



Home Parenteral Nutrition (PN) Learning Manual

Updated: November 2024

Welcome

Choosing to receive Home Parenteral Nutrition is a significant decision. We are offering this therapy to you because we believe that it is essential to meet your nutritional needs and provide the best outcomes for your future health.

Your positive attitude and desire to actively participate in your recovery will help your learning of these skills.

Your team members are:

Most Responsible Doctor: _____

Family Doctor: _____

Nurse: _____

Dietitian: _____

Home Care Agency: _____

Supply Company: _____

Pharmacy: _____

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Purpose of Home PN

The purpose of Home PN is to provide you with essential nutrition. Even though you may be able to eat, your gut is unable to absorb all the nutrients you need. Home PN ensures that you receive all these nutrients through the bloodstream by using your Central Venous Access Device (CVAD) ie: PICC, port, Hickman.

Introduction

This booklet is designed to introduce you to Home Parenteral Nutrition (PN). By reading and using this guide, we hope you will gain a thorough understanding of Home PN and develop the skills necessary to administer it independently.

While you are responsible for your Home PN care, it is essential to have another person available for support, guidance, and assistance. As you learn these new skills, we recommend that a family member or close friend also receive training to help you with Home PN. This "backup" person can provide support in case you encounter any issues at home.

This PN program involves close collaboration with the entire care team. Together, we will help you develop the knowledge and skills needed to manage your Home PN effectively. We are here to answer any questions and provide assistance. Please, do not hesitate to reach out if you need support.

How Home PN may affect your daily life

Home PN provides individuals with greater freedom from hospital settings and an opportunity to lead fulfilling lives. Those on Home PN have shared that:

- Being at home is immensely valuable to them
- They appreciate the time spent with family and friends
- They can engage in most of their preferred activities

With this freedom comes responsibility. Our role is to work with you and your backup person to ensure you both feel confident in the skills required for Home PN. It's natural to feel some nervousness about new routines.

During your hospital stay, you will have opportunities to speak with various members of the healthcare team involved in your Home PN care. We encourage you to ask questions and share your feelings about transitioning to Home PN.

Discussing these changes and your emotions is important. While Home PN offers independence and control over your life, it should not dominate it. Taking it one step at a time will help Home PN become a seamless part of your routine, allowing you to enjoy your time at home.

Daily living with Home PN

Can I still eat?

Yes you can eat while on PN, however, your individual treatment plan may include specific restrictions or modifications to your diet. The dietitian will provide detailed guidelines and explanations before you leave the hospital.

Can I exercise?

Exercise in moderation is encouraged. Being active helps your body utilize the calories and nutrients from Home PN more effectively. If you're new to exercise, start slowly and gradually increase your activity level. Regular exercise is important for building muscle and increasing strength. Walking is a great way to stay active.

How will this affect my sleep?

If your Home PN is administered at night, it may initially interrupt your sleep. You might be concerned about the pump's operation or the possibility of dislodging the central venous catheter. These concerns should diminish as you become more accustomed to the equipment.

Additionally, the nightly infusion may lead to more frequent trips to the bathroom. This will likely decrease as your body adjusts to the Home PN routine.

If you feel tired during the day, a nap can help ensure you get the rest you need.

We will aim to tailor your Home PN regimen to fit your lifestyle. While many people prefer to have their days free from the pump, we understand that this schedule may not work for everyone.

Can I shower, swim or bathe?

Regular bathing is important, but the method will vary depending on your Central Vascular Access Device (CVAD). Generally, sponge bathing or taking a bath with a low water level is acceptable. It is crucial to keep your CVAD clean and dry, so avoid immersing it in water.

How will it affect my social life?

Many people find that Home PN enhances their social life, allowing them to visit friends and family or host visitors at home. You can choose how much you wish to share about your Home PN. Being open and honest with family and close friends can strengthen your support network. Additionally, your Home PN routine can be adjusted for special occasions, so you can participate in events that matter to you.

Will it affect my sex life?

Home PN should not negatively impact your sexual relationships or activities. In fact, improved health from Home PN might enhance your overall well-being. However, the need for nighttime preparation and infusion may make spontaneity more challenging. Open communication with your partner about your feelings can help address any concerns and improve your experience.

Can I travel?

Yes, you can travel. Effective planning is crucial when traveling with Home PN. Before making any travel arrangements, discuss your plans with your family physician to ensure you're well-prepared.

The Home PN Team

During your hospital stay, the healthcare team involved in planning your Home PN includes you, your family, hospital staff, and community healthcare professionals.

Member Roles

Your role

As an active member of the home PN team, you play a crucial role in the planning and management of your PN therapy. Your goal is to effectively manage your PN at home.

To achieve this, you need to:

- Be mentally prepared and confident to start the program
- Adapt to the lifestyle changes required for home PN management
- Understand the principles of Home PN
- Perform the necessary skills safely
- Know how to respond if issues arise

Family / Friends

Your family and friends play an important role in your care by:

- Providing emotional support
- Communicating with the team to help us better understand your needs
- Serving as your “backup” person

Doctors

Your care may involve several doctors, including:

- A Gastroenterologist
- Your Family Doctor
- A surgeon

Registered Nurses (RNs)

The RNs on your team will:

- Teach you the skills needed to manage Home PN
- Assess your ability to understand and perform these skills
- Listen to your concerns about Home PN
- Answer your questions
- Assist with problem-solving and managing challenges
- Communicate with other team members to ensure your needs are met
- Plan and coordinate your care in collaboration with the team
- Discuss the storage of supplies at home
- Coordinate education with community nurses
- Provide support and encouragement

Social Worker

The social worker will:

- Help you and your family address and resolve any issues that arise or are anticipated
- Inform you about available community resources
- Assist with finding resources to cover the costs of Home PN

Registered Dietician

The registered dietitian will:

- Calculate your nutritional needs and provide recommendations to your doctor
- Organize and review blood tests and other assessments to monitor changes and determine your energy needs
- Monitor your nutritional progress and help adjust your diet as needed
- Answer any questions related to your nutritional health
- Revise your Home PN solutions in consultation with your nurse and doctor

Pharmacy

The pharmacy plays a crucial role in Home PN by:

- Ensuring that all necessary medications and nutritional solutions are accurately prepared and dispensed according to your treatment plan.
- Offering guidance on the proper handling, storage, and administration of Home PN products, including troubleshooting any issues related to the medications.
- Reviewing your medication regimen for potential interactions, ensuring safety and efficacy, and adjusting as needed in collaboration with your healthcare team.
- Communicating with your doctors, dietitian, and nurses to ensure a coordinated approach to your Home PN therapy.

Following Discharge

After completing your training and being discharged, you will continue to be monitored by the gastroenterologist and your family physician. An outpatient dietitian will also follow up on your nutritional needs.

Additionally, you may need to visit the outpatient ambulatory care unit weekly for CVAD dressing and cap changes, and possibly for blood work. If traveling to the clinic is not feasible, a homecare nurse can visit you at home weekly to perform these tasks.

Administration

How is Home PN Administered?

Home PN is delivered through a Central Venous Access Device (CVAD) because it contains a mixture of sugars (dextrose), proteins (amino acids), and fats (lipids) that need to be rapidly diluted in the bloodstream. This effective mixing occurs when the CVAD is placed in a large vein. The CVAD is typically positioned in the superior vena cava, a major vein in the chest near the heart, to ensure optimal dilution and absorption.

