

# Management of Parenteral Nutrition via a Central Venous Access Device in Adults

## Policy & Procedures

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## **REVIEW DATES AND DETAILS OF CHANGES MADE DURING THE REVIEW**

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This review was undertaken by Charlotte Rubio (Clinical Lead) and Nutrition Nurse Specialists Angela Holohan and Catherine Pickering. The main changes are:

- I. Clarification of roles and responsibilities for PN management linked to non-medical prescribing roles within the Nutrition & Dietetic service and advanced clinical practitioner Dietetic roles in critical care,
- II. Updated nursing administration guidance to reflect British Intestinal Failure Alliance procedures

## **KEY WORDS**

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TPN / tpn / Parenteral / parenteral nutrition / PN / pn / Intravenous / LIFT / NST  
catheter related blood stream infection (CRBSI)

## 1 INTRODUCTION AND OVERVIEW

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- 2 This documents sets out the University Hospitals of Leicester (UHL) Trust policy and procedure for the management of Parenteral Nutrition (PN) via a Central Venous Access Device (CVAD) in adult patients.

### Definition and Indications for Parenteral Nutrition

PN provides nutrition, fluid and electrolytes by intravenous administration. PN can provide the full range of macronutrients (protein, fat, carbohydrate) and micronutrients (vitamins, minerals and trace elements), with all the fluid and electrolytes that the patient requires. Historically this was known as Total Parenteral Nutrition (TPN) but now the term PN is more widely used, as it can also provide partial nutrition in addition to some enteral and/or oral nutrition. PN should be considered if it is not possible to provide nutrition support via the oral or enteral (gastrointestinal tract) route. An assessment of the degree of intestinal failure (IF) must be made.

PN is an expensive and invasive form of nutrition support and in inexperienced hands can be associated with risks from Central Venous Access Device (CVAD) placement, catheter related blood stream infection (CRBSI), thrombosis, and metabolic disturbances. Careful consideration is required when deciding for whom, when and how this form of nutrition support should be provided.

- 2.1 Patients being considered for PN and, if subsequently given this form of intravenous therapy, should have access to a multidisciplinary (MDT) Nutrition Support Team (NST). In UHL all patients outside of critical care units should be referred to Leicester Intestinal Failure Team (LIFT), on ICE. In intensive care units patients are assessed by the Specialist Dietitians as part of the MDT, with input from LIFT if required.

- 2.2 Common short term indications for PN include

- a) Post-operative ileus if gastro-intestinal function is not improving by the fifth post-operative day.
- b) Small Bowel Obstruction
- c) Impaired gastro-intestinal function or severe malabsorption either peri-operative in nature or associated with critical illness and other multi-organ failure

The above are classified as Type 1 IF, considered to be short term, self-limiting and requiring a short period of PN (normally 5 – 14days) until gastrointestinal function improves and oral/enteral nutrition can be reintroduced.

Some patients will have prolonged intestinal failure requiring long periods of PN (Type 2 and 3 IF) and this is seen in the following cases:

- d) Short Bowel Syndrome following severe gastrointestinal resection (small intestine < 200cm),

- e) High volume enterocutaneous fistula, only where enteral or oral nutrition causes issues with malabsorption, electrolyte losses and/or wound management,
- f) Severe gastrointestinal dysmotility disorders,
- g) Severe pancreatitis if enteral options are not indicated or tolerated
- h) Patients with severe mucositis subsequent to chemotherapy or graft versus host disease following Bone Marrow Transplant

2.3 Any patient requiring PN for longer than 28 days as an inpatient and/or being considered for Home PN should be discussed at the LIFT Intestinal Failure (IF), Nutrition MDT, led by Consultants in Gastroenterology, Clinical Nutrition, and Intestinal Failure.

**Routes of Administration of PN**

2.4 PN must be administered centrally. Gold standard is a single lumen CVAD dedicated for PN only. PN is not given via the peripheral route in UHL.

2.5 CVADS used in UHL for PN must be selected based on expected duration of PN

<b>CVAD</b>	<b>Indication</b>
Peripherally Inserted Central Catheter (PICC)	First choice for short term PN < 28days). Can also be used for medium and long term PN (NB issues with access for self caring home PN patients)
Hickman Line	Type 2 & 3 Intestinal failure patients requiring medium to long term PN.

2.6 Double-lumen CVAD use for PN must be limited to situations where long term IV medications are required and/or venous access is difficult. A peripheral device (cannula) should be used for additional intravenous access where there is adequate peripheral venous access.

