Adult Total Parenteral Nutrition Procedure

1. Purpose

The purpose of this procedure is to establish minimum practice standards for the care and management of parenteral nutrition delivered via a central line at WA Country Health Service (WACHS) facilities. The implementation of this procedure throughout the WACHS is dependent on regional governance approval processes in relation to site skill mix, and decisions in relation to the treating team and treating environment.

2. Procedure

Parenteral Nutrition (PN) is indicated when the gastrointestinal tract is not functional or accessible. For this procedure, total parenteral nutrition (TPN) will refer to delivery of PN via central venous access line, and not via a peripheral vascular line; known as Peripheral Parental Nutrition (PPN).

This document is to be used in conjunction with:

- WACHS Nutrition Screening, Assessment and Management Procedure
- WACHS Adult Peripheral Parenteral Nutrition Procedure
- WACHS Adult Refeeding Syndrome Clinical Guideline
- WACHS Aseptic Technique Policy
- WACHS Hand Hygiene Policy
- CAHS Parenteral Nutrition Prescribing and Administration Guideline

ATTENTION

TPN is only administered via a central venous access device (CVAD), typically a Central Venous Catheter (CVC) or a Peripherally Inserted Central Catheter (PICC). Choose CVAD with at least 3 lumens and designate one lumen **exclusively** for administration of TPN.

2.1 Patient Selection[1,2,3]

Indications

TPN is indicated for use when enteral or oral nutrition is not possible or is unlikely to meet the nutrition requirements.

Situations where TPN is appropriate:

- gastrointestinal tract is not functional or accessible (post operative ileus, extensive bowel resection, bowel obstruction, ischaemic bowel, fistula)
- following short term peripheral parenteral nutritional (PPN) support where the gut function has not resumed after 5-7 days
- major GI surgery when adequate enteral intake is not expected to resume within 7 to 10 days with well-nourished patients.

Recommended time frames for initiating TPN[2]:

- after 7 days for well nourished, stable adult patients who have been unable to receive adequate (50% or more of estimated requirements) oral or enteral nutrients
- within 3 to 5 days in those who are nutritionally at risk and unlikely to achieve desired oral intake or enteral nutrition
- as soon as is feasible for patients with baseline moderate or severe malnutrition in whom oral intake or EN is not possible or sufficient.

Contraindications

TPN may not be indicated in the following circumstances:

- well-nourished patient expected to return to adequate oral / enteral feeding within 5-7 days
- a patient is receiving end of life care or where use is contradictory to the patient's goals of care (refer to WACHS Goals of Patient Care Guideline)
- when central access is not available
- insufficient oral intake with functionable and accessible GI tract
- known hypersensitivity to eggs, soya protein, peanut, corn, components of the container or to any of the ingredients in the feeding solution
- severe renal insufficiency without the possibility of dialysis or haemofiltration.

A multi-disciplinary team decision inclusive of medical, dietetics, nursing and pharmacy team members is required to determine patient suitability for TPN.

2.2 Nutritional Assessment

Refer to the dietitian for a formal assessment of anthropometry, biochemistry, clinical background, diet history and malnutrition assessment (using validated tools: MR60.1.6 WACHS Dietetics - Subjective Global Assessment Form or MR60.1.7 WACHS Dietetics – Patient Generated Subjective Global Assessment (PG-SGA) Tool.

For more information on nutrition assessments, please refer to WACHS Nutrition Screening, Assessment and Management Procedure.

The dietitian will make recommendations on:

- starting formula / rates and target formula rates for TPN
- requirement for electrolytes, vitamins and trace element infusions
- refeeding syndrome risk
- transition from TPN to oral or enteral feeding
- suitability of solution based on any allergies or dietary sensitivities.

Assessing Biochemistry

The treating medical team should assess patient biochemistry, including electrolytes such as potassium, magnesium, and phosphate and replace prior to TPN commencement where possible. Refer to the WACHS Adult Refeeding Syndrome Clinical Guideline.

2.3 Ordering and Prescribing Parenteral Nutrition

The standard TPN products used at WACHS sites are Olimel® N9 and Olimel® N7 (2000 mL bags). Each bag is a three-chamber system containing amino acids, glucose and lipids plus electrolytes. Refer to Table 1 below for nutritional compositions of each bag.

