**Canberra Hospital and Health Services**

**ClinicalProcedure**

**Administration of Total Parenteral Nutrition (TPN) – Adults and Children (not NICU)**

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| Purpose |

The purpose of the Total Parenteral Nutrition **(**TPN) Clinical Procedure is to outline the process for the safe administration and management of TPN in adult and paediatric patients of Canberra Hospital and Health Services.

This clinical procedure provides information for nurses and midwives who care for patients receiving TPN in the acute hospital and the community setting.

Parenteral nutrition is complex and only aspects of TPN administration and monitoring are encompassed by this clinical procedure.  Further clinical guidance in relation to parenteral nutrition can be found in the *NSW Agency for Clinical Innovation Parenteral Nutrition Pocketbook: For Adults* (refer to references).

This Standard Operating Procedure (SOP) describes for staff the process to

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| Scope |

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| Alerts |

* All patients who are to commence TPN must have a Central Venous Access Device (CVAD) in situ, that is a:
* Central Venous Catheter (CVC)
* Hickman’s line
* Implanted port, or
* Peripherally Inserted Central Catheter (PICC).
* **In adults:** Prior to commencing TPN the tip of the CVAD must be confirmed to be at the distal superior vena cava close to or at the cavoatrial junction. Confirmation is made utilising fluoroscopy, Chest X-ray or ECG Tip confirmation technology.
* **In children:** Prior to commencing TPN the tip of the CVAD must be confirmed to be at the distal SVC. Confirmation is made utilising fluoroscopy or Chest X-ray.
* If a multi-lumen CVAD line is in place, one lumen from the CVAD must be allocated exclusively for TPN. In addition, when there is a multi lumen CVAD in situ, it is desirable that the CVAD not be used for other purposes.
* The TPN solution is light sensitive and must be covered with the supplied light protective bag at all times.
* TPN should be always be administered via a smart pump with infusion safety software.
* Patients on continuous TPN must have the TPN bags and lines changed every 24 hours. If a patient is on 16 hourly TPN infusions, the bags and lines should be discarded at the end of each infusion. In paediatric patients, there are some cases where the TPN bag can be run for a maximum of 72 hours, through a pal 96 hour endotoxin filter. In paediatric patients, lipid bags and lines must also be changed every 24 hours.
* **For inpatients, nothing is to be added to TPN or fat emulsion (lipid) solutions, bags or lines**. Some long term patients may be required to add vitamins in a pre loaded syringe. This is prescribed by the gastroenterologist or paediatrician.
* In most cases a standard neonatal bag (i.e. NN1, NN2, NN4 as per order form) may be run for infants and a standard adult bag may be run for adolescents. Paediatric TPN solutions are usually prepared in pharmacy for each patient. Therefore, use **Section 2 – Commencing TPN in Adults (Adult TPN solutions)** for patients receiving Adult TPN solutions, and **Section 3 – Commencing TPN in Children (Paediatric and Neonatal TPN Solutions)** for paediatric patients receiving Paediatric and Neonatal solutions.
* Paediatric solutions require the addition of a 0.22 micron filter to the giving set of the TPN solution, and a 1.2 micron filter to the giving set of the lipid solution**.**

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| Scope |

This clinical procedure applies to all CHHS patients except for patients in the Neonatal Intensive Care Unit (NICU).

This document applies to:

* Medical staff
* Registered Nurses who have achieved competence in CVAD management and Aseptic technique (Refer to CHHS CVAD management Clinical procedure and CHHS Aseptic technique SOP)
* Allied Health Professionals

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| Section 1 – Before commencing TPN |

* Order must be written by a Registrar, Consultant or Fellow on an IV Fluid Order form *and* appropriate TPN order form for the formulation i.e. Neonatal TPN form, Paediatric TPN form, Adult TPN form.
* TPN is provided by Pharmacy. TPN delivered to the ward from Pharmacy must be stored under refrigerated conditions until required by the patient. Dietitian consultation should be sought regarding nutritional assessment.
* Baseline bloods are required (LFTs, Triglycerides, BGLs, UECs, CMP). FBC and iron levels must be done initially.
* A baseline weight should be recorded.

