prepare Work Area
   - Select a work area with good lighting, free of dust and drafts, and away from household traffic. Keep this area free of dust, lint, and clutter. Pets should not be allowed in these areas. **Do not use bathrooms.** They are likely to have a large number of germs.
   - The HPN work area should be used only for HPN procedures. A stable tray, Formica or similar products (e.g., metal, glass or plastic) placed over a dresser or end table can be used. Clean your work surface with a household cleaner such as bleach, alcohol, or dish soap or you may place a clean paper towel on your work surface. Try not to touch the surface more than is needed after you have cleaned it.

2. Wash Your Hands
   - **Always** wash your hands thoroughly with an antibacterial soap such as Dial before starting any procedure to decrease the risk of infection.
   - You may use a waterless soap to wash your hands if they are not visibly soiled. Always check the label to be certain the gel contains either ethyl alcohol (ethanol), normal propyl alcohol (n-propyl) or isopropyl alcohol in concentrations between 62 to 90%.
   - Washing will clean hands, but not sterilize them, so care must still be taken when handling your catheter or supplies.
   - Wound, ostomy, or fistula care **must** be done separately from HPN procedures. Germs normally live in your intestinal tract and in ostomy or fistula fluids. If these germs or germs from improperly washed hands enter your bloodstream through the catheter or PN solution, they could cause a severe blood infection (septicemia).
3. Gather and Check Supplies

- Allow your HPN solution to warm to room temperature. Take it out of the refrigerator at least 8 hours before using it. If you forget, you may wrap the HPN bag in a warm clean towel or place it inside a plastic zip lock bag and place that in warm water. Do not microwave your HPN solution. HPN must be used within 24 hours after taking the solution out of the refrigerator.

- Make sure each item is sterile by checking for visible signs of contamination such as an open package or cloudy fluid. Damaged supplies, such as protective coverings on medication vials or needle caps, should never be used.

4. Care in Handling Sterile Supplies

- Some pieces of the supplies are sterile. Sterile means that all germs have been removed by a special cleaning process.

- Parts of the supplies that must be kept sterile are protected with a cover.

- Never touch sterile parts with your hands or allow a sterile item to contact a non-sterile surface.

- If you are inserting a sterile needle through a non-sterile surface, always use an alcohol wipe to clean the surface. Never touch this area after cleaning it.

What supplies do I need?

One (1) HPN bag
One (1) Sapphire® IV tubing (remove from package)
One (1) Anti-siphon valve
One (1) Prefilled heparin flush syringe (remove from package)
Two (2) Prefilled saline flush syringes (remove from package)
Multivitamins
Alcohol pads
Sapphire® pump
Household disinfectant or alcohol
Antibacterial soap
Paper towel
How do I prepare for the procedure?

1. Place a trash can next to your work area.
2. Clean your work surface or laminate mat with household disinfectant. Let the area air dry.
3. **Wash your hands** as follows:
   a. Wet your hands and wrists under running water.
   b. Scrub vigorously with antibacterial soap for 15 seconds.
   c. Work lather between fingers, under nails, over the palms and back of hands.
   d. Rinse hands well by keeping your hands up with fingers pointing up towards the ceiling so that the dirty water runs toward your elbows.
   e. Dry your hands with a clean paper towel from tips of fingers down.
   f. Turn off the faucet with the paper towel.
4. Gather your supplies and place on your work area.
5. **Wash your hands again.**

How do I add multivitamins to my HPN?

Refer to Home Parenteral Nutrition (PN) Mixing Protocol for instructions on adding multivitamins to your HPN.
How do I prepare the tubing?
1. Open anti-siphon valve package and remove by holding the long, narrow cap.
2. Remove cap from end of Sapphire tubing.
3. Remove short, round cap on anti-siphon valve and connect to open end of Sapphire tubing.
4. Secure with cuff on Sapphire tubing.
5. **Turn the pump on** by pressing the [ON/OFF] hard key in lower right corner.
7. Select HPN (review the pump program with the programming sheet).
8. Press [OK].
9. Open the safety door. Insert the IV tubing cassette into the pump by placing the saddle on the round metal anchor (Figure 4) and clipping the upper end of the cassette into the metal lock (Figure 5).
10. Remove the tab on the IV bag.
11. Remove the spike cover from the IV tubing. **Do not touch the spike.**
12. Hold the port of the IV bag straight and insert the spike by pushing and twisting at the same time.

13. To prime or remove the air from the IV tubing, press [PRIME] in the lower left corner of the screen (Figure 6).

14. The pump will then prompt you to be sure that the tubing is NOT connected to the patient’s catheter (Figure 7).

15. Press [OK] and the pump will begin to prime or fill the tubing with the IV solution.

16. Once the pump has stopped priming, check to be sure that all the air in the IV set is filled with fluid. If not, repeat the priming steps.

17. Once the air has been removed, the pump screen will tell you to “connect set to patient after prime.” Press [OK].
How do I give the HPN?

1. Check your catheter cap to make sure it is on securely. Always hold your catheter cap while connecting/disconnecting to prevent accidental removal.

2. Unclamp your catheter.

3. **Vigorously** scrub the end of the cap on your catheter with an alcohol pad for 15 seconds.