There are several types of CVADs:

- Tunneled (Hickman Catheter)
- Implanted Port (Port-a-Cath)
- Peripherally Inserted Central Catheter (PICC)

These devices can be either single-lumen or dual-lumen, meaning they have one or two passages (tubes) for administering Home PN. The decision on whether you need a single or dual-lumen device will be made by your doctor, with your input on which option best suits your needs.

The type of device chosen is based on:

- The expected duration of Home PN therapy
- Your overall health and the possibility of other treatments in the future
- Your daily activities and lifestyle
- Your personal comfort and preferences
- The most suitable vein for access

Types of CVADS

IMPLANTED PORT

What is an implanted port?

This device is made up of two parts. The two parts are the post-reservoir and the catheter. The reservoir is a round disk placed under your skin. A soft silicone catheter is attached to the reservoir and the catheter is put into the vein.

To use the implanted port, it needs to be accessed with a special needle.

Advantages:

- When the needle is not in place, you cannot see your device
- When the needle is not in place you do not need a dressing over it
- You are also free to go swimming when the needle is not in place

Limitations:

- No contact sports

How is it inserted?

The implanted port is inserted in the Operating Room. The insertion is done under sterile conditions. A local anesthetic will be used as the skin will be “frozen” where the device is put in. You will also get some medication to help you relax. The procedure usually takes around 60 minutes. You will need to sign a consent form before the procedure.

Can the device be replaced?

This device can last for a long time without any problems. If problems occur, a new device will need to be inserted.

How is the device removed?

The device will be removed if you no longer need it. It will also be removed if complications occur that cannot be managed. A small incision is made over the implanted port and then the port and reservoir catheter are removed. Local anesthetic is used when removing an implanted port.

Flushing Procedure for Implanted Port

Flushing a Port BEFORE starting PN

- Perform hand hygiene
- Gather equipment: 3 – 10mL prefilled normal saline (N/S) syringes, 2 – chlorhexidine (CHG) swabs, 1 – 4x4 sterile gauze
- Cleanse needle free connector hub vigorously with a CHG swab, place 4x4 gauze under to keep it sterile, and let dry for 90 seconds. (Skip this step if using Curoc caps)
- Unclamp and flush with 2-3 mL of N/S from the first pre-filled syringe, aspirate for blood return (2-3 mL), and then attach a new syringe and flush with 10 mL; attach the last syringe and flush for a total of 20 mL N/S, using push-pause technique.
 - **Rationale:** The push-pause method creates more turbulence, ensuring that the line is more effectively cleared of blood or medication.
- Remove syringe, clamp, and discard syringe. Cleanse needle- free connector hub again with CHG and allow to dry before attaching PN tubing.

Flushing a Port AFTER disconnecting PN

- Perform hand hygiene
- Gather equipment: 3 – 10mL prefilled N/S syringes, 2 – CHG swabs, 1 – 4x4 sterile gauze, 1 – 10 mL syringe, 5 mL Heparin 100 u/mL or prefilled heparin syringe with your prescribed strength and amount.
- Cleanse needle- free connector hub vigorously with a CHG swab, place 4x4 gauze under to keep it sterile, and let dry for 90 seconds.

- Unclamp and flush with 2-3 mL of N/S from the first pre-filled syringe, aspirate for blood return (2-3 mL), and then attach a new syringe and flush with 10 mL; attach the last syringe and flush for a total of 20 mL N/S, using push-pause technique.
- Flush with the 5 mL of Heparin 100 u/mL
- Remove syringe, clamp, and discard syringe. Apply Curocap cap if using.

PICC

What is a Peripherally Inserted Central Catheter (PICC)?

A PICC is a soft silicone catheter which is inserted in a vein near your elbow. A PICC may be used if you need Home PN for a short time only, or if you are waiting to have one of the other devices inserted.

How is the PICC inserted?

The PICC is inserted by a specially trained nurse at your bedside. You will need to sign a consent form before the procedure. The PICC is inserted in a vein near above your elbow. The catheter is then slowly advanced until the tip is in a big vein.

Advantages:

- It is a long-term device that permits users to receive their treatments at home.

Limitations:

- Swimming is not allowed if you have a PICC.
- It always needs a dressing over it.
- When you have a PICC you cannot lift any objects greater than 10 lbs.
- You cannot have venipuncture or blood pressure done on that arm

Can the PICC be replaced?

PICCs can last for a long time without any problems. If something were to happen that could not be repaired, a new PICC would be inserted. Your nurse will talk with you about what to do if your PICC breaks.

How is the PICC removed?

The PICC will be removed if you no longer need it. It will also be removed if your doctor thinks that it may be infected. A PICC is removed by the PICC nurse or a physician.

Flushing Procedures for PICC

Flushing a PICC BEFORE starting PN

- Perform hand hygiene
- Gather equipment: 3 – 10mL prefilled normal saline (N/S) syringes for each lumen of your PICC, 2 – chlorhexidine (CHG) swabs, 1 – 4x4 sterile gauze
- Cleanse needle- free connector hub vigorously with a CHG swab, place 4x4 gauze under to keep it sterile, and let dry for 90 seconds. (Skip this step if using Curocaps)
- Flush with 2-3 mL of N/S from the first pre-filled syringe, aspirate for blood return (2-3 mL), and then attach a new syringe and flush with 10 mL; attach the last syringe and flush for a total of 20 mL N/S, using push-pause technique.
 - **Rationale:** The push-pause method creates more turbulence, ensuring that the line is more effectively cleared of blood or medication infusion.
- Remove syringe, discard syringe, repeat for each lumen
Cleanse needle-free connector hub again with CHG and allow to dry before attaching PN tubing to one of the lumens needle free connector.

Flushing a PICC AFTER disconnecting PN

- Perform hand hygiene
- Gather equipment: 3 – 10mL prefilled N/S syringes for each lumen of your PICC, 2 – CHG swabs, 1 – 4x4 sterile gauze
- Cleanse needle- free connector hub vigorously with a CHG swab, place 4x4 gauze under to keep it sterile, and let dry for 90 seconds.
- Flush with 2-3 mL of N/S from the first pre-filled syringe, aspirate for blood return (2-3 mL), and then attach a new syringe and flush with 10 mL; attach the last syringe and flush for a total of 20 mL N/S, using push-pause technique.
- Remove syringe, and discard syringe. Apply Curore cap if using.
- Repeat for each lumen of your PICC

HICKMAN CATHETER

What is a tunneled device (Hickman catheter)?

This is a catheter made of a soft silicone material.

How is it inserted?

It is tunneled under the skin on your chest before the catheter enters the vein. The “tunneling” helps to keep the catheter in place on your chest wall. The catheter is inserted in the operating room or in the X-ray department. The insertion is done under sterile conditions. You may have either a general anesthetic or a local anesthetic. The type of anesthetic that will be used will be discussed with you before the procedure. If you are having a local anesthetic, the skin will be “frozen” where the device is put in. You will also get some medication to help you relax. The procedure usually takes around 60 minutes. You will need to sign a consent form before the procedure. It always needs a dressing over it.

Advantages

- It is a long-term device that permits users to receive their treatments at home.
- It can generally be left in longer than a PICC
- It is not as visible as a PICC

Limitations

- Swimming and contact sports are activities you cannot do if you have a tunneled device in place.
- Avoid bending at the waist, bend with your knees
- Avoid lifting heavy objects or weights.

Can the catheter be replaced?

This catheter can last for a long time without any problems. If the catheter should break or develop a hole, it is possible to repair it if it is a single lumen catheter. If something were to happen that could not be repaired, a new catheter would be inserted.

How is the catheter removed?