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| Section 2 – Commencing TPN in Adults (Adult TPN solutions) |

**Equipment**

* Personal protective equipment (goggles/safety glasses)
* Alcohol based hand rub (ABHR)
* TPN flask (as per medical prescription) with light protective cover
* Clean non sterile gloves
* Clean gown
* Light protected intravenous giving set (in outpatient settings, standard intravenous giving set can be used)
* Infusion pump device attached to IV pole
* Sterile dressing pack
* Sterile gauze
* Sterile gloves
* Chlorhexidine 2% alcohol 70% swabs x 3
* 10mL 0.9% Sodium Chloride x 1
* Blunt drawing up needle
* 10mL luer lock syringe
* Clinical waste bin
* General waste bin
* Sharps bin

**Procedure**

1. Attend hand hygiene
2. Clean dressing trolley with detergent impregnated wipes
3. Collect equipment
4. Remove TPN from refrigerator and place on trolley
5. Check TPN prescription order against the prepared TPN with another Registered Nurse or Enrolled Nurse
6. Attend hand hygiene
7. Explain the procedure to the patient and obtain verbal consent
8. Attend hand hygiene
9. Attend patient identification check with second staff member at the patient’s bedside utilising the three core identifiers. Confirm patient information on
10. patient identification band
11. TPN prescription
12. TPN light sensitive cover, and
13. TPN bag with verbal confirmation from patient.
14. Attend hand hygiene
15. Roll up light protective cover to allow access to TPN access port
16. Attend hand hygiene
17. Apply clean non sterile gloves
18. Access insertion port on TPN bag by removing blue tab (when using ‘SMOF Kabiven’ brand flask)
19. Swab insertion port on TPN bag vigorously with chlorhexidine 2% alcohol 70% swab for 10 seconds. Allow to dry for **30 seconds.**
20. Spike the prepared TPN bag utilising standard aseptic non touch technique (ANTT)
21. Hang the bag on the intravenous pole and re-apply light protect cover
22. Prime intravenous giving set
23. Select the TPN setting on the infusion pump
24. With the clinician who completed the initial prescription check, set infusion rate and volume to be infused as per the TPN prescription
25. Remove gloves and attend hand hygiene, don safety goggles and gown
26. Set up sterile field
27. Attend hand hygiene
28. Apply sterile gloves
29. Draw up 0.9% Sodium Chloride flush using blunt drawing up needle (maintaining sterile ANTT)
30. Using sterile gauze, lift dedicated TPN CVAD lumen and place sterile towel underneath
31. While still holding CVAD lumen, swab CVAD bung vigorously with chlorhexidine 2% alcohol 70% swab for 10 seconds. Allow to dry for **30 seconds**
32. Flush lumen with 10mLs of 0.9% Sodium Chloride using pulsatile action to ensure patency
33. While still holding CVAD lumen, swab CVAD bung vigorously with chlorhexidine 2% alcohol 70% swab for 10 seconds, allow to dry for **30 seconds,** place on sterile towel and discard gauze.
34. Using sterile gauze in your dominant hand, lift TPN infusion line
35. With non-dominant hand, use sterile gauze to remove infusion line cap and discard cap and gauze
36. Using sterile gauze in your non-dominant hand, lift lumen and connect to TPN infusion line
37. Remove sterile gloves and perform hand hygiene
38. Commence TPN infusion
39. Dispose of used equipment in line with organisational requirements
40. Sign TPN administration order with second staff member and document in notes as per the Clinical Record Documentation procedure located on the Policy Register

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| Section 3 – Commencing TPN in Children (Paediatric and Neonatal TPN Solutions) |

Neonatal and paediatric solutions require the addition of a 1.2 micron filter to the giving set of the fat emulsion (Lipid) solution.

Parenteral nutrition is an acknowledged risk factor for fungaemia, with Candida species being the most common organisms involved. Candida grows rapidly in lipid-containing admixtures. Retention of Candida from lipid-containing preparations is possible with an appropriate filter.