Olimel® N9	Olimel® N7
2000 mL Parenteral Nutrition Solution with Electrolytes **800 mL** Amino Acids 14.2% (113.9 g) **800 mL** Glucose 27.5% (242 g) **400 mL** Lipid (ClinOleic) 20% (80 g) Sodium:70 mmol, Potassium: 60 mmol, Magnesium: 8 mmol; Calcium:7 mmol; Phosphate:30 mmol	**2000 mL** Parenteral Nutrition Solution with Electrolytes **800 mL** Amino Acids 11.1% (88.6 g) **800 mL** Glucose 35% (308 g) **400 mL** Lipid (ClinOleic) 20% (80 g) Sodium:70 mmol, Potassium: 60 mmol, Magnesium: 8 mmol; Calcium:7 mmol; Phosphate:30 mmol

Table 1: Nutritional composition of standard TPN bags

Note: Olimel® is contraindicated in patients with a known hypersensitivity to egg or soya proteins, peanut protein, corn (maize) and corn products

TPN is ordered and prescribed by the treating medical team (Intensivist or consultant as available) on the MR60.1.11 WACHS Adult Total Parenteral Nutrition Form in consultation with dietitian and pharmacist as available. The following prescribing practices are recommended:

- TPN is usually continuously infused over 24 hours via a controlled infusion pump into a high flow vein via a central venous catheter (CVC) or a Peripherally Inserted Central Catheter (PICC), usually the superior vena cava adjacent to the right atrium (see section 2.6 for intermittent PN).
- continuous administration of TPN is the preferred method of infusion.
- typical infusion rates vary between 40-150 mL/hr and can usually be commenced at target infusion rate with adequate monitoring[2].
- patients at risk of refeeding syndrome (RFS), can commence TPN infusion rates at 50% of the patient's basal requirement (e.g. 5-10 kcal/kg) and increase gradually as per dietitian's recommendations[2].
- vitamins and trace elements are charted separately as below and require a separate cannula / lumen for administration (refer to Appendix 3 for full nutritional composition):
    - trace element solution (ADTE®): dilute 1 syringe in 100 mL of 5% glucose and administer via intravenous infusion (central or peripheral) over 4 hours
    - multivitamins for injection (Cernevit®): dissolve 1 vial in 5 mL water for injection and administer by slow intravenous injection (central or peripheral) over at least 10 mins
    - vitamin K: Cernevit® does not contain any vitamin K and the pre-mixed bags Olimel® N7-960E & Olimel® N9-840E contain variable levels of vitamin K per 2000 mL bag. For patient's receiving PN for >1 week additional 2 mg phytomenadione vitamin K1 weekly supplementation should be considered
    - **Note:** may be contraindicated in patients on vitamin K antagonists (e.g. warfarin) as adding vitamin K can destabilize the patients' INR. Only to be given upon treating medical team's request.

Once commenced, TPN prescription is to be reviewed daily by the treating medical team, who will monitor electrolytes and liaise with the dietitian and pharmacist, regarding TPN rate, additional fluid, or electrolyte requirements.

TPN bags are available from pharmacy. Bags should be stored in supplied overpouch to protect from light and contamination, and at temperatures below 25ºC.

Commencing TPN After Hours

The treating medical team may initiate TPN after hours prior to full nutrition assessment by the dietitian. The following is suggested:

- recommend using Olimel® N9 as standard TPN solution until reviewed by dietitian or pharmacist.
- if patient is not at risk of RFS, commence 40 mL/hr TPN of choice over 24 hours on MR60.1.11 WACHS Adult Total Parenteral Nutrition Form.
- increase to 60 mL/hr on treatment Day 2 and continue to monitor.
- if at risk of RFS:
  - commence IV thiamine, IV Cernevit® and trace element
  - commence TPN at 20 mL/h TPN of choice over 24 hours on MR60.1.11 WACHS Adult Total Parenteral Nutrition Form
  - monitor biochemistry, consider replacing potassium, magnesium and phosphate deficiencies prior to commencing TPN; monitor daily with replacement of electrolytes as required
  - increase to 40 mL/hr on treatment Day 2 if electrolytes are stable and continue to monitor.

Refer to WACHS Adult Refeeding Syndrome Clinical Guideline for more information on Re-feeding Syndrome.

2.4 Implementing Central Access

Document the date and time inserted and other relevant CVAD insertion and management details on MR179A WACHS Central Venous Access Device (CVAD) Insertion and Assessment Record and patient's healthcare record.

The methods used to check catheter position need to demonstrate the device has not been placed arterially. Once the CVC is deemed venous, it can be confirmed for use by the proceduralist and documented on the MR179A WACHS Central Venous Access Device (CVAD) Insertion and Assessment Record.

Refer to WACHS Central Venous Access Devices (CVAD) and Long Peripheral Venous Catheter (PVC) Management Clinical Practice Standard for full details on CVAD management.