4. Hold the prefilled saline syringe upright.

5. **Do not remove the cap.** Press forward on the plunger to break the seal. **Do not pull back on the plunger.**

6. Gently tap the sides of the syringe so the bubbles rise to the top. Remove the cap and push the plunger to remove all the air.

7. Push and twist the saline syringe into your catheter cap to the right until secure.

8. Inject the saline solution.

9. Remove and discard syringe in your trash.

10. Remove and discard the protective cap from the end of the IV tubing.

11. Vigorously scrub the end of the cap on your catheter with an alcohol pad for 15 seconds.

12. Push the end of the IV tubing into your catheter cap.

13. Make sure all clamps on your catheter and IV tubing are open.

14. Press [Start] on the screen to begin the infusion.


16. Place the IV bag and pump into the backpack/fanny pack.
How do I stop the HPN when my dose is done?

Your pump will beep 10 minutes prior to the end of your infusion. The pump will require you press [OK] to silence this alarm. Your pump will continue to infuse during this time.

Follow these steps:

2. Turn pump off by pressing the hard [ON/OFF] key.
3. Screen will read “Press OFF to turn off the pump”
4. Press [Off]
5. Disconnect the tubing from your catheter cap.
6. Open the safety door.
7. Remove the tubing cassette by raising the metal lock that secures it to the pump (Figure 8).
8. Throw away tubing.
9. Wash your hands.
10. Vigorously scrub the end of the cap on your catheter with an alcohol pad for 15 seconds.
11. Hold the prefilled saline syringe upright, press forward on the plunger, remove the cap, and push out the air.                                                                                     Figure 8
12. Push and twist the saline syringe into your catheter cap to the right until secure.
13. Inject the saline solution. Remove and discard the syringe in your trash.
14. Vigorously scrub the end of the cap on your catheter with an alcohol pad for fifteen seconds.
15. Hold the prefilled heparin syringe upright, press forward on the plunger, remove the cap, and push out the air.
16. Push and twist the heparin syringe into your catheter cap to the right until secure.
17. Inject the heparin leaving a small amount of solution in the syringe, and clamp your catheter before removing the syringe, then discard in your trash.
POTENTIAL COMPLICATIONS OF HPN THERAPY

Complications can occur with HPN therapy. By following the instructions in this manual, these complications may be prevented. The complications of HPN are classified as mechanical, infectious, and metabolic. Refer to Appendix B for a list of signs and symptoms of electrolyte and nutrient deficiencies.

MECHANICAL COMPLICATIONS

CLOTTING: occurs when fluids stop flowing through the catheter causing blood to backflow

<table>
<thead>
<tr>
<th>Signs of clotting</th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to flush your catheter or infusion pump alarms “oclusion”.</td>
<td>Kinks in the tubing or catheter. Closed clamp.</td>
<td>Avoid kinks in catheter when taping to your arm or chest.</td>
<td>Re-tape catheter. Open clamps.</td>
</tr>
<tr>
<td>Catheter is sluggish when you flush it.</td>
<td>Not following directions for catheter care. Clogged filter.</td>
<td>Always flush your catheter whenever HPN solution is completed or interrupted, after blood is drawn, or if blood backs up into the tubing. Follow the directions shown to you during training. When stopping the infusion, always clamp the catheter while the pump is still infusing. Change HPN tubing daily.</td>
<td>Notify your clinician if your catheter becomes difficult to flush. Do not use force when flushing your catheter. Change tubing.</td>
</tr>
</tbody>
</table>
**CATHETER DISPLACEMENT**: the tip of the catheter may have moved from the vein in your chest into a smaller vein in your neck.

<table>
<thead>
<tr>
<th>Signs of catheter displacement</th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain in the neck or shoulder when infusing PN. Swelling or puffiness at catheter site when infusing HPN.</td>
<td>Catheter is very flexible.</td>
<td>None. A chest x-ray may be needed to check the catheter location.</td>
<td>Stop the HPN infusion, flush the catheter and call your doctor immediately.</td>
</tr>
</tbody>
</table>

**CATHETER BREAKAGE**: the catheter leaks or breaks

<table>
<thead>
<tr>
<th>Signs of catheter breakage</th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaking of HPN fluid or blood.</td>
<td>Cut or tear in the catheter from scissors, pins, or other sharp objects. Using a clamp on the catheter with teeth or rough edges. Clamping the catheter in the same spot repeatedly.</td>
<td><strong>Never</strong> use sharp objects near the catheter. Always use a catheter clamp for clamping. Rotate the sites where you clamp your catheter.</td>
<td>Clamp the catheter as close to your body as possible. Call your doctor immediately. Your catheter will most likely need to be replaced.</td>
</tr>
</tbody>
</table>

**THROMBOSIS**: blood clot formation

<table>
<thead>
<tr>
<th>Signs of thrombosis</th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm (on the same side as your catheter) becomes swollen and cool to touch. May also cause swollen neck, chest or arm veins.</td>
<td>Catheter may cause blood flow obstruction.</td>
<td>None</td>
<td>Stop the HPN infusion, flush the catheter and call your doctor immediately.</td>
</tr>
</tbody>
</table>
**AIR EMBOLISM**: a large amount of air enters the blood system