Neonatal TPN bags may be administered over an extended period, up to 72hours, with the addition of the endotoxin eliminating filter (0.22 micron filter). In this case, the lipid bag and lines are still changed every 24 hours.

**Commencing TPN and lipids:**

If TPN and lipids are running a 2- or 3-way extension must be used to accommodate the second line.

**Equipment**

* Personal protective equipment (goggles/safety glasses)
* Alcohol based hand rub (ABHR)
* TPN flask (as per medical prescription) with light protective cover
* Lipid flask (as per medical prescription)
* Clean non sterile gloves
* Light protected intravenous giving set x2
* 0.22 micron **TPN** filter
* 1.2 micron **Lipid** filter
* 2 or 3 way extension
* Infusion pump device attached to IV pole
* Sterile dressing pack
* Sterile gauze
* Sterile gloves x2 (one for assembling lines, one for attaching lines)
* Clean gown
* Chlorhexidine 2% alcohol 70% swabs x 4 or Chlorhexidine solution
* 10mL 0.9% Sodium Chloride x 1
* Blunt drawing up needle
* 10mL Luer lock syringe
* Clinical waste bin
* General waste bin
* Sharps bin

**Procedure**

1. Attend hand hygiene
2. Clean dressing trolley with detergent impregnated wipes
3. Collect equipment
4. Remove TPN and lipids from refrigerator and place on trolley
5. Check TPN and lipid prescription order against the prepared TPN and lipids as per medication policy
6. Attend hand hygiene
7. Explain the procedure to the patient/carer and obtain verbal consent
8. Attend hand hygiene
9. Attend patient identification check with second staff member at the patient’s bedside utilising the three core identifiers. Confirm patient information on
10. patient identification band
11. TPN prescription
12. TPN light sensitive cover, and
13. TPN bag with verbal confirmation from patient/carer
14. Attend hand hygiene, don safety glasses and gown
15. Second staff member to roll up light protective cover to allow access to TPN access port
16. Set up sterile field
17. Attend hand hygiene and apply sterile gloves
18. Assemble lines, line filters and extension
19. Access insertion port on TPN bag – second person removes tab
20. Swab insertion port on TPN bag vigorously with Chlorhexidine 2% alcohol 70% for 10 seconds. Allow to dry for **30 seconds.**
21. Spike the prepared TPN bag using aseptic non touch technique (ANTT)
22. Hang the bag on the intravenous pole and re-apply light protect cover
23. Prime intravenous giving set
24. Access insertion point on lipid bag – second person removes tab
25. Swab insertion port on lipid bag vigorously with Chlorhexidine 2% alcohol 70% for 10 seconds. Allow to dry for **30 seconds**
26. Spike the prepared lipid bag using ANTT. Hang the bag on the intravenous pole
27. Prime intravenous lines
28. Select the TPN setting on the infusion pumps
29. With the second staff member, set infusion rate and volume to be infused as per the TPN and lipid prescription
30. Remove gloves and attend hand hygiene
31. Apply new pair sterile gloves
32. Maintaining asepsis, draw up 0.9% Sodium Chloride flush using blunt drawing up needle
33. Using sterile gauze, lift dedicated TPN CVAD lumen and place sterile towel underneath
34. While still holding CVAD lumen, swab CVAD intravenous cap vigorously with Chlorhexidine 2% alcohol 70% for 10 seconds. Allow to dry for **30 seconds**
35. Flush lumen with 0.9% Sodium Chloride using pulsatile action to ensure patency (volume used is dependent on age of child)
36. While still holding CVAD lumen, swab CVAD intravenous cap vigorously with Chlorhexidine 2% alcohol 70% for 10 seconds, allow to dry for **30 seconds,** place on sterile towel and discard gauze
37. Using sterile gauze, lift TPN infusion line
38. Use sterile gauze to remove infusion line cap and discard cap and gauze
39. Using sterile gauze, lift lumen and connect to TPN infusion line, ensuring that all connections are secure
40. Remove sterile gloves and perform hand hygiene
41. Repeat steps 30-36 for separate lipid infusion
42. Commence infusions
43. Dispose of used equipment in line with organisational requirements
44. Sign TPN order and document in notes as per the Clinical Record Documentation procedure