2.5 Administering Parenteral Nutrition

Two (2) individuals (within their scope of practice) are required to perform the checking procedures, per the WACHS Medication Prescribing and Administration Policy, at the commencement of each bag which includes confirming programming of the pump and where possible for infusion rate changes.

The following steps outline processes for administering TPN:

- perform patient identification checks and ensure TPN order is valid (refer to WACHS Patient Identification Policy)
- check the TPN prescription against the label on the outside of the TPN bag, including the TPN solution volume, components, administration rate and expiry date / time. If there is a discrepancy, **do not connect TPN to the patient. Page the clinical pharmacist for confirmation**

- perform hand hygiene, don recommended personal protective equipment (PPE) and use non-sterile gloves when administering TPN
- designate one lumen exclusively for administration of TPN if a multi lumen catheter is in situ. In ICU always add a 3-way tap when commencing TPN
- TPN must always be administered through an infusion pump with a 1.2 micron filter attached to end of infusion line

Figure 1: Oxydetect check

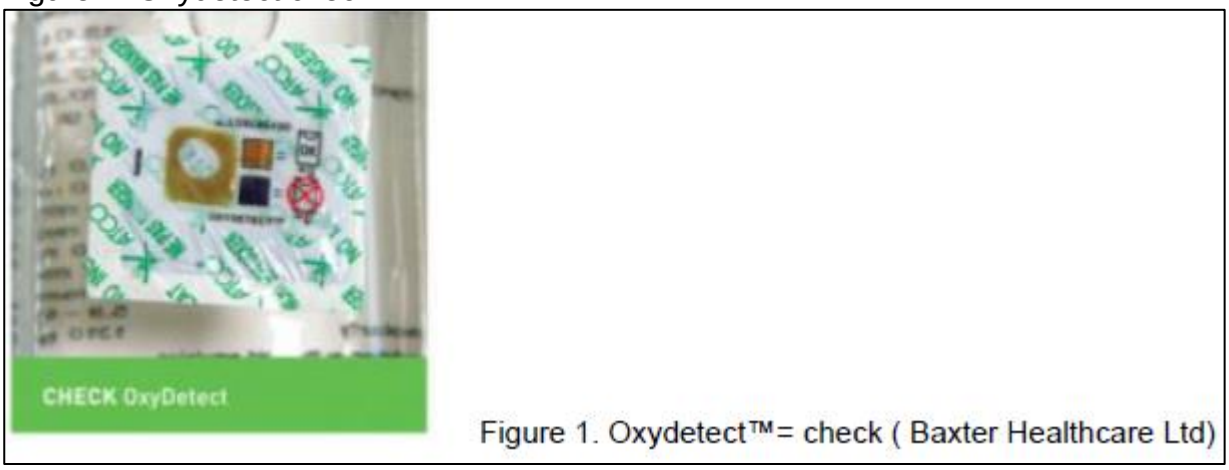

Figure 1. Oxydetect™= check (Baxter Healthcare Ltd)

- TPN Solution will come in vacuum sealed bag. Check Oxydetect™= visual proof that oxygen has not infiltrated bag. Light yellow indicates safe to use. Blue = DO NOT USE. Do not use scissors to open bag as you will risk damaging internal TPN solution bag. Slits at top and bottom of bag that can be used to help open by hand