<table>
<thead>
<tr>
<th>Symptoms of air embolism</th>
<th>Possible Causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortness of breath, coughing</td>
<td>The catheter is not clamped when the cap is removed.</td>
<td><strong>Always</strong> clamp the catheter whenever the catheter is opened to air.</td>
<td>If large amounts of air are seen in the tubing, clamp the catheter, stop the infusion, clear the tubing of air and restart the infusion.</td>
</tr>
<tr>
<td>Chest pain</td>
<td>The IV tubing becomes separated at a connection or the cap falls off the end of the catheter.</td>
<td>Tighten all tubing, connections and caps.</td>
<td><strong>FOR SYMPTOMS OF AN AIR EMBOLISM</strong>: Clamp the catheter and call 911.</td>
</tr>
<tr>
<td>Loss of consciousness</td>
<td>The IV tubing or filter is not filled correctly.</td>
<td>Fill the IV tubing carefully so air is not left in the tubing or filter.</td>
<td>Take small breaths only.</td>
</tr>
<tr>
<td>INFANTS may have:</td>
<td></td>
<td></td>
<td>Lie on your left side with feet and legs elevated and your chest and head down.</td>
</tr>
<tr>
<td>• a higher than usual breathing rate</td>
<td></td>
<td></td>
<td>If you are able, attach a syringe to your catheter and withdraw the air from the catheter until you get a blood return.</td>
</tr>
<tr>
<td>• a bluish coloring to lips or skin</td>
<td></td>
<td></td>
<td>Then flush with heparin.</td>
</tr>
<tr>
<td>• loss of consciousness</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**INFECTIOUS COMPLICATIONS**: symptoms of infections may occur either at the catheter exit site (local) or within the bloodstream (systemic).

**LOCAL**: infection at the catheter exit site.

<table>
<thead>
<tr>
<th>Symptoms of <strong>local infection</strong></th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>At catheter exit site:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Redness</td>
<td>Touching the exit site with your hands.</td>
<td>Avoid touching exit site with hands.</td>
<td>Call your clinician.</td>
</tr>
<tr>
<td>• Swelling</td>
<td>Rushing through the dressing procedure.</td>
<td>Take your time.</td>
<td>You may need to change dressing every day until infection has cleared, then you may return to your previous dressing change schedule.</td>
</tr>
<tr>
<td>• Tenderness</td>
<td>Not washing hands before dressing changes.</td>
<td>Follow procedures as shown to you in your training session.</td>
<td></td>
</tr>
<tr>
<td>• Drainage</td>
<td>Sutures left at the exit site.</td>
<td>Wash hands with antibacterial soap before starting or stopping HPN, changing dressings or if you are interrupted during any procedure.</td>
<td>Have suture removed in clinic or by your visiting nurse.</td>
</tr>
</tbody>
</table>
**INFECTION - SYSTEMIC**: an infection within the bloodstream. Systemic symptoms may be caused by another source of infection such as a “flu” virus, bladder infection or pneumonia.

<table>
<thead>
<tr>
<th>Symptoms of <strong>systemic infection</strong></th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Sloppy technique.</td>
<td>Take your time. Do not rush through procedures.</td>
<td>Take your temperature. If your temperature is greater than 101.5° (F) orally, call your clinician as soon as possible.</td>
</tr>
<tr>
<td>Chills</td>
<td>Not following procedures.</td>
<td>Follow procedures as shown to you in your training session.</td>
<td>If you are infusing your HPN and begin to experience a temperature or shaking chills, save your bag and tubing. It may need to be checked for contamination.</td>
</tr>
<tr>
<td>Sweating</td>
<td>Not washing hands with antibacterial soap before sterile procedures.</td>
<td>Wash hands with antibacterial soap before changing dressing.</td>
<td></td>
</tr>
<tr>
<td>Weakness</td>
<td>Using contaminated supplies or HPN solution.</td>
<td>If you think you contaminated any supplies or solutions, throw them out.</td>
<td></td>
</tr>
</tbody>
</table>
**METABOLIC COMPLICATIONS:** blood tests will be done periodically and any changes in the PN will be based on these lab reports.

**HYPERGLYCEMIA:** a higher than normal level of sugar in the blood.

<table>
<thead>
<tr>
<th>Symptoms of hyperglycemia</th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>• weakness</td>
<td>HPN has infused too fast.</td>
<td>Always use an infusion pump and taper your PN solution. <strong>Do not press the prime key</strong> when your pump tubing is connected to your catheter.</td>
<td>Check your urine fractional. Call your clinician if your urine fractional is not negative.</td>
</tr>
<tr>
<td>• feeling tired and thirsty</td>
<td>Body is unable to process the amount of sugar in your PN solution.</td>
<td>Follow procedures as shown to you during training.</td>
<td>Take your temperature. Call your clinician if greater than 101.5°F as soon as possible.</td>
</tr>
<tr>
<td>• dry mouth</td>
<td>Infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• headache</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• increase in urine output</td>
<td></td>
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<td></td>
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</tbody>
</table>

**HYPOGLYCEMIA:** a lower than normal level of sugar in the blood.

<table>
<thead>
<tr>
<th>Symptoms of hypoglycemia</th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>• nervous</td>
<td>HPN is suddenly stopped.</td>
<td>Do not stop your HPN infusion in the middle of a cycle unless directed by your clinician.</td>
<td>Drink something with sugar in it (such as orange juice) or suck on a hard candy</td>
</tr>
<tr>
<td>• irritable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• headache</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• dizziness &amp;/or cold sweats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infants may be:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• lethargic</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• clammy to touch pale</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

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<table>
<thead>
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</thead>
</table>
**FLUID IMBALANCE**: fluid balance will be affected by your nutritional and health status.