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| Section 4 – Monitoring TPN in Adults and Children |

**The RN caring for the patient having TPN must:**

* Ensure that the patient has blood monitoring as ordered (usually daily biochemistry initially and at least weekly full blood counts and liver function tests).
* Measure and record the patient’s Blood Glucose Level (BGL) four times a day (QID) on commencement of TPN, then daily when BGLs are stable (as determined by the patient’s treating team).
* Measure and record the patient’s weight on the weight chart on commencement of TPN, then twice weekly.
* Maintain at least 4 hourly vital signs on patients for the duration of TPN, unless otherwise ordered by the treating medical team.
* **For paediatric patients**, measure and record the patient’s weight, height and head circumference on commencement of TPN, then weight twice weekly and height and head circumference (HC) every month in children under 3 years of age.
* **For paediatric patients on long-term TPN**, additional pathology is required at 3, 6 and 12 monthly intervals. Please refer to Royal Children’s Hospital ‘Clinical practice guideline - Parenteral nutrition RCH specific’ (refer to references)

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| Section 5 – Disconnecting TPN in Adults and Children |

**Equipment**

* Personal protective equipment (goggles/safety glasses)
* Alcohol based hand rub (ABHR)
* Clean non sterile gloves
* Chlorhexidine 2% alcohol 70% swab x 1
* 0.9% Sodium Chloride flush – either 10mL syringe, drawing up needle and 10mL 0.9% Sodium Chloride or a 10mL 0.9% Sodium Chloride Posiflush
* Clinical waste bin
* General waste bin

**Procedure**

1. Attend hand hygiene
2. Ensure patient privacy
3. Confirm order to cease infusion
4. Confirm patient identification using the three core identifiers on the TPN prescription order, patient identification band and verbal confirmation from patient
5. Explain procedure to patient and obtain consent
6. Attend hand hygiene
7. Apply clean non sterile gloves
8. Disconnect TPN line from CVAD
9. Swab CVAD bung vigorously with chlorhexidine 2% alcohol 70% swab for 10 seconds. Allow to dry for **30 seconds.**
10. Flush lumen with 10mLs of 0.9% Sodium Chloride using pulsatile action
11. Dispose of TPN flask into the clinical waste bin
12. Attend hand hygiene

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| Section 6 - Weaning and Cycling TPN |

**Tapering administration rate prior to TPN cessation is no longer standard practice in adults.**  Care should be taken when ceasing parenteral nutrition in patients receiving an insulin infusion to ensure the insulin infusion is ceased before TPN administration is ceased or a glucose source in place of parenteral nutrition is commenced to prevent hypoglycaemia.

Abrupt cessation of TPN can possibly cause rebound hypoglycaemia.  Parenteral nutrition rate is tapered prior to discontinuation in children to prevent hypoglycaemia. Tapering TPN is achieved by a weaning process involving decreasing the administration rate by half for two hours before cessation.  Regular checking of BGLs must be attended during the process until tolerance to the weaning process is ascertained.

Cycling TPN refers to having time off TPN, for example, eight hours off TPN a day.

Weaning TPN refers to the gradual reduction of the TPN rate prior to ceasing TPN (may be for cyclic delivery, or when stopping TPN completely).

Enteral feeding may need to be considered if TPN is being ceased completely or if cyclic TPN is required but full nutritional requirements are not being met.

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| Section 7 – Home Parenteral Nutrition (HPN) – Patient Education and Discharge Planning |

Parenteral nutrition is a costly treatment with significant infection risks and complications.  Home Parenteral Nutrition (HPN) can only be justified for patients with clearly defined indications.  Approval through the Canberra Hospital and Health Services Drug and Therapeutics Committee is required to achieve funding by Canberra Hospital of the parenteral nutrition solution, equipment and consumables which are provided through a supplier (for example, Baxter or Fresenius Kabi).  Canberra Hospital remains the clinical provider and provides the clinical management.