The catheter will be removed if you no longer need it. It will also be removed if complications occur that cannot be managed. The tunneled catheter is removed by making a small incision and pulling it out. Local anesthetic is used when removing a tunneled catheter.

Flushing Procedure for a Hickman Catheter

Flushing a Hickman BEFORE starting PN

- Perform hand hygiene
- Gather equipment: 3 – 10mL prefilled normal saline (N/S) syringes, 2 – chlorhexidine (CHG) swabs, 1 – 4x4 sterile gauze
- Cleanse needle- free connector hub vigorously with a CHG swab, place 4x4 gauze under to keep it sterile, and let dry for 90 seconds. (Skip this step if using Curo caps)
- Unclamp and flush with 2-3 mL of N/S from the first pre-filled syringe, aspirate for blood return (2-3 mL), and then attach a new syringe and flush with 10 mL; attach the last syringe and flush for a total of 20 mL N/S, using push-pause technique.
 - **Rationale:** The push-pause method creates more turbulence, ensuring that the line is more effectively cleared of blood or medication infusion.
- Cleanse needle- free connector hub again with CHG and allow to dry before attaching PN tubing to one of the lumens

Flushing a Hickman AFTER disconnecting PN

- Perform hand hygiene
- Gather equipment: 3 – 10mL prefilled N/S syringes, 2 – CHG swabs, 1 – 4x4 sterile gauze, 1 – 10 mL syringe,
- Cleanse needle- free connector hub vigorously with a CHG swab, place 4x4 gauze under to keep it sterile, and let dry for 90 seconds.
- Unclamp and flush with 2-3 mL of N/S from the first pre-filled syringe, aspirate for blood return (2-3 mL), and then attach a new syringe and flush with 10 mL; attach the last syringe and flush for a total of 20 mL N/S, using push-pause technique.
- Remove syringe, clamp, and discard syringe. Apply Curo cap if using.

Concerns with CVADS

Am I at risk for any possible problems to occur with a central vascular access device (CVAD)?

There is a chance for problems to occur any time we place a medical device in the body. You can help decrease the chances of any problems by:

- washing your hands before working with your CVAD
- following the instructions you will receive about using your CVAD
- checking your CVAD every day
- notifying your family physician of any concerns, problems or changes in the way your CVAD is working – no matter how small they may seem to you.

When should you get medical attention at the nearest Emergency Room?

1. Fever and/or chills
 - You should be regularly checking your temperature. Nursing staff will give you an oral thermometer and will show you how to use it
 - If your temperature is greater than 38°C or 100.4°F you should go to the hospital
2. Shortness of breath (difficulty breathing)
3. Dizziness and/or weakness
4. Vomiting and/or diarrhea
5. Blurred vision
6. Redness, pain, swelling, or drainage at the catheter insertion site or moving away from the insertion site along the vein that it is in
7. The dressing covering your central venous access device (ie PICC dressing) is wet, loose, and/or lifting

Hand Hygiene

Hand hygiene is the most critical aspect of your Home PN care. Proper hand hygiene helps prevent contamination and infection through the central venous catheter and the Home PN delivery system.

It is essential to follow the hand hygiene steps outlined in the handout provided to you before starting any Home PN procedures. Bacteria present on your skin, clothing, and environment can pose a significant risk if transferred to any part of the intravenous system, potentially endangering your health.

Do I need a special soap to use for hand washing?

No, you do not need to use antimicrobial soap. Plain liquid soap and good hand washing technique is sufficient.

***Hand washing* should occur:**

- Before you handle PN and CVAD supplies
- Before you touch the CVAD
- Before you do any PN procedures
- When your hands are visibly soiled
- After using the toilet

***Hand washing* tips:**

- Use a liquid soap (but not a refillable one)
- Remove jewelry from hands and wrists
- Use a paper towel to dry your hands
- Use the towel to turn off the taps

How to handwash



1
Wet hands with warm water.



2
Apply soap.



3
Lather soap and rub hands palm to palm.



4
Rub in between and around fingers.



5
Rub back of each hand with palm of other hand.



6
Rub fingertips of each hand in opposite palm.



7
Rub each thumb clasped in opposite hand.



8
Rinse thoroughly under running water.



9
Pat hands dry with paper towel.



10
Turn off water using paper towel.



11
Your hands are now safe.

Adapted with permission from the Ministry of Health and Long-Term Care of Ontario - Just Clean Your Hands Campaign poster

How to handrub



Apply 1 to 2 pumps of product to palms of dry hands.



Rub hands together, palm to palm.



Rub in between and around fingers.



Rub back of each hand with palm of other hand.



Rub fingertips of each hand in opposite palm.



Rub each thumb clasped in opposite hand.



Rub hands until product is dry.
Do not use paper towels.



Once dry, your hands are safe.

Adapted with permission from the Ministry of Health and Long-Term Care of Ontario -
Just Clean Your Hands Campaign poster

Asepsis

Asepsis is the absence of bacteria, viruses, and other microorganisms. Preventing infections requires maintaining a sterile environment through careful practices and precise techniques. Key skills for infection prevention include:

- Thorough hand hygiene
- Proper organization of your workspace
- Correct use and handling of equipment

Aseptic technique

Aseptic technique involves maintaining the sterility of objects that have been treated to be free of bacteria and other germs, usually through heat or chemical processes. A sterile object becomes contaminated if it comes in to contact with anything unsterile.

- For instance, if a sterile needle touches a non-sterile surface, such as a table or the floor, it would be considered contaminated.

Principles of aseptic technique

- **Always face the sterile field:** Keeping the sterile field in your line of sight ensures that sterile objects do not accidentally encounter non-sterile items.
- **Hold sterile objects above waist level:** Keeping sterile items in sight reduces the risk of accidental contamination.
- **Avoid talking, coughing, sneezing, or reaching over the sterile field:** This helps prevent contamination from droplets or airborne particles from your mouth or nose

Home PN Supplies

Upon discharge, you will collect your Home PN products, along with any prescribed additives, from your designated hospital pharmacy—either the QEH Pharmacy or PCH Pharmacy. Before discharge, you will be shown the location of the pharmacy where you will be collecting your supplies.

PCH
• PN can be picked up weekly between 8:00 AM and 4:00 PM. • Arrangements for pickup will be confirmed before your discharge, typically between 3:00 and 4:00 PM on the designated day.
QEH
• PN can be picked up weekly between 8:00 AM and 4:00 PM on holidays and weekends, and from 8:00 AM to 7:30 PM on weekdays. • Pickup arrangements will also be finalized before discharge, generally between 3:00 and 4:00 PM on the chosen day.

When collecting your weekly supply, please bring a cooler large enough to hold seven PN bags for safe transport back to your home.

Before discharge, you will need to arrange a pickup schedule with your designated pharmacy. If you cannot pick up your PN on a scheduled day, please notify your pharmacy as soon as possible.

PN Storage

- You will need a small refrigerator dedicated solely to storing your PN. This is crucial to prevent contamination from other foods, which could lead to infection.
- The refrigerator door should always remain closed, except when removing PN for administration. It is important to remove the PN bag from the fridge **60 minutes before** infusion to ensure it reaches the proper temperature. Opening the door frequently could cause temperature fluctuations, which may contaminate the PN.

Additional Supplies

- The other supplies required for your PN, such as tubing and syringes, are **not available** through the pharmacy. Your social worker will discuss options for obtaining these supplies before you are discharged.
- These supplies should be stored in a clean, dry area free from dust, clutter, and pets. A plastic container with drawers is ideal, and it should be thoroughly cleaned before use.