Figure 2: Activation of TPN bag

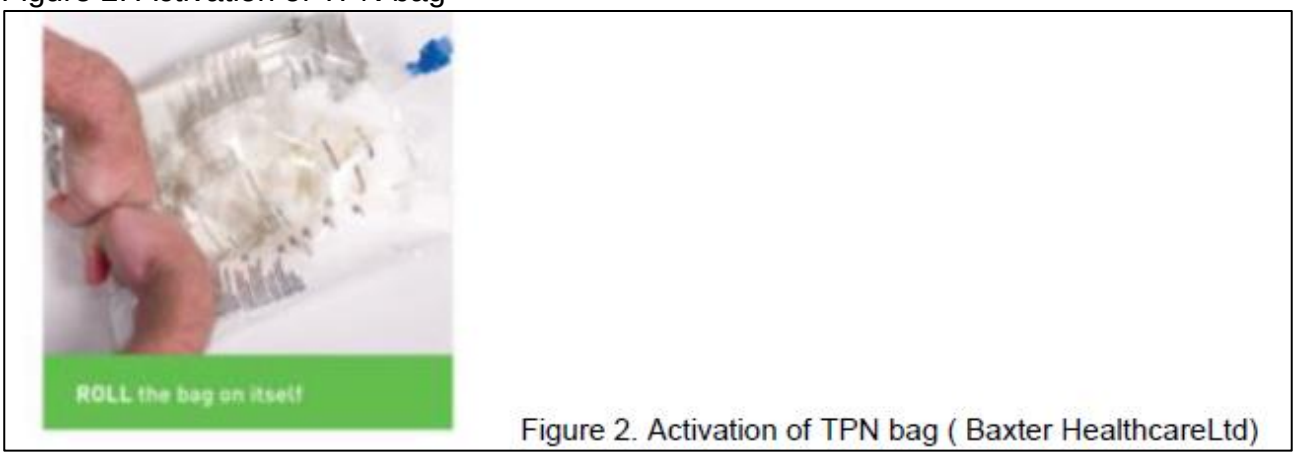

Figure 2. Activation of TPN bag (Baxter HealthcareLtd)

- roll the TPN bag to break the solution chambers and gently oscillate to mix the solution. After reconstitution the mixture is homogenised with a milky appearance
- decontaminate the needle free connector or hub by performing a “scrub the hub” technique for 20 seconds with a 2% chlorhexidine in 70% alcohol swab
  - If contraindicated use povidone iodine 10% in 70% alcohol. If alcohol is contraindicated use 10% povidone iodine aqueous solution
- flush the line with sodium chloride 0.9% 10 mL to assess patency
- connect TPN line to the port, ensuring 1.2 micron filter attached to TPN line. Do not contaminate the port
- administer at the prescribed rate using a volumetric infusion pump

- tape and secure the line and ensure a TPN administration sticker is attached to the dressing site to indicate that the cannula is not for other fluids or medications
- continuous or uninterrupted TPN delivery is important to minimise changes to blood glucose levels
- maintain the TPN administration line and CVAD as a 'closed' system to minimise the risk of blood stream infections[4]. Once line is disconnected, TPN must be discarded
- TPN solution and line should be discarded at or before the expiry date and time
- TPN bag must be used or discarded within 24 hours of commencement
- administration set should be changed with every new bag of TPN
- **important, clinicians must not**[8]:
  - collect blood samples from the TPN CVAD lumen
  - introduce any additional medications to the TPN infusion bag
  - administer any bolus IV medications via TPN lumen / line
  - co-infuse blood transfusions
  - use the TPN lumen for CVP measurements.

Olimel® TPN bags do not need to be covered with light protective bags while being infused as part of routine care. Alternative compounded formulations require light protection bags. Sites may choose to use light protective bags to differentiate from PPN, noting these are **not** required for non-compounded TPN bags.

2.6 Overnight / Cyclic / Intermittent Parenteral Nutrition

If the patient is to be nourished via TPN for an extended period, cyclic TPN may be used. With cyclical TPN the patient is fed overnight, usually starting from 18:00 hrs for 12 hours to 16 hours.

Cyclical TPN may be indicated to:
- provide stable patient with freedom of lines during day
- to reduce the risk of TPN-induced liver dysfunction
- to supplement dietary requirements whilst encouraging oral intake or receiving supplemental enteral feeding throughout the day.

TPN infusion rates and duration of hours are determined according to the volumes and formula required in consultation with dietitian and treating medical team. These are charted on MR60.1.11 WACHS Adult Total Parenteral Nutrition Form, the rate is prescribed as "cyclical". The infusion rate will be higher than standard TPN rates.

2.7 Home Parenteral Nutrition

For patients admitted to a WACHS facility who are already commenced on home TPN, the following is recommended:
- contact tertiary hospital managing the home TPN patient, so they are aware of the admission and confirm infusion rates and solution
- if the patient has brought home TPN bags with them, continue TPN infusion as per home TPN program unless otherwise indicated by the treating team.

2.8 Patient Monitoring[1, 2, 4]

Requirements include:

- monitoring and reporting any signs of CVAD insertion site deterioration to the treating medical team. Refer to WACHS Central Venous Access Devices (CVAD) and Long Peripheral Venous Catheter (PVC) Management Clinical Practice Standard
- monitoring and recording the patient's vital signs 4 hourly for the duration of the TPN infusion. Once stable, vital signs can be monitored daily as per treating medical team
- monitoring patient's temperature 4 hourly
- measuring patient weight both prior to TPN commencement, then daily or as directed by the treating medical team or dietitian (monitor for signs of fluid retention or overload)
- maintaining daily strict fluid balance charts during TPN administration as instructed by the medical team. Chart on MR144 WACHS Fluid Balance Work Sheet.