In addition to the clinical indication for HPN, the physical, cognitive and emotional capabilities of the patient and/or carers should be considered and the appropriateness of the home environment.  Extensive patient and/or carer training in the management of HPN is required while still an inpatient, with this usually taking several weeks (possibly up to 6 weeks) depending on the patient and and/or carer’s ability to learn the techniques to ensure safe home practice.

The role of the hospital ward RN is to educate the patient and/or carer towards independent administration of parenteral nutrition with the ability to recognise problems and complications and respond appropriately.

**Procedure**

1. It is recommended to have a planned timeline for the setting up of the HPN patient, coordinated by the hospital ward CNC, covering a two week period. The hospital ward CNC informs the following clinicians of the new HPN patient:

* CNC Acute Post Acute Care RACC (ACT Residents Only), phone: 6174 7958
* Discharge Liaison Nurse (DLN) – to refer to community nursing. NSW Residents should be referred to the relevant Local Health District Community Nursing Service.
* HPN manufacturer to order HPN bags, equipment and consumables. See Attachment A for information on ordering from the main supplier, Baxter.
* In paediatric patients the Paediatric Day Stay CNC is informed of the pending discharge

1. Education of the patient and/or family carer in the management of HPN is carried out in hospital. This process can take two or more weeks depending on the medical condition of the patient and/or the family carer’s ability to undertake the care independently. Patient and/or family carer education related to HPN is divided into four areas:

* Care of the CVAD
* Administration procedures
* Monitoring for complications, for example, CVAD and pump troubleshooting, sepsis
* How to order supplies

**Patient/Family Carer Education Checklist**

* Issued with product information from HPN manufacturer (for example, *Parenteral Nutrition At Home Patient Guide* from Baxter)
* Demonstrates principles of asepsis when doing procedures
* Demonstrates safe use of equipment and pump
* Demonstrates safe handling and storage of HPN
* Recognises mechanical problems related to CVAD and responds appropriately
* Recognises signs and symptoms of infection and responds appropriately
* Recognises signs and symptoms of fluid imbalance
* Recognises signs and symptoms of hyperglycaemia and hypoglycaemia

During training the patient is encouraged to take responsibility for self-monitoring and recording in a logbook or diary in preparation for discharge. This may include monitoring of: fluid balance, BGLs, weight and temperature. If the patient is found to be stable after several weeks on parenteral nutrition a decrease in monitoring activities is indicated. Generally stable patients do not need to monitor BGL or temperature at home. If the patient becomes unstable then home monitoring activities may need to be increased.

1. The HPN regimen requires regular evaluation (this may be weekly initially to up to six monthly depending on the stability of the patient).  A recommended standard of care for the management of patients receiving HPN is for this to be multidisciplinary.  Review should be arranged with the consultant clinician (gastroenterologist managing parenteral nutrition) and dietitian (gastroenterology outpatient dietitian or paediatric dietitian as appropriate).  The gastroenterologist orders the frequency of blood collection for monitoring of electrolytes and chemistry; and the schedule for the patient and/or family carer to monitor BGLs, weight, and temperature. Blood is collected by a pathology service prior to review by the gastroenterologist or GP. The dietitian organises follow up appointments as required. The patient should be given a contact list for the HPN manufacturer, community nursing, dietitian, emergency services, gastroenterologist, GP and hospital pharmacy.

**Discharge Checklist**

* HPN approved by the Drug and Therapeutics Committee (CHHS)
* ‘Purchase Order Number’ provided by Canberra Hospital Pharmacy
* CVAD in situ
* Referred to Community Nursing CNC Acute Post Acute Care (ACT residents only)
* Referred to community nursing and Link Team for support and monitoring
* Appointments with gastroenterologist, GP and dietitian
* Blood collection schedule
* Contact list for HPN manufacturer (see Attachment A), community nursing, dietitian, emergency services, gastroenterologist, GP and hospital pharmacy
* Home Monitoring Protocol
* Product information from HPN manufacturer (for example, *Parenteral Nutrition At Home Patient Guide* from Baxter)
* HPN solutions
* Equipment: ambulatory pump, IV set, backpack for ambulatory pump, IV pole
* List of consumables
* Consumables

1. It is recommended that the patient is assessed for safety and independence in the performance of TPN administration early in the discharge planning process. It is recommended that the patient’s home be assessed for the suitability of their storage of a month’s supply of consumables in their original boxes in a clean and dry area, the selection of an area for HPN connection and disconnection and appropriate location of power points for the pump. A dedicated fridge is required to store the HPN and vitamins. Vitamins should not be stored in the refrigerator door. The patient may consider purchasing a folding table, or a stainless steel/plastic tray to provide a clean surface on which to perform HPN management.

