TPN (Total Parenteral Nutrition): Care of Patient

Site Applicability

PHC Acute Care

Practice Level

Basic: Registered Nurses

Requirements

1. Total Parenteral Nutrition (TPN) is administered via a central venous catheter (CVC)
   - Administration of TPN via peripheral IV is **not** recommended and can only be allowed under special circumstances with consultation of the TPN Team.
   - The CVC may be single, double or triple lumen – if other medications or fluids are also required, a multi-lumen CVC is recommended.
   - For CVCs in the upper body (neck, chest, upper arm): The catheter tip will be confirmed and documented to be in the mid to distal superior vena cava (SVC) or the right atrial junction of the SVC and the right atrium.
   - For CVCs in the lower body (groin via femoral vein): The catheter tip should be confirmed and documented to be in the inferior vena cava (IVC) at the level of the diaphragm on x-ray.
   - If possible, TPN is infused through a dedicated "TPN" lumen of the multi-lumen CVC to minimize multiple accesses with other medication and / or blood sampling to prevent infection and patency issues.
   - If the dedicated TPN lumen must be accessed to have TPN co-infuse with other medications, compatibility must be verified with the TPN-Compatibility Chart and pharmacy.
   - Attach **lipid-only** tubing (1.2 micron in-line filter) to core solution tubing (with 0.22 micron in-line filter) **at lowest/distal port, closest to patient**.
   - Proper flushing with 10 to 20 mL NS pre and post medication must be done to maintain patency of CVC lumen.

2. TPN must be delivered using an infusion pump (Alaris CareFusion) with appropriate IV tubing and filters.

Need to Know

TPN provides nutrition intravenously, when oral and enteral feeding is impossible, inadequate or not medically advised.

Refer to CST-Cerner Help for the CST-Cerner PowerChart workflows for product checks and documentation

Protocol

Obtain TPN product(s)

Verify Product and Patient (see CST-Cerner Help for more information)

- Check the product label(s) against the TPN order all nutrients
- Confirm volume falls within acceptable range (see MAR/PowerForm)
- Using the Closed Loop Medication Administration process, scan the patient's armband and then product bar code (Cerner label bar code on 3 in 1 or 2 in 1 bag, commercial bar code on the lipid bag)

Infusing TPN

Using Alaris CareFusion Smart Pump, program in ***Guardrails IV Fluids***

- "**TPN Central**" – use for core solution and/or for 3-in-1
- "**Fat emulsion 20%**" – use for lipid-only bags (e.g. INTRALIPID 20%, SMOFLIPID 20%)

3-in-1 TPN (core solution with lipids = 1 large bag) - See Appendix A:

- Primary IV tubing without secondary port but with distal port and **1.2** micron filter (inline filter)
- Change tubing every **24** hours

2-in-1 TPN (core solution + separate container for lipids) - See Appendix A:

- Core solution – Primary IV tubing with **0.2** micron in-line filter with one distal/lower port.
  - Change tubing every **24** hours
- Lipid-only emulsion – Primary IV tubing without secondary port but with distal port and **1.2** micron filter (inline filter)
  - Change tubing for lipids-only every **12** hours (*lipids must not hang for more than 12 hours).
  - Attach lipids tubing to core solution tubing **at lowest/distal port,** below 0.2 micron filter, closest to patient.

Assessment and Interventions – CVC Complications

Monitor the patient for these complications of CVC insertion, immediately post-insertion and during the initial infusion