2.7 If a double **lumen** PICC/Hickman Line is required, **a lumen must be dedicated for PN only** (Refer to UHL Vascular Access in Adults and Children Policy. Trust Ref B13/2010).

2.8 The use of non-tunnelled, non-dedicated multi-lumen CVC lines must be avoided unless no other option is available and only used if the patient is in an intensive care unit or high dependency setting. A dedicated single lumen line must be inserted as soon as is clinically possible.

## **Management of CVAD for Administration of PN**

- 2.9 To reduce the risk of CRBSI, a strict aseptic non-touch technique (ANTT) technique must be observed following the procedure outlined in this policy.
- 2.10 All staff manipulating PN CVAD must have received competency based training before accessing the CVAD unless there is an urgent clinical necessity for central venous access.
- 2.11 The CVAD lumen used for PN must be clearly labelled or have the hub covered with a gauze flag to reduce the likelihood of inadvertent manipulation of the CVAD by non-trained staff.
- 2.12 If a non-single lumen CVAD is used to administer PN, all lumens on the device must be treated with the same aseptic non-touch technique (ANTT) as the lumen dedicated for PN.

## **Maintaining patency of CVAD if not in use**

- 2.13 Hickman lines / PICC lines
  - i. Flush weekly with 10ml 0.9% Sodium Chloride. This must be prescribed on the regular part of the medication chart.

### Needle free connector

- i. Must be changed once a week when flushing the line.

## **Supply of PN to inpatients**

- 2.14 Once PN is dispensed from pharmacy no further additions can be made to the solution.
- 2.15 During normal working hours PN must only be supplied following an assessment by LIFT or a Speciality PN competent Dietitian in areas such as renal or intensive care units.
- 2.16 Out of hours provision of PN in a new patient prior to specialist assessment must be limited. Malnutrition is the culmination of a gradual process and should not be considered as an 'emergency'. The use of PN in inexperienced hands is associated with many potential risks.

## **Home Parenteral Nutrition (HPN)**

- 2.17 Patients being discharged from UHL on HPN are managed as per the National Health Service England (NHSE) national contract for the supply of HPN and UHL Policy on the Provision of a Homecare Medicine Service (Ref B13/2019) and NST Standard Operating procedure for Home Parenteral Nutrition.
- 2.18 Patients and carers will receive the UHL HPN Resource Pack.

- 2.19 If a HPN patient is readmitted, a member of medical staff must refer the HPN patient to LIFT using ICE. If the patient is admitted out of hours, medical staff must contact the Gastro team on call and try to transfer the patient to the intestinal failure unit (wards 42/43). The CVAD for PN administration must only be accessed by PN trained staff unless it is an emergency. All HPN patients are given a patient passport with a QR code that links to further details and management guidelines.

### 3 POLICY SCOPE

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- 3.1 This policy applies to all registered and non-registered healthcare staff who care for an adult patient being considered for, or receiving, PN.
- 3.2 Registered nursing staff administering PN must complete the PN study day (booked via HELM) and be competency assessed by the Nutrition Specialist Nurse Team.
- 3.3 This policy applies to pre-registration student nurses, midwives and nursing associates caring for these patients whilst under the supervision of their mentor / assessor.
- 3.4 This policy recognises the definition of an adult as a person over the age of 16 years. A person in special education will be an adult over the age of 19 years.

### 4 DEFINITIONS & ABBREVIATIONS

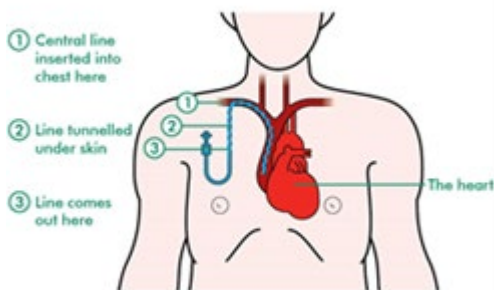
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**Central Venous Access Device (CVAD):** A catheter which has its tip located in the distal third of the superior vena cava (SVC) superior to the right atrium. CVAD is sometimes referred to as a Central Venous Catheter (CVC).

**Catheter-Related Blood Stream Infection (CRBSI):** Can be defined as the presence of bacteraemia originating from a CVAD.

**Enteral Nutrition (EN):** The delivery of nutrition via the gastrointestinal tract involving an enteral feeding tube.

**Hickman CVAD** are inserted via the chest into the subclavian vein then tunnelled under the skin to exit on the chest. They have a Dacron cuff which grows into the subcuticular layer and prevents displacement. This creates greater stability for the line and reduces movement as the patient mobilises. The dressing on the chest wall is more effective as it is not under tension from multiple IV lines and if curled effectively reduces any damage to the exit site tissue reducing the likelihood of sepsis.