<table>
<thead>
<tr>
<th>Symptoms of fluid imbalance</th>
<th>Possible causes</th>
<th>Prevention</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss or gain of 3 pounds or more for 2 days in a row.</td>
<td>The amount of HPN solution may be too little or too much.</td>
<td>Weigh yourself every day at the same time. Keep track of your intake and output, and weight daily. Record the information on the Daily Monitoring Form.</td>
<td>Call your clinician.</td>
</tr>
<tr>
<td>New or increased swelling in your feet, ankles, or fingers.</td>
<td>Increased fluid loss or decreased urine output (for infants: decreased diaper changes).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Infants</strong>: sunken or puffiness around the eyes, fullness of the “soft spot” on the head, a depressed “soft spot”, or difficult, rapid, labored breathing.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INFUSING EXTRA IV FLUIDS
Occasionally your clinician may wish to infuse more fluid than your HPN solution. These fluids may also be used in case of a pump failure. The most common fluids are:

- dextrose 10% water (D_{10}W)
- dextrose 5% water and 0.45% normal saline (D_{5}W/0.45% Sodium Chloride)
- dextrose 5% water and 0.45% normal saline with 20 mEq KCl (potassium)
- lactated ringers (LR)
- normal saline (0.9% Sodium Chloride)

You will receive a small supply of one or two of these fluids once you are discharged from the hospital. You should infuse these only as directed by your clinician.

Key Points:

- Check the bag for leaks and floating materials. Check the expiration date and contents of the fluid.
- If the bag has expired or if you find any leaks or floating materials, set IV bag aside and use another one. Notify HomeMed if this should occur.
- IV solutions do not usually need to be refrigerated. HomeMed will instruct you on whether or not your IV solutions need to be kept in the refrigerator. This information will also be included on the label.
- IV tubing used for IV fluids may be used for 3 days (72 hours) as long as you put a new sterile cap on the end of the tubing after using it.

What supplies do I need?

- One (1) IV medication bag
- One (1) Gravity IV tubing
- One (1) Flow controller extension set
- One (1) Luer lock cap (red cap to keep IV tubing sterile for reuse)
- One (1) Prefilled heparin flush syringe (remove from package)
- Two (2) Prefilled saline flush syringes (remove from package)
- Four (4) Alcohol pads
- Household disinfectant or alcohol
- Antibacterial soap
- Paper towel
How do I prepare for the procedure?
1. Place a trash can next to your work area.
2. Clean your work surface or laminate mat with household disinfectant. Let the area air dry.
3. **Wash your hands.**
4. Gather your supplies and place onto your work area.
5. **Wash your hands again**

How do I prepare the tubing?
1. Attach the gravity IV tubing to the flow controller extension set.
   - Remove the cap from the end of the gravity IV tubing.
   - Remove the cap on the shorter end of the flow controller tubing and attach it to the gravity IV set by twisting at the luer lock connection.
2. Remove the tab from the IV bag.
3. Remove the spike cover from the IV tubing. Do not touch the spike.
4. Hold the port of the IV bag straight and insert the spike by pushing and twisting at the same time.
5. Hang the IV bag with the attached tubing on the IV pole. Squeeze and release the drip chamber on the IV tubing until it is half full of fluid.
6. Squeeze and release the drip chamber on the IV tubing until it is half full of fluid.
7. Turn arrow on flow controller to “open” to fill the IV tubing with fluid.
8. When the fluid is at the end of the IV tubing, turn the arrow on flow controller to “off”.
9. Hang the IV tubing over the IV pole. Do not let the tubing fall on the floor.
10. Place the expiration label on the IV tubing to remind you to change it in 72 hours (3 days).
How do I give the IV fluid?
1. Check your catheter cap to make sure it is on securely (always hold your catheter cap while connecting/disconnecting to prevent accidental removal).
2. Unclamp your catheter.
3. Vigorously scrub the end of the cap on your catheter with an alcohol pad for fifteen seconds.
4. Hold the prefilled saline syringe upright.
5. Do not remove the cap. Press forward on the plunger to break the seal. Do not pull back on the plunger.
6. Gently tap the sides of the syringe so the bubbles rise to the top. Remove the cap and push the plunger to remove all the air.
7. Push and twist the saline syringe into your catheter cap to the right until secure.
8. Inject the saline solution. Remove and discard syringe in sharps container.
9. Vigorously scrub the end of the cap on your catheter with an alcohol pad for fifteen seconds.
10. Remove the protective cap from the flow controller extension set.
11. Push and twist the luer lock into your catheter cap to the right until secure. Then “lock down” the spin collar to ensure a secure connection.
12. Turn the arrow on the flow controller to the rate noted on the bag label in order to infuse over the correct amount of time.