IV Pump

- An IV pump, which is necessary for administering PN, will be loaned to you from either PCH or QEH. Before taking the pump home, you will be required to sign a loan agreement form.
- The IV pump must be returned to the hospital unit from which it was borrowed once it is no longer needed.

The Work Area

Selecting your work area

- Select an area in your home that is free from drafts and fans, visible dirt, dust and clutter.
- Select a smooth table, countertop or tray that can be cleaned with alcohol and a clean cloth or paper towel.
- Select an area that has enough space and good light in which to work.
- Select an area that is close to your supplies
- Pets should not be within your work area
- It should be a low traffic area without a lot of interruptions

Organizing the Work Area

Organizing your work area is important. Gather all your equipment before you start. This will help you be efficient and avoid contamination.

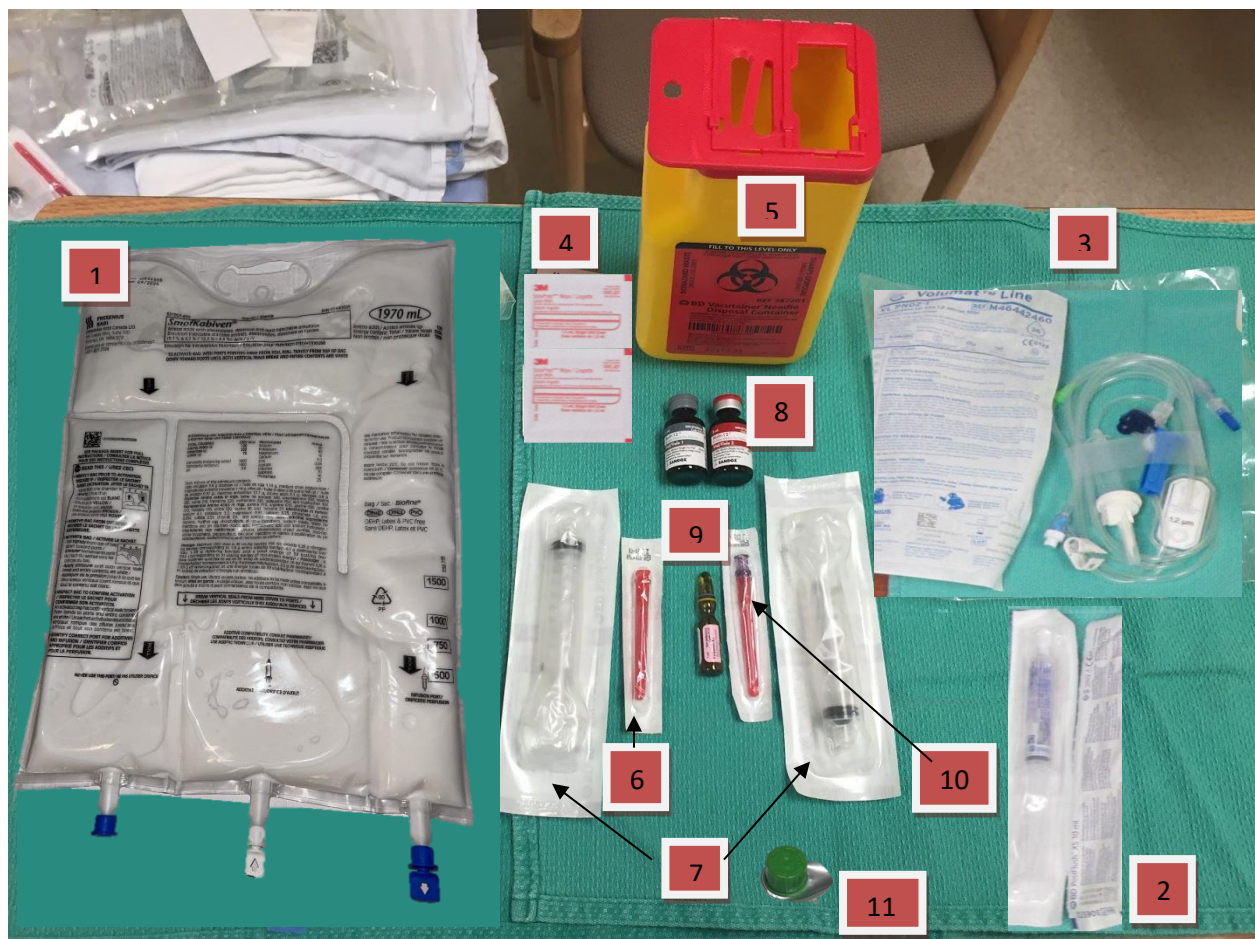
1. Remove PN bag from refrigerator and allow the bag to warm to room temperature for 60 minutes (Do this first while you prep/clean workspace).
2. Roll up sleeves, remove watch and hand jewelry, and tie hair back if needed.
3. Wash hands using technique described earlier in the hand hygiene section.
4. Gather all materials and equipment necessary (Listed on next page).
5. Begin preparation of workspace and supplies.

Getting Started

1. Pour a small amount of alcohol onto a clean face cloth or paper towel and wipe the work surface down.
2. Wipe dry with clean paper or cloth towel.
3. Your work area has now been prepared for your supplies.
4. If you contaminate your work area during use, clean it again with alcohol and a clean face cloth or paper towel.

Supplies

1. SmofKabiven PN
2. 10 ml 0.9% NS prefilled syringes (4)
3. Volumat Administration Set with 1.2-micron filter (IV tubing)
4. Antiseptic Swabs (4)
5. Sharps container
6. Blunt needles (2)
7. 10 ml syringes (2)
8. Multivitamin vials (as applicable)
9. Vitamin K (as applicable)
10. Filtered blunt needle (purple end, if Vitamin K needed)
11. Curo Cap



Checking Supplies

All supplies used for your Home PN should be in sealed packages to prevent contamination. Follow these steps when checking your supplies:

Inspect all PN bags of solution for anything that looks unusual

Do not use your bags if:

- there are any leaks
- there are any particles or specks in the solution
- the label on the bag or bottle does not have your name on it
- the label on the bag or bottle has a different drug or dose listed
- the expiration date on the label has passed

Do not use any supplies that you think may be contaminated

Call your supplies contact person (Pharmacy or the SPD department, depending on where you purchase your supplies) if you have any contaminated supplies as you will need to obtain new supplies. In addition, your supplier may want to check the contaminated supplies.

Preparing Supplies

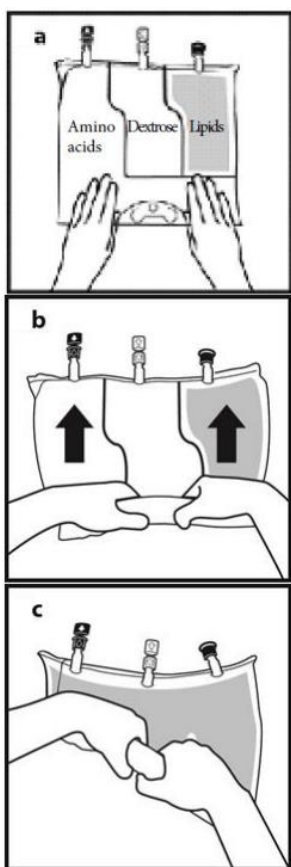
Your PN supplies should be prepared on a clean surface dedicated to PN preparation. It should be free of dust, clutter and pets to minimize the risk of contamination of the supplies.