Assessment	Intervention
• **Malposition of CVC** ○ Assess for pain, swelling, leaking from the site	Consult Provider. Chest x-ray may be indicated to assess position of CVC and CVC tip.
• **Pneumothorax/hemothorax** ○ Assess for signs of subcutaneous emphysema, shortness of breath • **Hydrothorax** ○ Assess for shortness of breath	Stop infusion, clamp the catheter, call the Provider, stay with the patient, flush and cap the line (contact IV Team if appropriate). Chest tube may be required. CVC may require replacement
• **Air embolism**: May occur at insertion or anytime the catheter is in place • Assess for dyspnea, continuous coughing, chest pain, headache, confusion	Place patient on left side in Trendelenberg position, call Provider STAT.
• **Thrombosis:** ○ CVC lumen may be sluggish or blocked during infusion ○ May occur in any vein in the body	○ Ensure strict adherence to CVC insertion and care protocols. ○ Monitor vital signs as per routine ○ Report any problems to the Provider
• **Hyperglycemia** ○ TPN amino acid solution contains a high dextrose content ○ Can be due to increased carbohydrate intake (not often seen when 20% dextrose solutions are infused and as fatty acids are used every day). ○ Dehydration = dry mucous membranes	○ Monitor blood glucose, physician order required. (Orders usually twice a day (BID) for 3 days – if levels stable after 3 days, recommend change in ordered frequency or discontinuation)
• **Fluid overload** ○ Can occur in the initial stages of hyperglycemia due to glucose molecules increasing osmotic pressure in the vascular compartment ○ Can occur due to rapid infusion of fluid ○ Edema, shortness of breath	○ Record intake & fluid balance every shift ○ Daily vital signs, report concerns ○ Daily weight, report ↑ or ↓ of 2 kg to Provider ○ Ensure rate of administration correct on pump – check pump and container hourly ○ Change/hang TPN container at the designated time

Assessment	Intervention
• **Infection** ○ Can be CVC–related complication ○ Can be related to other condition, wound or pathology	○ Monitor vital signs, note any changes in temperature and heart rate ○ Monitor / assess CVC site and document appropriately every shift ○ Ensure CVC dressing is intact and changed as per standard procedure. ○ Ensure TPN tubing changed appropriately: ▪ Every **24** hours (if continuous and without lipid content – core solution, 3-in-1 TPN) ▪ Every **12** hours (**lipid bag only**) ▪ As needed (PRN) ▪ Contact IV Resource Team if appropriate ○ Ensure CVC care and maintenance as per standard procedure.
• **Hypoglycemia** ○ Can occur when TPN is stopped or discontinued	○ Monitor blood glucose via capillary blood glucose as ordered ○ Give oral intake of fruit juice, etc. ○ Notify Provider ○ Teach patient signs and symptoms of hypoglycemia when TPN is discontinued, especially if there is no taper-off time.

Documentation

Document in Cerner in the appropriate fields:

- MAR
- Fluid balance – intake and output
- CVC access, de-access and IV tubing and dressing changes (may be specific to IV Team in some areas at SPH)
- Blood glucose monitoring
- Daily weight
- Any complications or problems – document in iView and as Nursing Narrative Note in Documentation (or paper equivalent if Cerner downtime.

Patient and Family Education

1. Instruct patient to notify nurse or MRP/physician with signs and symptoms of problems with CVC.
2. Instruct patient to notify nurse or MRP/physician of signs and symptoms of hyperglycemia.

3. Instruct patient to notify nurse or MRP/physician of signs and symptoms of hypoglycemia.
4. Instruct patient to notify nurse or MRP/physician of signs and symptoms of infection.
5. Reinforce need to notify nurse if infusion pump alarms.
6. For patients requiring Home TPN, ensure that the Patient Educator for Home TPN Program has been consulted. Patient teaching can take up to 10 working days, early referral is recommended.
    a. The patient educator for the Home TPN Program's role for the care and management of a patient receiving TPN is to assess, teach and evaluate the patient's ability to learn related procedures and consistently practice safely at home.