Monitor blood glucose levels (BGLs) as follows:

- perform a baseline BGL prior to commencement of TPN
- hourly for first 4 hours of initiation and with any rate changes
- 4 - 6 hourly as advised by the treating medical team; maintained between 5 – 10 mmol/L for 24 hours (based on the patient's clinical status)
- once stable, measure random BGLs twice daily at a minimum. More frequent monitoring may be required based on the patient's clinical status as directed by the treating medical team
- liaise with the treating medical team if BGL falls outside of normal limits
- if there is persistent hyperglycaemia, or the patient is usually on insulin, an insulin infusion may be required
- refer to MR157A WACHS Insulin Infusion Order Chart for commencement of insulin and revised protocol for blood glucose monitoring:
    - in the event that there is insufficient venous access or available central access lumens to administer insulin and TPN separately, contact the treating medical team for insertion of additional access (e.g. PIVC) site for insulin / other medications. TPN to be administered via PICC / CVC access only
- monitor for rebound hypoglycaemia after TPN is ceased.

Monitor biochemistry as follows:

- minimum requirements include daily urea and electrolytes, magnesium, phosphate, calcium (adjust TPN rates)
- full blood picture and liver function tests (including INR) every second day.

Tests are to be ordered by the treating medical team and responsibility for replacement of any electrolytes is with the treating medical team.

Deficient electrolytes should be replaced prior to TPN commencing with additional blood tests performed as clinically indicated. For long term hospitalised TPN patients, a full vitamin and trace element analysis should be conducted every 3 months (or more often as required). A full nutritional analysis includes fat soluble vitamins (A, D, E), vitamin C, B group vitamins, folate, zinc, copper, manganese, selenium, iron studies, molybdenum, iodine and thyroid function test.

2.9 Ceasing or weaning TPN

The dietitian and / or treating medical team will make the decision regarding the continuation or cessation of TPN prior to the next scheduled bag change.

The following must be considered prior to ceasing or weaning TPN:

- Oral intake and / or enteral nutrition achieve 50%–75% of requirements for energy, protein, and micronutrients, unless impaired gastrointestinal function precludes 100% absorption of nutrient needs[2]
- Before ceasing TPN the delivery rate must be gradually reduced. When weaning, reduce TPN rate by half for 2 hours and then cease (or as per the dietitian/treating medical team instructions). Monitor BGL with each rate change
- Rate changes to be prescribed on the rate change section of the MR60.1.11 WACHS Adult Total Parenteral Nutrition Form
- Do not reconnect a TPN bag that has been disconnected. It must be discarded.
- Monitor BGL 1 hour after cessation, then 2-6 hourly for 24 hours
- Once TPN is ceased and the line disconnected, (using aseptic technique) flush port with 10 mL sodium chloride 0.9% to enable use for other infusions
- Review insulin infusion if being administered
- Abrupt cessation / interruption of TPN should be avoided where possible to reduce the risk of hypoglycaemia. If TPN is abruptly ceased or interrupted, treating medical team is to prescribe glucose 10% and administer at the same rate as the discontinued TPN until TPN is replaced / resumed. If TPN is not to be recommenced, treating medical team to wean IV glucose / insulin infusion (if being administered) as per typical TPN weaning (as per above) with monitoring BGL (1 hour after cessation, then 2-6 hourly for 24 hours).

3. Roles and Responsibilities

The **treating medical team** is responsible for:

- ordering and prescribing daily TPN on MR60.1.11 WACHS Adult Total Parenteral Nutrition Form
- liaising with the dietitian for recommendations on TPN solution and rates of infusion
- charting trace element and multivitamin injection on MR170A WA Hospital Medication Chart – Short Stay
- ordering daily morning bloods while the patient is receiving TPN
- replacing deficient electrolytes
- reviewing blood and maintenance fluids
- monitoring the patient for potential complications
- including use of TPN in NaCS discharge summary.

The **dietitian** is responsible for:

- conducting nutrition assessment of anthropometry, biochemistry, clinical, medical and diet history
- establishing re-feeding syndrome risk
- calculating energy and protein requirements
- providing guidance on starting and target rate
- monitoring weight, fluid balance, biochemistry, blood glucose levels, and bowel function or stoma output
- advising on transition from TPN to oral or enteral nutrition
- establishing transitional feed once oral or enteral intake commences.

The **nurse** is responsible for:
- care of the CVAD
- managing the infusion and associated equipment
- ensuring accurate patient weight and height is documented on admission and daily weights are undertaken as directed by the treating medical team
- performing and documenting baseline vital signs
- monitoring regular BGLs and liaising with the treating medical team if outside acceptable parameters
- reviewing the patient's previous 24 hour fluid balance status and assessing the current total intake and output. Consider concurrent IV therapy regimens
- liaising with the treating medical team to incorporate maintenance IV fluid requirements as necessary.