How do I stop the IV fluid?
1. When infusion is done, roll down the roller clamp on the IV tubing to close it.
2. Wash your hands.
3. If the tubing has been used less than three days, disconnect the IV tubing from the cap on your catheter and place the red cap onto the end of the flow controller tubing (this will keep the IV tubing sterile for reuse). Keep empty bag attached to tubing (see next section to learn how to reuse tubing).
4. Vigorously scrub the end of the cap on your catheter with an alcohol pad for 15 seconds.
5. Hold the prefilled saline syringe upright, press forward on the plunger, remove the cap, and push out the air.
6. Push and twist the saline syringe into your catheter cap to the right until secure.
7. Inject the saline solution. Remove and discard the syringe in your sharps container.
8. Vigorously scrub the end of the cap on your catheter with an alcohol pad for fifteen seconds.
9. Hold the prefilled heparin syringe upright, press forward on the plunger, remove the cap, and push out the air.
10. Push and twist the heparin syringe into your catheter cap to the right until secure.
11. Inject the heparin leaving a small amount of solution in the syringe, and clamp your catheter before removing the syringe, then discard in trash.

**How do I reuse the tubing for the next dose?**

**Change your IV tubing every 3 days.** Labels will be provided to help you keep track. If the tubing has been used for 3 days, throw it away and use a new tubing for the next dose. If your tubing has been used less than 3 days do the following:
1. Remove the empty medication bag by twisting and pulling out the spike. Keep the spike on the IV tubing sterile.
2. Replace the old empty medication bag with a new one.

**In summary: These are the steps to follow when you give your IV fluids using a flow controller extension set:**

- Wash your hands
- Attach flow controller to gravity IV tubing
- Spike bag and prime tubing with fluid
- Flush your IV catheter with saline
- Start infusion (set flow controller to rate noted on bag label)
- Stop infusion (keep tubing sterile for 3 day reuse)
- Flush your IV catheter with saline
- Flush your IV catheter with heparin
NOTIFY YOUR DOCTOR, VISITING NURSE OR HOMEMED

IMMEDIATELY:

1. If you are unable to infuse any or part of the HPN solution.
2. If you are having difficulties flushing your catheter.
3. If you have a hole or break in your catheter.
4. If you have pain in the neck or shoulder when infusing the HPN solution.
5. If your urine fractionals are not negative.
6. If you experience symptoms of hypoglycemia or hyperglycemia.
7. If you experience symptoms of systemic (body-wide) infection such as fever, chills, sweats or weakness.
8. If your arm (on the same side of your catheter) becomes swollen, cool or painful.
9. **Call 911** if you experience symptoms of air embolism: shortness of breath, coughing, and chest pain.
10. In children, if there is no urine output for more than eight to twelve hours.
11. For infants, if weight loss or gain is greater than 50 grams (1.76 ounces) a day or if they have puffy eyes, full or “depressed” soft spot, decrease in diaper changes, lethargy or difficult, rapid or labored breathing.

CALL AS SOON AS POSSIBLE:

1. If your urine output is less than 800 mL per day for two days in a row.
2. If there is new or increased swelling in your feet, ankles or fingers.
3. If you have vomiting, diarrhea or a sudden increase in fistula drainage.
4. If you have a weight loss or gain of 3 pounds or more for two days in a row.
5. If you see redness, swelling, tenderness and/or drainage at the catheter exit site.
6. If your catheter is sluggish when flushing but you are still able to flush it.
PREPARE FOR EMERGENCIES

1. Keep supplies that are necessary to flush your line with you at all times.

2. Always keep your IV catheter taped securely to prevent dislodgement.

3. If you notice that the filter is leaking or cracked, change the IV tubing.

4. If your battery pack does not work, use the disposable batteries sent to you by HomeMed. Call HomeMed in the morning to replace the battery pack.

5. You may wish to purchase a medical alert bracelet at your local pharmacy stating your medical condition and the presence of your IV catheter.

6. Keep your HPN manual, infusion pump manual and telephone numbers in a place where you can find them easily if problems arise.

7. If you are infusing your HPN solution and need to leave your home immediately, do not stop the infusion. Put the HPN solution in the backpack and take it with you.

8. If you need to temporarily relocate from your home, please contact our office with your temporary address and phone number.

9. If you lose power to your refrigerator, remove your HPN solution and additives and store them in a portable cooler with ice. This will keep your HPN and medications stored safely for at least 24 hours. Call your HomeMed clinician for further instructions.

PLAN FOR OTHER HEALTH CONCERNS

1. Notify your doctor in advance of any dental work or minor surgery to be done. You may need to take antibiotics.

2. Brush and floss your teeth and use mouthwash two to three times a day.

3. If you have a cold or are sick, wear a mask when starting, stopping or mixing your PN solution, or when changing your catheter dressing.