1. Clean workspace with alcohol and a clean paper towel or face cloth. Allow it to dry.
2. Place supplies on your clean work area and open packages.
3. Check to see that tubing ends, syringe ends and needles have a protective cover on them to keep them sterile.
4. Do not use any items that have protective covers missing.

Preparing the SmofKabiven

SmofKabiven is presented in the form of a 3-chamber bag. Each bag contains dextrose solution, amino acids and lipids. The lipid emulsion is a mix of refined olive oil, soybean oil, medium chain triglycerides and fish oil. To administer the PN, the 3 chambers must be mixed. The pharmacy will have **already mixed the bag**, but you are required to inspect the bag to ensure each compartment is mixed appropriately.

As a reference to how a bag should be mixed - see the illustration below. This will help you understand what to look for when inspecting your bag. Once mixed, it will have a milky appearance.



ACTIVATE BAG.

- Place bag on a clean, flat surface with text side up and ports pointing away from you.
- Roll tightly from top of bag down toward ports.
- Apply pressure until both Vertical Seals break and entire contents are white. It may take up to 5 seconds of continued pressure to break Vertical Seals.

NOTE: Both Vertical Seals must be broken from bends to ports. Upper section of Vertical Seals and Horizontal Seal may remain unbroken.

- After both Vertical Seals are broken, mix contents thoroughly by inverting the bag at least three times to ensure a homogenous mixture.



Fresenius Kabi (2020). *Smofkabiven Product Monograph*. Retrieved from: <https://www.fresenius-kabi.com/en-ca/documents/131-SmofKabiven-230147-PM-pristine-EN-101620.pdf>

Additives

The physician may order multivitamins, insulin and/or Vitamin K to be added to your PN. You may be required to add these to your PN bag with each administration, depending on how often you pick up the PN from your Pharmacy.

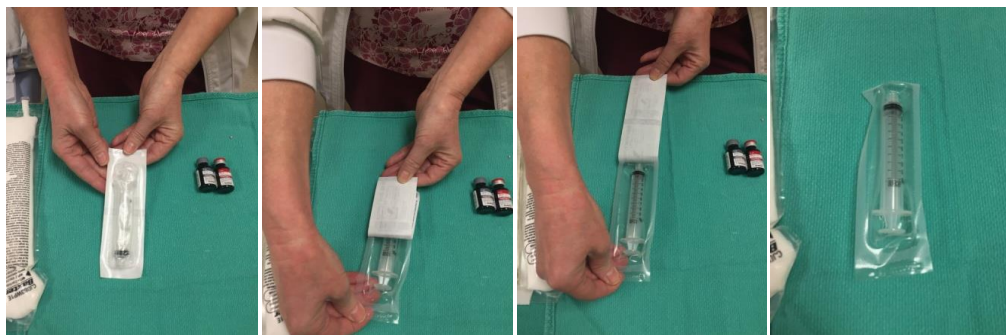
Since the PN only remains stable for a set amount of hours after some additives have been added, you will need to add these to the bag as ordered by your physician.

POINTS TO REMEMBER

- Wipe injection sites with chlorhexidine-alcohol swabs.
- Inject air into vial before withdrawing any solutions.
- Ensure the tip of the needle is in the fluid when drawing up multivitamins.
- **DO NOT TOUCH NEEDLE TIP** - If you do, CHANGE NEEDLES.

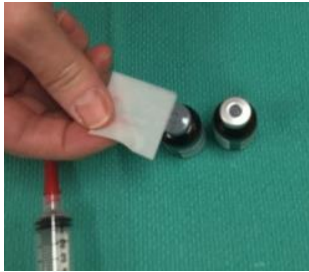
Adding Multivitamins (as applicable)

1. Obtain the 2 multi vitamin vials (#1, #2) from the fridge. Open the 10 mL syringe by peeling the wrapper halfway down, and place syringe with wrapper on clean area



2. Flip the tops off the multivitamin vials

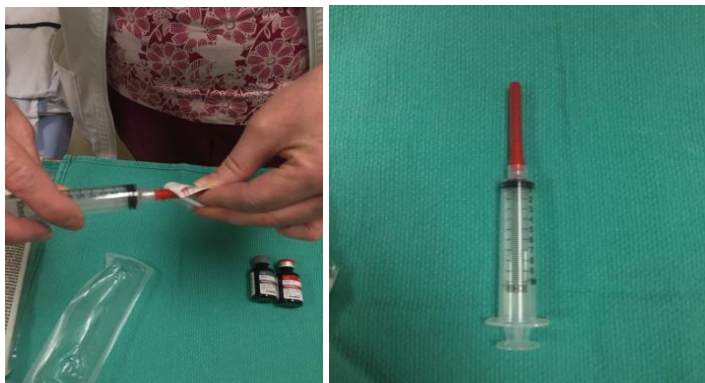
3. Use an antiseptic swab to clean the rubber stopper on top of the vials for 15-30 seconds and allow to air dry (this may take up to 90 seconds).



4. Open the blunt needle by peeling down the wrapper and holding onto the needle away from the open end.



5. Keeping the end of the needle sterile, remove the syringe from wrapper and screw the needle to the syringe (do not touch the end of the needle with anything).



6. Remove the cap from the needle and draw the same amount of air into the syringe as there is liquid in the vial.
(Example: vial is 5 mL, pull back on the syringe to the 5 mL mark to pull in air)



7. Drawing up the Multivitamins

- Insert needle into rubber top and push the air in the syringe (5mLs) into vial #2.
- Holding vial #2 and syringe upward, withdraw the solution (5 mL of clear multivitamin).
- Remove the needle from vial #2 and draw back 5 mLs of air.
- Insert needle into rubber top of vial #1.
- Hold upright and push the air in the syringe into vial # 1 (be careful not to add the clear multivitamins into vial number 2 bottle)
- Withdraw the solution gradually from vial #1 (5 mLs of yellow multivitamins).
- There should be a total of 10 mLs multivitamins in the syringe when done.



8. Adding the multivitamins into your PN Bag

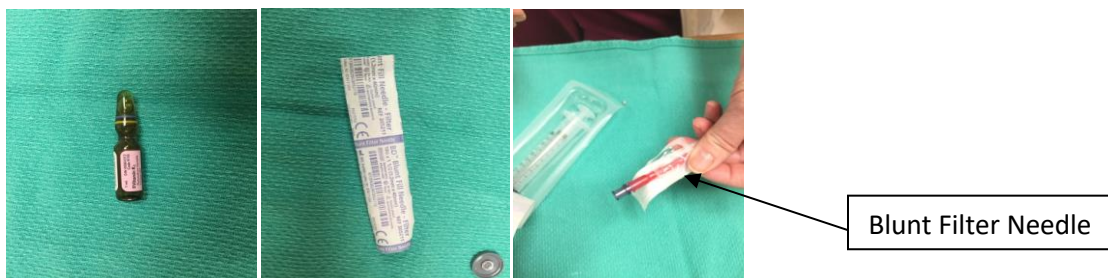
- Swab the injection port (WHITE port in the middle with “additive port” written above it) on PN bag with antiseptic swab allow 15-30 seconds to dry (this may take up to 90 seconds).

- Insert the needle into the port and inject multivitamins into PN bag. Be careful to insert the needle straight into the port to avoid accidentally puncturing the bag
- Remove and discard the syringe and needle into sharps container.
- Rotate bag gently to mix the vitamins with the PN solution. The milky solution should turn a yellow color.