The **pharmacist** is responsible for:
- completing a comprehensive medication review as required
- ensuring all medications are given by the most appropriate route of administration taking into account the patient's ability to absorb medications enterally
- providing guidance on electrolyte replacement
- maintaining appropriate stock of TPN available.

All staff are required to work within policies and guidelines to make sure that WACHS is a safe, equitable and positive place to be.

4. Monitoring and Evaluation

4.1 Monitoring

WACHS clinical leads for Medical, Nursing, Pharmacy and Dietetics will monitor compliance with this procedure. Routine monitoring will include TPN orders, number of days TPN is administered, and any clinical incidents associated with TPN administration.

4.2 Evaluation

Evaluation of this procedure will be carried out by the Dietetic Coordinator, in consultation with stakeholders. Regional evaluation of performance measures may include, but are not limited to:
- CIMS Datix incident data
- Regional Clinical Governance audit tools.

5. Compliance

Failure to comply with this document may constitute a breach of the WA Health Code of Conduct (Code). The Code is part of the Integrity Policy Framework issued pursuant to Section 26 of the *Health Services Act 2016* and is binding on all WACHS staff which for this purpose includes trainees, students, volunteers, researchers, contractors for service (including all visiting health professionals and agency staff) and persons delivering training or education within WACHS.

WACHS staff are reminded that compliance with all policies and procedures is mandatory.

6. References

1. National Institute for Health and Clinical Excellence. CG32 Nutrition support in adults: oral nutrition support, enteral tube feeding and parenteral nutrition (CG32). Manchester: NICE; 2006, updated 2017: [On-line] Available: Overview | Nutrition support for adults: oral nutrition support, enteral tube feeding and parenteral nutrition | Guidance | NICE.
2. ASPEN 2017, 'When is Parenteral Nutrition Appropriate?', Journal of Parenteral and Enteral Nutrition, vol. 41. No.3, pp. 324-377 (access: When Is Parenteral Nutrition Appropriate? - Worthington - 2017 - Journal of Parenteral and Enteral Nutrition).
3. Pittiruti M, Hamilton H, Biffi R, MacFie J, Pertkiewicz M. ESPEN guidelines on parenteral nutrition: Central venous catheters (access, care, diagnosis and therapy of complications). Clin Nutr. Aug 2009;28(4):365-377 (access: ESPEN Guidelines on Parenteral Nutrition).
4. Dietitians Association of Australia. Parenteral nutrition manual for adults in health care facilities: Deakin; 2018: [On-line] Available: https://dietitiansaustralia.org.au (members only).
5. Guenter P, Worthington P, Ayers P, Boullata JI, Gura KM, Marshall N, et al. Standardized Competencies for Parenteral Nutrition Administration: The ASPEN Model. Nutrition in Clinical Practice. 2018;33(2):295-304 (access: Standardized Competencies for Parenteral Nutrition Administration).
6. Government of Western Australia South Metropolitan Health Service Adult Total Parenteral Nutrition (TPN) . Perth: Fiona Stanley Fremantle Hospitals Group; 2023 [Cited 12 December 2023].
7. Government of Western Australia East Metropolitan Health Service Parenteral Nutrition: Total (TPN) Management Perth: Royal Perth Bentley Group; 2018 [Cited 12 December 2023].
8. Government of Western Australia North Metro Health Service. Nursing Practice Guideline Total Parenteral Nutrition Perth: Sir Charles Gairdner Osborne Park Health Care Group 2020 [Cited 12 December 2023].

7. Definitions

Term	Definition
Parenteral Nutrition (PN)	The provision of nutrition via a central or peripheral vein and is required when oral and enteral nutrition is insufficient or unsafe[1]
Total Parenteral Nutrition (TPN)	The intravenous delivery of nutrients (glucose, amino acids, lipids, electrolytes, vitamins, minerals and trace elements) via a central vein. Can provide up to 100% of the patient's nutritional requirements.
Peripheral Parenteral Nutrition (PPN)	Similar to TPN but has a lower concentration of nutrients and lower osmolarity that TPN solutions, allowing for peripheral venous administration only. It is not likely to provide 100% of nutritional requirements.