4. Notify your clinician(s) if you are admitted to a hospital or if you are started on any new medications.
SUMMARY OF STEPS

Starting HPN

1. Obtain daily weight and temperature to record on Daily Monitoring Form
2. Clean work area
3. Wash hands
4. Open supplies and place on work area
5. Check and compare HPN prescription and bag label
6. Mix additives in HPN bag (refer to HPN compounding instruction sheets)
7. Attach anti-siphon valve to IV tubing
8. Place IV tubing into the pump
9. Turn the pump on
   • Press [PreSet Programs]
   • Select TPN (review pump program with the programming sheet)
   • Press [OK]
10. Spike HPN bag with IV tubing
11. Prime IV tubing
12. Flush your catheter with saline
13. Connect IV tubing to your catheter
14. Press [START] on pump screen to begin infusion
15. Press [LOCK] then [Patient Lockout] on the screen
16. Place the IV bag and pump into the backpack or on IV pole
17. If instructed, check urine fractional 3-4 hours into cycle. If not negative, call HomeMed or your doctor. If using a glucometer, check blood sugar 3 hours into cycle and call HomeMed or your doctor for glucose greater than 200.
Stopping HPN

1. Clean work area
2. Wash hands
3. Press the [STOP] key on the infusion pump
4. Flush your IV catheter with saline then heparin
5. Turn pump off
6. Remove tubing and HPN bag from the pump and discard
7. Remove a new HPN bag from the refrigerator
8. Plug pump into outlet to charge
APPENDIX A

FREQUENTLY ASKED QUESTIONS

1. How will I get the supplies I need to administer my HPN at home? HomeMed will deliver them. All the supplies you will need to administer HPN, for about one week, will come to your home the same day or evening of discharge from the hospital. A Team Technician from HomeMed will contact you the day of discharge to see what time you will be at home so a delivery time can be organized. The Team Technician will also discuss with you a schedule for delivering further supplies to your home, usually once a week.

2. What types of things will they provide? Your HPN solution, a refrigerator (specifically for HPN), tubing, extension tubing, pump, backpack, syringes, needles, heparin flush, medication to be added to the HPN solution, alcohol wipes, IV dressing change kits, tape, sharps container, IV pole, extra IV fluid, and supply list.

3. How will I learn how to administer PN with all the supplies above? The HomeMed Training Team will instruct you in the hospital. Equipment will be brought to your room to practice with and you will also be given written material to read. Once you are at home, a visiting nurse will reinforce what you have learned in the hospital.

4. When will the Visiting Nurse come to my home? A Visiting Nurse Agency (VNA) will be contacted before your discharge. This nurse is the best person to ask when they will come to your home. Generally, it’s around 7pm or 8pm the evening of discharge. This is because most people are “cycled” on their HPN and are due to be hooked up at this time of the evening.

5. What is “Cycling”? In the hospital, HPN is connected to your catheter 24 hours a day. At home, many patients are on HPN only 12 hours per day, and generally infuse at night while sleeping. Prior to discharge, HomeMed works with your physician towards cycling your HPN down to 12 hours. Each patient is different, due to their age and medical status, in terms of how quickly the HPN cycle can be lowered. If you are not on a 12 hour cycle at discharge, you may be able to continue to be “cycled down” once at home with the help of your HomeMed clinician.
6. **Who are my HomeMed clinicians?** The team of clinicians who will care for you include a pharmacist and a nurse. They will be in contact with you frequently once you are home. They will monitor your labs and HPN progress with your physician.

7. **Who do I contact if I’m missing supplies?** During your first visit with your VNA, it’s a good idea to go through your supplies with your nurse to verify that you have all the items necessary to start your HPN therapy. The Team Technician at HomeMed is the individual to contact if something is missing. Their name and extension numbers are listed in the front of your HPN manual. Please wait until morning to contact them if it’s not urgent. If it’s necessary to have the item that night, contact the 24-hour on call number: 1-800-862-2731.

8. **How often is IV tubing changed?** Every day due to the sugar and lipid content in the HPN.

9. **There is some other clear IV fluid in my box. What are these used for?** Some patients may need additional hydration while on HPN. This may be due to increased vomiting, diarrhea, ostomy output, etc. Your HomeMed clinician will inform you what IV fluids to use if additional hydration becomes necessary. You may need to use these solutions if your pump fails. Generally, these hydration fluids do not need to be refrigerated unless the label directs you to do so.

10. **I see a different type of tubing in my box with a dial on it. What is this used for?** This is used if it is necessary to infuse extra hydration fluids. If required, your HomeMed clinician will discuss this with you. This type of tubing can be used for three days, since the sugar content is lower in hydration fluids.

11. **Who do I call when my sharps container is full?** Contact your Team Technician at HomeMed to send you an empty one to use. To dispose of a sharps container, seal and secure the lid, double bag it, and place into your regular household trash.

12. **I have the urine test sticks in my box to check my sugar. Why is this so important to do 3 to 4 hours into my cycle?** Your HPN solution contains a large amount of sugar (glucose) in a short period of time, due to being cycled. (The time that is infused when you will be receiving the greatest amount of sugar is between the taper up and taper down periods). This is when you need to check your urine. If your body is having difficulty handling this amount of sugar, the kidneys will try to remove as much of the excess sugar as possible and pass it into your urine. If your urine fractionals are high,
changes will need to be made in your HPN solution because you can easily become dehydrated (see complications for symptoms). Your HomeMed clinician will ask you what your urine fractionals have been when they contact you. This is a key part of HPN monitoring.

13. They check blood glucose levels in the hospital. Do I need to check these at home too? Generally, in most patients, urine fractionals are all that is needed. Certain patients, such as diabetics, are requested to monitor blood glucose levels. If blood glucose checks are needed, a member of your medical team will inform you of this.

14. If I do feel hypoglycemic, hyperglycemic, dehydrated etc., who do I contact? You can contact your HomeMed clinician or your doctor.

15. I’m feeling great on PN. I’m gaining weight and have lots of energy. Can I just skip a day of PN? NO! When you are ready to “come off” HPN, this is done slowly and only under the supervision of your doctor and HomeMed clinicians.