Related Documents

1. BD-00-12-40033 – CVC: Implantable Venous Access Device (IVAD) Central Venous Catheter – Basic Care and Maintenance
2. BD-00-12-40045 – CVC Non-Tunneled Central Venous Catheter (NT-CVC) – Basic Care and Maintenance
3. BD-00-12-40067 – CVC: Tunneled Central Venous Catheter (T-CVC) Basic Care and Maintenance
4. BD-00-12-40055 – Peripherally Inserted Central Catheter (PICC): Insertion and Exchange procedure
5. B-00-16-10036 – Downtime and Recovery - Cerner

References

1. Canadian Vascular Access Association. (2019). Occlusion Management Guideline for Central Venous Access Devices (CVADs). Pembroke, ON: Pappin Communications.
2. Canadian Vascular Access Association. (2019). Canadian Vascular Access and Infusion Therapy Guidelines. Pembroke, ON: Pappin Communications.
3. Gorski LA, Hadaway L, Hagle ME, et al. (2021). Infusion therapy standards of practice. .Journal of Infusion Nursing. 44(suppl 1):S1-S224. doi:10.1097/NAN.0000000000000396
4. Mirtallo, J. M., Ayers, P., Boullata, J., Gura, K. M., Plogsted, S., Anderson, C. R., ... & Mason, A. E. (2020). ASPEN lipid injectable emulsion safety recommendations, part 1: background and adult considerations. *Nutrition in Clinical Practice*, *35*(5), 769-782.
5. Ayers, P., Adams, S., Boullata, J., Gervasio, J., Holcombe, B., Kraft, M. D., ... & American Society for Parenteral and Enteral Nutrition. (2014). ASPEN parenteral nutrition safety consensus recommendations. *Journal of Parenteral and Enteral Nutrition*, *38*(3), 296-333.

Appendices

Appendix A: TPN Quick Reference

Appendix B: TPN Tubing and Filters Practice Pointer

Appendix A: TPN Quick Reference

April 2023

Providence Health Care

Total Parenteral Nutrition (TPN) Quick Reference

TPN is used when oral or enteral feeding is impossible, inadequate or not advised.

TPN make up—based on Provider's order

1. One container of TPN (**"3 in 1"** or Total Nutrient Admixture)
   - Contains Core Solution/amino acids; carbohydrates, fatty acids (lipid emulsion) and other additives
2. Two containers of TPN (**"2 in 1"**) - separate core solution and lipid solution
   - Used when other additives make "3 in 1" unstable

RN Responsibilities

1. Check each new bag against TPN order in Cerner.
2. Check TPN solution for regularity, hold and call pharmacy if thick layers of fat noted.
3. Change tubing and hang new bags of TPN ("3 in 1" or core solution) at 1800 hours (Q24h).
4. Change tubing and hang new bags of LIPIDS at 0600 hours and take bag down and flush tubing (20 mL) at 1800 hours.

   Filter requirements (inline)
   - **Core solution:** 0.2 micron filter (white)
   - **"3 in 1" solution:** 1.2 micron filter (blue)
   - **Lipids:** 1.2 micron filter (blue). *Attach to lowest port of core solution tubing.*
5. Program the infusion in the Alaris infusion pump using the drug library entry Guardrails —> Fluids —> TPN. If programming lipids only (e.g. INTRALIPID 20% or SMOFlipid 20%)
6. Check Alaris infusion pump—regulate rate , increasing or decreasing by 20% if discrepancies due to interruptions.
7. Assess patient for
   - **Hyperglycemia:** core solution has high sugar content. Check CBG BID x 3 days and as ordered
   - **Fluid Status:** check for dehydration or fluid overload Q shift.
     Assess VS, edema, IV rate, lung sounds, fluid balance. Monitor weight Q weekly. Report increase or decrease of 2 kg or more.
   - **Hypoglycemia:** TPN should be tapered off and not stopped abruptly to prevent hypoglycemia. Increase oral intake of sweet drinks (fruit juice)
   - **CVC complications and infection**: Change CVC dressing and cap every week. Check CVC site every shift for redness, purulent discharge, tenderness to touch. Observe for fever or other signs of infection.