8. Document Summary

Coverage	WACHS-wide
Audience	Nurses, medical officers, dietitians and pharmacists involved in administering TPN
Records Management	Health Record Management Policy
Related Legislation	*Health Services Act 2016* (WA)
Related Mandatory Policies / Frameworks	• MP 0122/19 - Clinical Incident Management Policy 2019 • MP 0171/22 - Recognising and Responding to Acute Deterioration Policy • MP 0053/17 - WA Clinical Alert (Med Alert) Policy • MP 0175/22 - Consent to Treatment Policy • MP 0131/20 - High Risk Medication Policy • Clinical Governance, Safety and Quality Framework
Related WACHS Policy Documents	• Adult Peripheral Parenteral Nutrition Procedure • Adult Refeeding Syndrome Clinical Guideline • Aseptic Technique Policy • Central Venous Access Devices (CVAD) and Long Peripheral Venous Catheter (PVC) Management Clinical Practice Standard • Clinical Observations and Assessments Clinical Practice Standard (physiological, neurovascular, neurological and fluid balance) • Enteral Tubes and Feeding – Adults Clinical Practice Standard • Goals of Patient Care Guideline • Hand Hygiene Policy • High Risk Medications Procedure • Medication Prescribing and Administration Policy • Nutrition Screening, Assessment and Management Procedure • Patient Identification Policy
Related Forms	• MR60.1.10 WACHS Adult Enteral Feeding Form • MR60.1.11 WACHS Adult Total Parental Nutrition Form • MR60.1.12 WACHS Oral Nutrition Support Chart • MR111 WACHS Nursing Admission, Screening and Assessment Tool - Adults • MR120 WACHS Adult Nursing Care Plan • MR140A WACHS Adult Observation and Response Chart (AORC) • MR144 WACHS Fluid Balance Work Sheet • MR44C WACHS Diabetics - Food Intake Chart • MR156A WACHS Insulin Subcutaneous Order and Blood Glucose Record – Adult Form • MR170A WA Hospital Medication Chart – Short Stay

	• MR179A WACHS Central Venous Access Device (CVAD) Insertion and Assessment Record • MR157A WACHS Insulin Infusion Order Chart
Related Training Packages	Via MyLearning LMS: • eviQ: Cancer ADAC Principles of Central Venous Access Devices Declaration (CVAD1 EL2) • eviQ: Cancer ADAC Patient Assessment and Education Declaration (CVAD2 EL2) • eviQ: Cancer ADAC Care and Management of CVADs Declaration (CVAD3 EL2)
Aboriginal Health Impact Statement Declaration (ISD)	ISD Record ID: 3001
National Safety and Quality Health Service (NSQHS) Standards	1.03, 1.07, 1.27, 2.06, 2.10 4.04, 4.13, 4.14, 4.15, 5.27, 5.28,
Aged Care Quality Standards	Nil
Chief Psychiatrist's Standards for Clinical Care	Nil

9. Document Control

Version	Published date	Current from	Summary of changes
3.00	11 February 2025	11 February 2025	• update from Clinical Practice Standard to Procedure including change of title.

10. Approval

Policy Owner	Chief Operating Officer
Co-approver	Executive Director Nursing and Midwifery Executive Director Clinical Excellence
Contact	Area Coordinator Dietetics
Business Unit	Health Programs, Central Office
EDRMS #	ED-CO-15-94424

This document can be made available in alternative formats on request.

Appendix 1: Troubleshooting Equipment Issues[4,5]

Problems	Management
TPN line breakage / accidental disconnection	DO NOT reconnect a damaged or disconnected TPN line to the CVAD: • Clamp and cap the CVAD. • Clamp the disconnected TPN bag, line and filter; place in a sealed plastic container and save for inspection by pharmacy. • Notify the MO and clinical pharmacist. • Contact the MO to prescribe 10% glucose and administer at the same rate until TPN, bag line and filter is replaced. • Continue to monitor BGL as clinically indicated in liaison with the MO.
Filter breakages, blockages, or missing filter	DO NOT connect TPN to patient: • Notify the clinical pharmacist and the MO. • Contact MO to prescribe 10% glucose and administer at the same rate of TPN until TPN bag, line and filter is replaced. • Continue to monitor BGL as clinically indicated in liaison with the MO.
Central VAD compromise	• Includes infected insertion site, cracked ports, accidental dislodgement, leakage of solution at insertion site. • Stop and disconnect TPN; clamp and save TPN solution and line for inspection by pharmacy. • Notify the clinical pharmacist and the MO. • MO to prescribe 10% glucose and administer at the same rate of TPN via peripheral IV cannula, to prevent rebound hypoglycaemia. • New CVAD should be organised as soon as possible by MO. • Recommence TPN when the next bag is available and new CVAD has been deemed safe to use. • Continue to monitor BGL as clinically indicated in liaison with the MO.
TPN infusion completed and next bag is not available	• Notify clinical pharmacist and MO. • Contact MO to prescribe an infusion of 10% glucose and administer at the same rate of TPN until replacement TPN is available. • Continue to monitor BGL as clinically indicated in liaison with MO.
TPN order is incorrect or the bag is perforated, leaking or contaminated	DO NOT connect the faulty TPN: • Notify the clinical pharmacist and the MO. • Clamp the disconnected TPN bag, line and filter; place in a sealed plastic container and save for inspection by pharmacy. • Contact MO to prescribe 10% glucose and administer at the same rate as TPN until TPN is replaced. • Continue to monitor BGL clinically indicated in liaison with the MO.
Patient undergoing a surgical or other procedure	• Continue TPN as prescribed unless ordered otherwise by MO. Send MR60.1.11 WACHS Adult Total Parental Nutrition Form with patient. • If the TPN infusion is to be ceased for the procedure, reinforce with the procedural staff that the TPN line should remain connected to the patient. • If the line is disconnected, the solution must be discarded and a new bag of PN obtained