Adding Vitamin K - (as applicable)

1. Prepare empty 10 mL syringe as previously stated in “Adding Multivitamins section”. Since vitamin K comes in a glass ampoule, it is necessary to use a blunt needle with a filter when drawing it up (end is purple, see photo below). The process to open the blunt needle with filter and connect it to the syringe is the same as previously stated in “Adding Multivitamins section”.



2. Carefully snap the top of the vitamin K ampoule at the score line. You may use a gauze or antiseptic swab package to protect your hands
3. Remove the cap from the needle and draw up 1 mL of solution



4. Recap the needle and prepare a new blunt needle with filter to attach onto the syringe with vitamin K in it prior to injecting into the PN bag to make sure no broken glass is transferred into it.

5. Adding Vitamin K into your PN Bag

- Swab the injection port (WHITE port in the middle with “additive port” written above it) of the PN bag with antiseptic swab for 15-30 seconds and allow to dry (this may take up to 90 seconds).
- Insert needle into the port and inject vitamin K into bag (be careful to insert the needle in straight to avoid puncturing the bag)
- Remove and discard the syringe and needle into sharps container
- Rotate the bag gently to mix the vitamin K into the PN solution. The colour of the solution may change slightly.

Once all additives are injected into the bag, mix by turning the bag upside down at least 3 times.



Mix by turning the bag upside-down at least 3 times.

Fresenius Kabi (2020). *Smofkabiven Product Monograph*. Retrieved from: <https://www.fresenius-kabi.com/en-ca/documents/131-SmofKabiven-230147-PM-pristine-EN-101620.pdf>

In the Event of a Power Outage

If the power goes out the, the fridge should maintain its temperature if it is not opened. If the power is out for more than 24 hours your Pharmacy should be contacted for advice.

If the power goes out during an infusion, the battery on the pump should run for a period of time. A generator or back up power source could also be used to power the pump. If the power sources are depleted, discontinue the infusion as you were taught. Take note of how much infusion was remaining. **Do not** run the infusion without a pump. **Notify** your doctor or healthcare provider ASAP regarding the incomplete infusion.

Priming IV Tubing with PN Solution

1. Remove the IV Tubing with 1.2-micron filter from the package. Remove the paper tab from tubing and uncoil it and **close the roller clamp**.



2. Place PN bag on a flat surface. Locate the plastic blue tab over “Infusion port” (port on the far right of the bag). Break off the BLUE tab on the infusion port with the arrow pointing away from the bag. **DO NOT** touch the open end.



Figure adapted from Fresenius Kabi 2024

3. Remove the plastic cap covering the spike on the IV Tubing with 1.2 micron filter. Be careful not to touch the spike end against anything.
4. Insert tubing spike into **blue** port (labelled infusion port) of PN bag until port reaches line on spike while holding the inlet port to prevent puncturing the bag



5. Hang PN bag and tubing on IV pole. Compress drip chamber and release repeatedly until fluid line on the drip chamber is reached.
6. Slowly open the roller clamp to prime the line. Priming the tubing slowly will help prevent air bubbles in the tubing. Adjusting the roller clamp will regulate the speed of the fluid in the tubing



7. With the in-line filter (1.2 microns) in vertical upright position, slowly prime the filter. **Do not invert filter.**



8. Invert and gently tap any connector ports to ensure the air is removed during priming.



9. When fluid reaches end of tubing, close roller clamp.



10. Once the tubing is primed and there is **no** air in the line, begin to load tubing into Agilia Pump.

- Open the pump door by lifting the door lever and align the tubing horizontally with the green connector positioned to the right and the safe clip positioned in the blue slot with the round knob in the top position.



(Fresenius Kabi, 2019)

Preparing to Connect Pump Tubing to Central Catheter

PICC LINE

**** WASH HANDS ****

- If you are using the curos cap (green cap) you can take it off carefully ensuring you do not take the PICC line connector off and throw it out.
- If you do not have a curos cap, clean the connector on PICC with an antiseptic swab - rub using friction for 15-30 seconds and allow to dry (this may take up to 90 seconds).
- Remove air from a prefilled 10 mL 0.9% saline syringe
 - Loosen the cap on end of the syringe, but leave it on the syringe

- Gently push up on the plunger of the syringe until you feel/hear a “click”
- Gently push up on the plunger to push out the air
- Attach syringe and flush with 2- 3 mLs of saline and then check for blood return by pulling back gently on the plunger. Then disconnect syringe and discard
- Then attach a new prefilled syringe and flush using the push-pause method
- Remove syringe and discard



Port or Hickman

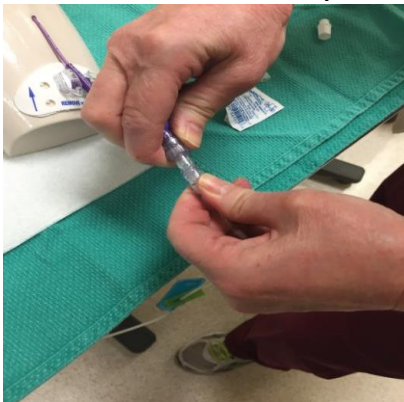
**** WASH HANDS ****

- Clean the connector using an antiseptic swab - rub using friction for 15-30 seconds and allow to dry (this may take up to 90 seconds).
- Remove air from a prefilled 10 mL 0.9% saline syringe
- Attach syringe to connector
- Open clamps and flush with 2- 3 mLs of saline and then check for blood return by pulling back gently on the plunger. Then disconnect syringe and discard

- Then attach a new prefilled syringe and flush using the push-pause method
- Remove syringe and discard



1. Clean cap again using antiseptic swab - rub using friction for 15-30 seconds and allow to dry (this may take up to 90 seconds) and attach PN tubing to cap on end of the catheter by screwing them together

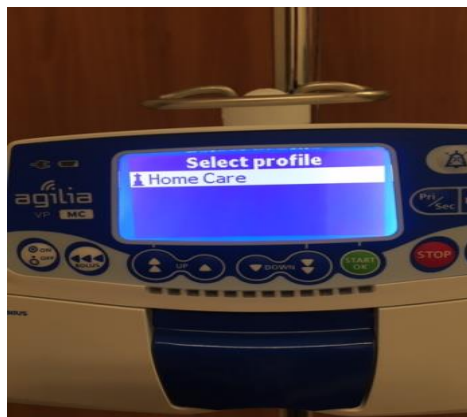


Programming the Agilia Pump

1. Turn on pump using the “on/off” button.



2. “Select Profile” screen will appear, and it only has the “Home Care” option to select so press the green start/OK button.



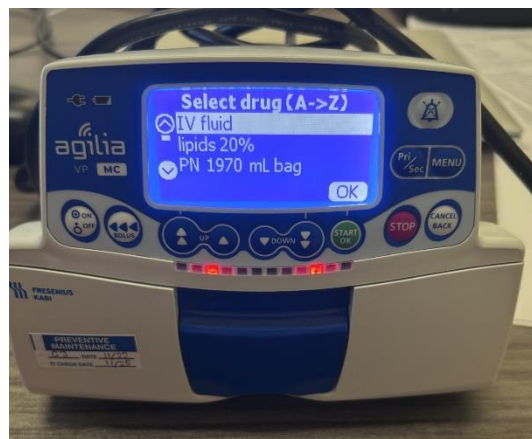
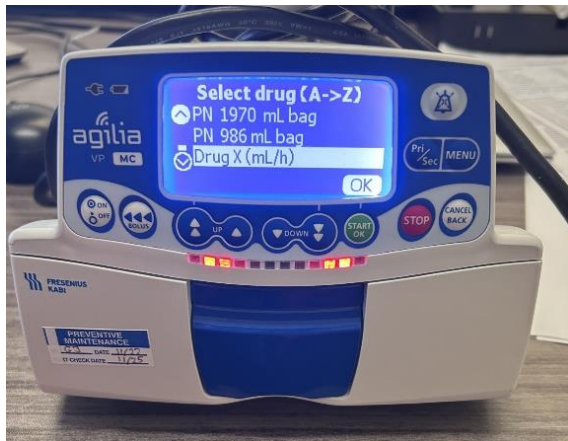
3. You will then get a reminder screen to install the set if you have not already done so.