16. I’m feeling so good; I’d like to travel a little bit. Is this possible while on HPN? Yes, you can travel, if approved by your doctor. Contact your HomeMed clinician and Team Technician to assist you with organizing this. Please notify HomeMed as far ahead of time as possible so that your supplies can be shipped directly to your destination.
APPENDIX B

SIGNS AND SYMPTOMS OF ELECTROLYTE AND NUTRIENT IMBALANCES

MAJOR ELECTROLYTES

SODIUM
Important for fluid balance and many vital functions.

Hypernatremia (High Sodium)
- Thirsty
- Rough, dry tongue
- Decreased urine output
- Decreased weight

Hyponatremia (Low Sodium)
- Weakness
- Apathy
- Weight gain, swelling in the hands and feet
- Headaches, shortness of breath

POTASSIUM
Involved in many important actions including heart function.

Hyperkalemia (High Potassium)
- Weakness
- Generally tired
- Muscle cramping or twitching

Hypokalemia (Low Potassium)
- Decreased reflexes
- Muscle cramping or twitching
- Muscle weakness
- Rapid, weak pulse

CALCIUM
Necessary for bone growth, blood clotting muscle, nerve, and heart function.

Hypercalcemia (High Calcium)
- Drowsiness, tiredness
- Loss of appetite
- Nausea, vomiting
- Muscle weakness
- Deep bone pain

Hypocalcemia (Low Calcium)
- Twitching
- Seizures
- Tingling around the mouth
- Spasms of the feet or hands
- Numbness, tingling of hands or feet
- Abdominal cramping
- Nausea, vomiting, diarrhea
**MAGNESIUM**
Mineral found in soft tissue, muscle and bones.

**Phosphorus**

**Glucose**
**Blood Glucose**
Sugar found in the blood.

**Hypermagnesemia (High Magnesium)**
- Drowsiness
- Tiredness
- Flushing
- Muscle weakness

**Hypomagnesemia (Low Magnesium)**
- Not able to sleep
- Leg, foot cramps
- Muscle weakness, twitching, tremors

**Hyperphosphatemia (High Phosphorus)**
- Numbness, tingling of extremities
- Muscle cramps
- Nausea, vomiting, diarrhea
- Dry skin
- Brittle nails
- Tingling around the mouth

**Hypophosphatemia (Low Phosphorus)**
- Tiredness
- Muscle weakness
- Loss of appetite
- Mild bone pain

**Hyperglycemia (High Blood Sugar)**
- Weakness
- Tired
- Thirst
- Headache
- Dry mouth
- Increased urine output
- Irritability, confusion

**Hypoglycemia (Low Blood Sugar)**
- Nervousness
- Headache
- Cold sweats
- Dizziness
- Irritability, confusion
FLUID IMBALANCES

**Fluid Overload (Water Excess)**
- Confusion, poor coordination
- Nausea
- Muscle cramps, weakness
- Headache
- Weight gain
- Moist skin
- Swelling in legs
- Fluid intake greater than output
- Shortness of breath
- Light-colored, large amounts of urine output

**Dehydration (Water loss)**
- Dizziness, weakness
- Thirst
- Dry skin and mucous membranes
- Swollen, dry and fissured tongue
- Weight loss
- Decreased urine output
- Dark-colored, concentrated urine
- Foul smelling urine
# NUTRIENT DEFICIENCIES