For more information see DST: TPN (Total Parenteral Nutrition) Clinical Nurse Specialist: local 62693/ Cell: 604.763.7077

PHC PROFESSIONAL PRACTICE–EDUCATION

Appendix B: TPN Tubing and Filters Practice Pointer

EDUCATION PRACTICE POINTER

April 2023

Providence Health Care

TPN Tubing and Filters

3 in 1 TPN

3 in 1 TPN Tubing and filter

Alaris Tubing set with 1.2 micron (blue) filter

Change every 24 hours

Alaris SmartSite Low Sorbing Infusion Set

REF 10010453 (ePro / PS # 00104740)

2 in 1 TPN

2 in 1 TPN Tubing and Filter

Core Solution /Amino Acids

Alaris tubing set with 0.2 micron (white) filter

Change every 24 hours

Alaris SmartSite Low Sorbing Infusion Set

REF 10010454 (ePro / PS # 00087657)

NEW

Lipids

Alaris tubing set with 1.2 micron (blue) filter

Change and remove bag every 12 hours

Alaris SmartSite Low Sorbing Infusion Set

REF 10010453 (ePro / PS # 00104740)

Connect LIPIDS line (with 1.2 micron filter) to lowest port on Core Solution line (with 0.2 micron filter) closest to CVC lumen/patient

PHC PROFESSIONAL PRACTICE—EDUCATION

Appendix C: Cerner Downtime and Recovery Procedures

Parenteral Nutrition/Total Parenteral Nutrition (PN/TPN) is ordered and viewed in Cerner through a PowerForm.

In a downtime, the TPN PowerForm can be viewed and printed from the 724Access Viewer under Documents. The PowerForm can be used to conduct the product check prior to administration. The rate and acceptable range will also be populated on the downtime MAR, though not the TPN components.

The 724Access Viewer retains documents for 7 days, if the TPN prescription is older than 7 days, then contact pharmacy for a copy of the prescription.

Document administration of the TPN and lipids if applicable on the downtime paper MAR, indicating start time, stop time, and any changes as appropriate. Upon uptime, document in the Cerner MAR when the infusion was started or stopped.

To order new TPN or change TPN in a downtime, the TPN team will use a paper PPO found in the downtime toolkits which will be faxed to pharmacy. Upon uptime the orders will be entered into Cerner by pharmacy.

Downtime MAR:

Continuous Medication Orders ✓=completed [ ]=due ▲=modified

INTRALIPID 20% 20 g		
order rate: 8.33 mL/h, IV, drug form: bag, start: 27-Mar-2023 22:00 PDT, volume (mL): 100 Order Comment:**Discard Unused Portion of Bag** Infuse lipid from 2200h to 1000h (12 hours) Contains purified soybean oil Dispensed as 250 mL bag		Ordering Provider: TestUser, GeneralMedicine-Physician, MD
Mar 31, 2023 23:00 -22:59	**Mar 30, 2023** 23:00 -22:59	**Mar 29, 2023** 23:00 -22:59

parenteral nutrition (PN/TPN) 1,000 mL		
order rate: 41.7 mL/h, IV, drug form: bag, start: 27-Mar-2023 18:00 PDT, volume (mL): 1,000, acceptable range: 998 mL to 1,002mL		Ordering Provider: TestUser, GeneralMedicine-Physician, MD
Mar 31, 2023 23:00 -22:59	**Mar 30, 2023** 23:00 -22:59	**Mar 29, 2023** 23:00 -22:59
		10:00 Begin Bag 1,000 mL-Bag #1 41.7 mL/h - - - - - 10:45 Infuse 41.7 mL 41.7 mL total parenteral nutrition - - - - -

Persons/Groups Consulted

Alice O'Sullivan, Vicky Davis, Nurse Educators Surgery

Courtney Symes, Derreck Lee, Nurse Educators, Medication Safety/Medication Management, Professional Practice

Susan Bello/ Ron Shiu, Nurse Educators ICU SPH

Linda Jang, TPN/Chemotherapy Clinical Pharmacist

Revised by

Jocelyn Hill, Clinical Nurse Specialist, IV Therapy, Vascular Access and Chemotherapy, Heme/Onc

First Released Date:	May 1999
Posted Date:	26-APR-2023
Last Revised:	26-APR-2023
Last Reviewed:	26-APR-2023
Approved By: *(committee or position)*	PHC
	Professional Practice Standards Committee
Owners: *(optional)*	PHC
	Vascular Access/I.V. Therapy