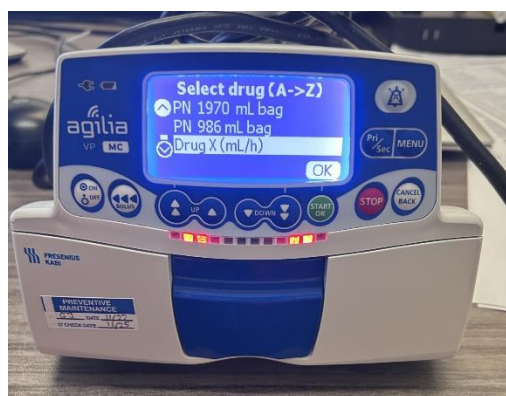
4. “Select drug (A->Z)” is the next screen. “G->I” will automatically be highlighted by the banner bar so you can press the green start/OK button.



5. Next you will have to select the prescribed infusion you are infusing from the drug library. You can use the small single arrow down or up to move the highlighted bar to your ordered therapy. Options are “IV Fluid, lipids 20%, PN 1970 mL bag, and PN 986 mL bag. It is very important to select the correct **infusion** to ensure you get the complete therapy.



Do not select Drug X unless you are instructed by your Health Care Team



6. After selecting your infusion, you will get a clinical alert that reminds you to open all the clamps.



7. Next you will need to confirm the settings. Your banner bar will highlight the **Volume to be Infused** (Infusion from the library will already have the correct volume).

Select the green start/OK button to move to **Duration** press the green start/OK button to move-to **Flow Rate**. Your flow rate has been pre-set based on the volume of your bag.

**** Do not change any of these settings unless instructed to by your Health Care Team. ****



8. If you need to make changes you can press the double up arrow which is below “C”. You will then be asked to confirm the program settings one final time. You will press the green start/OK button to start your infusion. Do not change any of these settings unless instructed to by your Health Care Team.



9. Your infusion is running when:

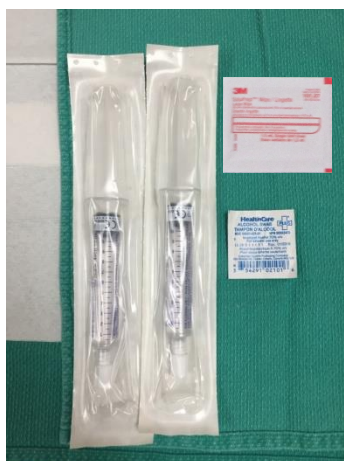
- The green light is running on your pump.
- There is a droplet falling on the display screen
- PN will be dripping into the drip chamber on the IV line



(Fresenius Kabi, 2019)

Disconnecting PN Infusion when Infusion Complete

1. Wash hands as per provided instructions
2. Gather supplies: Clean towel, antiseptic swabs, two prefilled 10 mL 0.9% saline syringes.



This is the 5mL prefilled heparin syringe that you will need for a Port when disconnecting your PN

****Port/Hickman may need to be flushed with 5 mL of 10 units/ mL heparin (50units). You will be told if you need it.**

3. Wash table and place towel on table. Set supplies on towel and wash hands again.
4. Press “stop” button on infusion pump, then “on/off” to turn off pump.
5. Close the roller clamp
6. Disconnect IV tubing from PICC/port/Hickman
7. Swab the connector of PICC/port/Hickman with antiseptic swab for 15-30 seconds and allow to dry (this may take up to 90 seconds).
8. Flush the IV device (see below).
 - Remove air from a prefilled 10 mL 0.9% saline syringe
 - Loosen the cap on end of the syringe, but leave it on the syringe
 - Gently push up on the plunger of the syringe until you feel or hear a “click”
 - Gently push up on the plunger to push out the air

- Attach syringe and flush with 2-3 mLs of saline and then check for blood return by pulling back gently on the plunger. Then disconnect syringe and discard
 - Then attach a new prefilled syringe and flush using the push-pause method
 - Remove syringe and discard
 - Repeat with a 2nd saline syringe for total of 20 mL
9. Disconnect saline syringe
 10. If Heparin is required, flush with Heparin prefilled syringe, and clamp
 - Swab connector of port with antiseptic swab 15-30seconds and allow to dry (this may take up to 90 seconds).
 - Clamp Port/Hickman
 11. Put on a new curos cap (green cap) if applicable.
 12. Dispose of syringes and PN tubing. Wipe table clean

Potential Problems associated with PN

In addition to the potential complications with CVADs noted above, there are also potential problems associated with the TPN itself.

Hyperglycemia (High Blood Sugar)

This condition may occur if the infusion of the amino acid-dextrose solution is administered faster than the body can use this glucose.

Symptoms include increase in frequency and volume of urine, thirst, presence of sugar in blood and urine, headache, belly pain or cramps, nausea, weakness, tiredness.

-Notify your doctor and/or go to the Emergency Department

-If you are diabetic or already trained to check your blood sugar you can do so and treat it as you have been trained.

Hypoglycemia (Low Blood Sugar)

Hypoglycemia occurs when there is a sudden decrease or a deficiency of sugar in the blood if the TPN is infused quickly and then suddenly discontinued.

Symptoms include headache, nausea, nervousness, cold sweats, blurred vision and drowsiness may appear. This may occur while you are “hooked up” or shortly after discontinuing the amino acid-dextrose infusion.

If oral intake is permitted, juice with additional sugar must be consumed.

Fluid Overload

If large volumes of solution are infused or are administered rapidly, the circulatory system may be affected. Signs of weight gain, peripheral edema (accumulation of fluid), and shortness of breath indicate a problem, and the physician should be notified.

Dehydration

This process occurs when the output of body fluid exceeds fluid intake. This may be due to the deprivation of water, excessive loss of fluid i.e. diarrhea. These situations can be precipitated by hot weather, gastroenteritis, flu, ingestion of alcohol, etc. If signs of thirst, dry mucous membranes, weakness, dizziness occur; notify the physician.

Oral Hygiene

Good oral hygiene must be always maintained. Teeth should be brushed 3-4 time/day and mouth wash, and dental floss used regularly. The gums should be exercised and massaged. This will prevent oral infections, i.e. cankers, parotitis, caused by the collection of bacteria. Regular dental checkups will help. Patients with limited oral intake should especially adhere to this.

Malaise or Illness

If you do not feel well, you should never hesitate to contact the physician. A fever or slight temperature elevation can be a concern, and the physician should be notified.

What are the risks of a central vascular access device?