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>FUNCTION</th>
<th>SYMPTOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin K</td>
<td>Vitamin important in blood clotting; controls bleeding</td>
<td>• Bruising easily&lt;br&gt;• Bloody nose&lt;br&gt;• Cut that bleeds too long&lt;br&gt;• Bleeding gums</td>
</tr>
<tr>
<td>Fat Emulsion</td>
<td>Provides essential fatty acids</td>
<td>• Scaly skin (dermatitis)&lt;br&gt;• Loss of hair&lt;br&gt;• Oily taste in mouth</td>
</tr>
<tr>
<td>Zinc</td>
<td>Trace element involved in many enzyme systems</td>
<td>• Scaly skin (dermatitis)&lt;br&gt;• Loss of hair&lt;br&gt;• Red rash</td>
</tr>
<tr>
<td>Biotin</td>
<td>Vitamin important in nutrient metabolism</td>
<td>• Loss of hair&lt;br&gt;• Depression</td>
</tr>
<tr>
<td>B₁₂, Folic Acid, Iron</td>
<td>Prevents anemia</td>
<td>• Anemia&lt;br&gt;• Tiredness</td>
</tr>
<tr>
<td>Trace Elements</td>
<td>Promote the efficient use of nutrients within our bodies</td>
<td>• Metallic taste in mouth</td>
</tr>
<tr>
<td><strong>GLOSSARY</strong></td>
<td>Description</td>
<td></td>
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<td>----------------</td>
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<tr>
<td><strong>AIR EMBOLISM</strong></td>
<td>An air bubble that is carried in the bloodstream</td>
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<tr>
<td><strong>AMINO ACID SOLUTION</strong></td>
<td>Intravenous protein</td>
<td></td>
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<tr>
<td><strong>ASEPTIC</strong></td>
<td>Bacteria free, sterile</td>
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<tr>
<td><strong>CATHETER (INTRAVENOUS)</strong></td>
<td>A slender tube of plastic or silicone inserted into a blood vessel for infusing fluid</td>
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<tr>
<td><strong>CATHETER CLAMP</strong></td>
<td>Prevents flow of liquids through a section of tubing</td>
<td></td>
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<tr>
<td><strong>COMPOUNDING</strong></td>
<td>Preparing your HPN solution</td>
<td></td>
</tr>
<tr>
<td><strong>CONTAMINATION</strong></td>
<td>The presence of bacteria which makes an item unsterile</td>
<td></td>
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<tr>
<td><strong>CYCLIC PN</strong></td>
<td>Method of HPN infusion where the day is divided into &quot;cycles&quot; - HPN is infused during the same time period each day</td>
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<tr>
<td><strong>DEXTROSE</strong></td>
<td>(Glucose) simple sugar that is a major caloric source in HPN</td>
<td></td>
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<tr>
<td><strong>DEHYDRATION</strong></td>
<td>A decrease in body water. Signs and symptoms include thirst, low urine output. Frequent causes are diarrhea, increased stoma output, vomiting</td>
<td></td>
</tr>
<tr>
<td><strong>ELECTROLYTE</strong></td>
<td>An important chemical necessary in any cell's functioning (i.e., sodium, potassium)</td>
<td></td>
</tr>
<tr>
<td><strong>ENTERAL</strong></td>
<td>Using the gut (intestine) as opposed to veins (parenteral)</td>
<td></td>
</tr>
<tr>
<td><strong>EXPIRATION DATE</strong></td>
<td>Do not use beyond this date</td>
<td></td>
</tr>
<tr>
<td><strong>FAT EMULSION</strong></td>
<td>(Same as lipids, Liposyn®, Intralipid®) - liquefied fat for IV administration</td>
<td></td>
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<tr>
<td><strong>GAUGE</strong></td>
<td>Measurement for diameter of needles - the larger the number - the smaller the diameter</td>
<td></td>
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<tr>
<td><strong>GLYCEMIA</strong></td>
<td>Sugar or glucose in the blood</td>
<td></td>
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<tr>
<td>Term</td>
<td>Definition</td>
<td></td>
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<td>--------------------</td>
<td>---------------------------------------------------------------------------</td>
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<tr>
<td><strong>HEPARIN</strong></td>
<td>A drug which prevents the blood from clotting</td>
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<tr>
<td><strong>HYPER</strong></td>
<td>Prefix meaning above, excessive or beyond normal</td>
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<tr>
<td><strong>HYPERAL</strong></td>
<td>Slang term for hyperalimentation, PN (Parenteral Nutrition)</td>
<td></td>
</tr>
<tr>
<td><strong>HYPO</strong></td>
<td>Prefix meaning below or less than normal</td>
<td></td>
</tr>
<tr>
<td><strong>INTRAVENOUS (IV)</strong></td>
<td>Through the vein</td>
<td></td>
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<tr>
<td><strong>LUER LOCK</strong></td>
<td>A special type of IV tubing connection which twists together and prevents ends from pulling apart</td>
<td></td>
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<tr>
<td><strong>MULTIDOSE</strong></td>
<td>A container or vial that can be used more than one time if it is refrigerated</td>
<td></td>
</tr>
<tr>
<td><strong>MVI</strong></td>
<td>Multiple Vitamin Injection</td>
<td></td>
</tr>
<tr>
<td><strong>PARENTERAL NUTRITION (PN)</strong></td>
<td>Infusion of a dextrose and amino acid solution to provide calories and protein to meet daily nutritional requirements</td>
<td></td>
</tr>
<tr>
<td><strong>PATENCY</strong></td>
<td>Open, not obstructed</td>
<td></td>
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<tr>
<td><strong>PICC (Peripherally Inserted Central Catheter)</strong></td>
<td>A catheter that is inserted in the arm into the subclavian vein</td>
<td></td>
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<tr>
<td><strong>PIGGYBACK</strong></td>
<td>Technique for infusing two IV solutions through one line - a needle is used to plug one IV into another using a rubber entry port</td>
<td></td>
</tr>
<tr>
<td><strong>PRIMING</strong></td>
<td>Filling the IV tubing with fluid</td>
<td></td>
</tr>
<tr>
<td><strong>SEPSIS</strong></td>
<td>Bacteria in the blood</td>
<td></td>
</tr>
<tr>
<td><strong>SINGLE DOSE – (UNIT DOSE)</strong></td>
<td>A container or vial which can be used only once</td>
<td></td>
</tr>
<tr>
<td><strong>SUBCUTANEOUS</strong></td>
<td>Under the skin</td>
<td></td>
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<tr>
<td><strong>SUPERIOR VENA CAVA</strong></td>
<td>Large vein that empties into the right side of the heart</td>
<td></td>
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<tr>
<td><strong>SYSTEMIC</strong></td>
<td>Throughout the body</td>
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</tr>
<tr>
<td><strong>TRACE ELEMENTS</strong></td>
<td>Promote the efficient use of nutrients within our bodies</td>
<td></td>
</tr>
<tr>
<td><strong>URINE FRACTIONALS</strong></td>
<td>Urine testing done to check for sugar in the urine - should be negative</td>
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</tbody>
</table>