Appendix 2 - Troubleshooting Patient Complications[4,5]

Complication	Potential Causes	Treatments
Infection from catheter site resulting in general sepsis	Fungal / bacterial contamination	Antibiotics Re-educate on hygienic procedures for site management
Technical complications	Vein thrombosis, pneumothorax, haemothorax, haematoma, embolism, vein perforation	Refer to MO
Hyperglycaemia	High glucose infusion rate, preceding sepsis, diabetes, stress response	Reduce glucose infusion rate, consider insulin, monitor BGL 4 hourly
Hypoglycaemia	TPN infusion rate reduced too fast during discontinuation of feeding / feed stopped suddenly	Slow tapering of feed over 1-2 hours
Abnormal LFTs	Multifactorial, relating to disease. Can be related to overfeeding.	Does not require TPN to be ceased - refer to MO for advice
Low Mg / Ca / PO4 / electrolytes / Na / K	Refeeding Syndrome or malnutrition, medications e.g. diuretics	Correct electrolytes (IV) before increasing infusion rate, monitor bloods regularly
High Mg / Ca / PO4 / electrolytes / Na / K	Renal or liver disease, medications e.g. piperacillin with tazobactam	Regularly monitor bloods, *consider* reducing rate, *consider* insulin to ↓ K
Micronutrient deficiencies	Long term TPN	Regular blood monitoring, replacement of micronutrients, check Zn, Cu, Fe, Vit K
Fatty liver / hepatobiliary complications	Excessive energy/TPN rate (ensure carbohydrate intake no more than 5 g/kg/day)	Dietitian to re-assess energy requirements and modify as required, monitor LFTs / INR; check baseline LFTs prior to feeding
Respiratory failure	Excessive glucose (unlikely in all-in-one bags)	Ensure glucose < 5 mg/kg per minute
Hypertriglyceridaemia	High lipid component (unlikely in all-in-one bags)	Decrease lipid component; minimum is 3 times a week, check baseline triglycerides prior to commencing TPN
Fluid overload	Excessive fluid intake / administration Compromised renal or cardiac function Re-feeding syndrome	Review volume of parenteral nutrition and other fluids received from IV medications. Monitor fluid status using a fluid balance chart. Discuss appropriate fluid allowance / sources with MO. Consider changing to a more concentrated parenteral nutrition formulation. Initiate parenteral nutrition gradually.

Appendix 3: Cernevit® and Baxter ADTE® trace element formulation

Cernevit®

Vitamin	Amount per vial of Cernevit
B1 (thiamine)	3.51 mg
B2 (riboflavin)	4.14 mg
B3 (niacin)	46 mg
B5 (pantothenic acid)	17.25 mg
B6 (pyridoxine)	4.53 mg
B7 (biotin)	69 microg
B9 (folic acid)	414 microg
B12 (cyanocobalamin)	6 microg
C (ascorbic acid)	125 mg
A (retinol palmitate)	3500 units
D3 (cholecalciferol)	5.5 microg
E (dl-alpha-tocopherol)	11.2 units

Baxter ADTE® Trace Element Solution

Element	Amount per 10 mL syringe
Zinc	100 micromol (6.5 mg)
Copper	8 micromol (508 microg)
Selenium	1 micromol (80 microg)
Iron	20 micromol (1.1 mg)
Manganese	1 micromol (55 microg)
Chromium	0.2 micromol (10 microg)
Molybdenum	0.2 micromol (19 microg)
Iodine	1 micromol (130 microg)

Source: Baxter Health Care