The main risks for any CVAD are:

Infection	Air embolism	Dislodgement	Clot (unable to flush)
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Infection	
Meticulous care must be taken to prevent any type of infection. Since the permanent catheter remains in place on a long-term basis, the entry site must be cleaned and dressed well to prevent the growth of any organisms. Contamination of the TPN solutions must be avoided.	
Signs & Symptoms of Infection	
Fever (38.5 °C/101.3 F)	Chills
Lethargy	Weakness
Increased heart rate	Skin around the exit site is hot
Redness, swelling, drainage pain around the exit site or along the area where the line is tunneled	
If the above symptoms occur during an infusion	
• Stop the infusion • Disconnect the tubing and flush your line as per protocol • Save the infusion and all tubing to return to the hospital for culture studies • Notify physician	
Infection can be prevented by	
• always washing your hands well	

- always follow the instructions provided to you in caring for your line
- keep your sterile supplies free from germs by storing them appropriately and following asepsis when handling them
- changing your dressing if it gets soiled or wet (contact ambulatory care)
- wear a mask when caring for your CVAD if you or your partner has a cough or cold

Air Embolism

This occurs if air is allowed to enter the venous system of the body's circulatory system. This may occur at the time of catheter insertion or any time the catheter or tubing become disconnected and are therefore open to air. If a catheter is open to room air, the negative intrathoracic pressure created by breathing inwards draws air into the vein resulting in air embolism. Air may then travel through the heart and enter the pulmonary circulation. All tubing must be completely flushed of air prior to use.

Signs & Symptoms of Air Embolism:

Shortness of breath	Increased breathing
Coughing	Increased heart rate
Low blood pressure	Chest pain

If the above symptoms occur:

- Lie on your left side
- Call 911

Air embolism can be prevented by ensuring:

- All tubing is completely flushed of air before using them
- Needle- free connectors are tight
- PN tubing is securely attached to needle- free connector when infusing
- Clamp on CVAD is closed prior to disconnecting PN
- Air bubbles have been removed from syringes prior to flushing CVAD
- Air bubble have been removed from TPN tubing during priming
- Always use an IV pump to deliver TPN

Dislodgement

This occurs when tension is placed on a CVAD, resulting in the device being pulled out from the insertion site. If this occurs, you must cover the area immediately to avoid an air embolism.

Signs & Symptoms of Dislodgement

- Potential bleeding at the CVAD insertion site
- Potential air embolism (see Signs & Symptoms of same above)
- If the CVAD becomes completely dislodged, it will be completely out of the body i.e chest, arm
- If the CVAD becomes partially dislodged, more of the catheter will be visible at the insertion site
- If the CVAD becomes partially dislodged, you may feel a pain in your ear when you start your PN
- If the CVAD becomes partially dislodged, there may be swelling of tissues if fluid is not going into the vein

If the above symptoms occur:

- If the CVAD is completely dislodged, hold your breath until you can cover it with a dressing. If you do not have a dressing nearby, take a clean piece of cloth (e.g. face cloth) and place it on the exit site and then apply a dressing well taped over the site when possible. Go to the ER or call 911.
- If the CVAD is partially dislodged, go to the ER. Heparinize the line before going.

Clot (unable to flush)

This occurs when a blood clot forms inside the lumen or around the outside of your CVAD.

Signs and Symptoms

- Difficult to flush (sluggish),
- Unable to get blood return (1-way occlusion), or
- Unable to get blood return or flush anything in (2-way occlusion).

If the above symptoms occur:

If you have a 1-way occlusion – you can still use the line, but you must call your physician / same day treatment / homecare during the daytime hours to alert them so the line can be treated as soon as possible. Flush well following your TPN.

If you have a 2-way occlusion – it will need to be treated before you can use your line. If you have more than one lumen, you can use the other one. The occluded line will need to be treated as soon as possible. Call your physician / same day treatment / homecare / or go to the emergency department so the line can be treated as soon as possible.

Other Potential Complications

The following complications may occur:

Large amounts of air in the tubing and/or catheter

1. Stop the pump
2. Close clamps on catheter if available
3. Disconnect the tubing making sure to apply a clean blunt needle
4. If air is noted in the CVAD catheter, swab the catheter cap with antiseptic swab and allow it to dry (this may take up to 90 seconds).
 - 1) Attach empty 10 mL syringe
 - 2) Draw blood back 10 mL into the syringe and discard
 - 3) Flush the catheter with 10 mL saline
 - 4) Call Ambulatory Care to notify staff of event

You will need to re-prime new PN tubing and bag prior to resuming infusion

Neutral pressure connector falls off

Make sure the line is clamped (if there is a clamp)

If line is already clamped

- 1) Draw up 2 cc of normal saline and prime positive pressure connector.
- 2) Cleanse lumen with chlorhexidine swab and attach needle- free connector.

If line is unclamped (open)

- 1) Swab catheter with antiseptic swab, allow to dry (this may take up to 90 seconds) and attach **empty** 10 mL syringe
- 2) Draw off 10 mL of blood and discard syringe
- 3) Flush a new cap with saline
- 4) Cleanse catheter end with antiseptic swab and attach the new cap with saline and flush with 10mL
- 5) Come to the hospital for assessment. If ambulatory care is closed, go to your nearest emergency department

Your catheter has a crack or tear in it

- 1) Stop the infusion and close clamps on catheter
- 2) Disconnect tubing from the catheter
- 3) Close clamp on catheter if applicable
- 4) If tear or hole is below the clamp, or no clamp is available, **kink or fold over the catheter, then wrap tape around where the catheter is folded** so that the kink is between the hole and you
- 5) Come to your nearest Emergency Department

****Always keep an extra set of clamps with you****

The pump is alarming “downstream or upstream occlusion”



Downstream - between the pump and you

Upstream - between the pump and the IV bag

You first need to silence the pump



Then check the following:

- a) Check the IV device and tubing for any kinks or clamps that may be closed
- b) Disconnect line from patient and apply clean blunt fill needle. **Do not contaminate the tubing.**
- c) Flush catheter with saline and attempt to draw blood back into syringe
- d) Repeat saline flush
- e) If pump continues to alarm, stop the pump and disconnect the TPN tubing
- f) Flush catheter with saline (and heparin if required)
- g) Come to your nearest Emergency Department for assessment

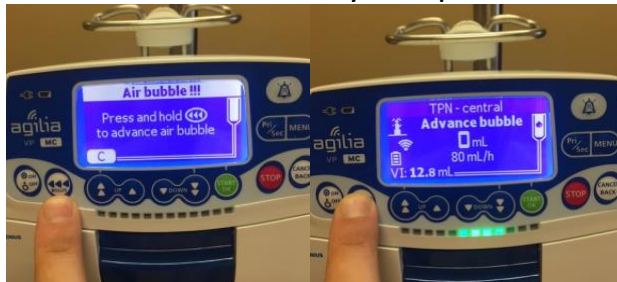
AIR BUBBLE ALARM (Bolus)

- Silence the pump
- Press OK (Green Start/OK Button) to advance air bubble



- Next you will **press and hold** the bolus button
"Advance bubble" will be on your display screen while holding in the bolus button

- There is a safety feature built into the pump that limits the amount of volume to be infused via bolus to try and pass the air bubble



- You will know the air bubble has been advanced within 10 seconds and your infusion will go back to the “STOPPED” screen
- To continue your infusion, you will press START/OK
- You will see the air that was passed in the tubing



Air Bubble Alarm (When bolus function does not work)

- You first will need to silence the pump
- Then you will need to close your roller clamp, open the pump and take the tubing out, and disconnect the tubing from your CVAD.



- You will then need to open the blue SafeClip **ONLY** after you have disconnected the line from your CVAD.



- Holding the line over something that will catch the drips you will then slowly open the roller clamp, and the fluid and air will start to move through the line



- Once you have removed all the air from the line you will close the roller clamp and refer to “Priming IV Tubing with TPN Solution” on how to insert the tubing into the pump and wait for the IV pump to do the test to make sure all the air is out and then following the prompts to continue your infusion