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| Implementation |

* Available via the Intranet on the CHHS Policy register
* This procedure will be communicated to relevant staff as part of unit based orientation and ward meetings
* This procedure will be incorporated into existing education and training programs

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| Related Legislation, Policies and Procedures |

*Human Rights Act 2004*

**Policies**

Consent and Treatment Policy

Medication Handling Policy

**Procedures**

Aseptic Non Touch Technique 2014

Central Venous Access Device (CVAD) Management- Children, Adolescents and Adults (Not Neonates) 2013

Clinical Record Documentation 2012Patient Identification and Procedure Matching

Healthcare Associated Infections 2015

Nursing and Midwifery continuing competence 2012, DG12-050

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Sydney Children’s Hospital Network, Sydney, Australia, Practice Guideline *on Parenteral Nutrition Administration – SCH* [Internet, last updated 18 January, 2016; cited 1st October 2015, Available from: <http://www.schn.health.nsw.gov.au/_policies/pdf/2013-7039.pdf>

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| Search Terms |

CVAD, Home parenteral nutrition, HPN, Nutrition, Total parenteral nutrition, TPN

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| Attachments |

Attachment A – Information Regarding Suppliers of HPN

**Disclaimer**: *This document has been developed by ACT Health, <Name of Division/ Branch/Unit> specifically for its own use. Use of this document and any reliance on the information contained therein by any third party is at his or her own risk and Health Directorate assumes no responsibility whatsoever.*

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| Date Amended | Section Amended | Approved By |
| *Eg: 17 August 2014* | *Section 1* | *ED/CHHSPC Chair* |
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## Attachment A – Information Regarding Suppliers of HPN

The main supplier of HPN for CHHS patients is Baxter.

There are two Baxter Healthcare Departments that manufacture, coordinate and distribute products for HPN patients:

**A.** **Baxter Pharmacy Services:** prepares HPN solutions for patients on prescription from the Gastroenterologist via the hospital Pharmacy Department.

HPN bags and preloaded vitamin syringes (if required) are delivered to the patient’s home via courier once a week. The HPN bags in overpouches and preloaded vitamin syringes are to be unpacked and put into the refrigerator (maintained at 2 to 8ᴼC) as soon as possible after receipt of the delivery. The patient or family carer should complete a stock take on receipt of the delivery and contact Baxter Pharmacy Service promptly if there any issues.

The patient should have an extra HPN bag in case of courier delay or leakage of contents of the HPN bag. This bag is to be used on the night of the weekly HPN delivery. The first bag of the new delivery is to be administered the day after the weekly HPN delivery.

**B.** **Baxter Customer Support**: supplies a Bodyguard 323 Ambulatory Pump, IV pole, backpack and consumables on order from the hospital ward CNC on a ‘Baxter Home Parenteral Nutrition New Patient Request Form’. The consumables are delivered to the patient’s home via courier on a monthly basis.

The Baxter Customer Support Specialist contacts the patient two weeks prior to the monthly consumables delivery for a stock take. The patient or family carer should do a stock take the day prior to the monthly phone call from the Baxter Customer Support Specialist

Baxter Contact Details

**Baxter Pharmacy Service – for enquires about the Baxter HPN bag and vitamin syringes**

T: 1800 227 487 (Monday – Friday 8:30am – 5:00pm)

After Hours Emergency: 1800 249 837

**Baxter Customer Support – for enquires regarding Baxter consumables and loan pump**

T: 1800 812 740 (Monday – Friday 8:00am – 5:00pm)

E: homecare\_ANZ@baxter.com

Fax: 1800 806 923

After Hours Emergency: 1800 249 837