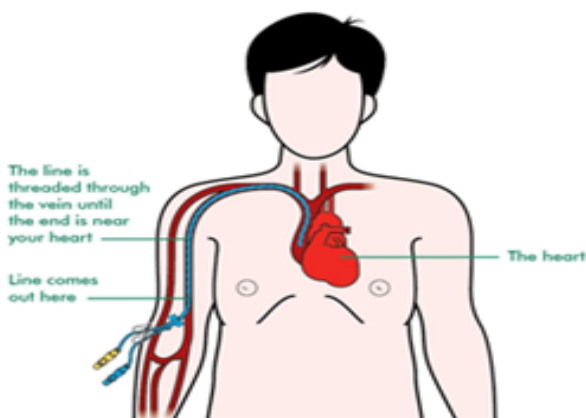


**Home Parenteral Nutrition (HPN):** intravenous nutrition at home in patients with acute or chronic intestinal failure in whom nutritional and / or water and electrolyte balance cannot be corrected by oral or enteral feeding.

**Intestinal Failure (IF):** Any condition which requires patients to be dependent upon Parenteral Nutrition (PN) or Intra Venous fluid infusions (IVI) to maintain nutrition or hydration.

**Leicester Intestinal Failure Team (LIFT):** Nutrition Support Team (Nutrition Specialist Nurses, Specialist Dietitians), medically led by Gastroenterology Consultants for Nutrition and Intestinal Failure and supported by a wider multidisciplinary team (pharmacy, consultants in chemical pathology and microbiology).

**Peripherally Inserted Central Catheter (PICC):** A type of long catheter that is inserted through a peripheral vein, into a larger vein in the body,



**Parenteral Nutrition (PN) or Total Parenteral Nutrition (TPN):** The provision of nutrition by intravenous administration of aseptically prepared solution.

**Quick Response Code (QR Code):** A square (two-dimensional) barcode to store information in a machine-readable optical label.

#### 4 ROLES AND RESPONSIBILITIES

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4.1 The **Executive Lead** is the Medical Director.

4.2 **CMG Heads of Nursing, Deputy Heads of Nursing and Matrons alongside Head of Service** are responsible for ensuring:

- a) Adequate staffing levels of competent nurses within their clinical areas to care of a patient with PN.
- b) Patients must be moved to a PN trained area if the ward/clinical area is not familiar or competent in managing a patient on PN.



#### 4.3 **Ward Sisters / Charge Nurses are responsible for:**

- a) Allocating registered nurses for PN training and maintaining ongoing monitoring of the quality of the PN techniques used within their clinical areas
- b) Removing staff that lack competency from administering PN and re-allocating them for PN training.

#### 4.4 **Medical Staff / Competent Clinician** are responsible for the overall management of a patient requiring and receiving PN. Junior doctors who do not feel they have this level of expertise should seek guidance from senior colleagues, or Leicester Intestinal Failure Team (LIFT). In particular they are responsible for:

- a) Referring patients to LIFT (on ICE).
- b) Arranging insertion of a suitable CVAD after liaising with LIFT to confirm that PN is indicated.

#### 4.5 **Consultant Radiologists and Vascular Access Specialist Nursing Team** (where integral to job role) take responsibility for the insertion of the central venous catheters as indicated at the request of the primary consultant with reference to the UHL Vascular Access Policy B13/2010.

#### 4.6 **Leicester Intestinal Failure Team (LIFT)**

- a) **It is mandatory that LIFT be involved with any adult patient outside of intensive Care if PN is being considered. LIFT can be contacted on extension 16988 or via their group email HPN.LIFT@uhl-tr.nhs.uk**
- b) LIFT is a multidisciplinary team consisting of consultants (Gastroenterology, and also dedicated sessional microbiologists), Nutrition Support Team dietitians and nutrition nurse specialists, and pharmacists responsible for offering expert advice on the care and management of patients requiring artificial nutritional support via the parenteral or enteral route.
- c) LIFT ensure the Trust standards for management of adult PN are met (see appendix 1).

#### 4.7 **Nutrition Nurse Specialists are responsible for:**

- a) Assessing, ordering and prescribing PN (if a non-medical prescriber) on a rostered basis as part of LIFT following completion of a competency-based package as outlined in section 6.
- b) Overseeing the management and care of the CVAD use for PN and for training, assessing and supporting all staff members in caring for and treating patients on PN within UHL in line with this policy.
- c) Providing expert advice, support and clinical input on an individual basis to patients on PN and to act immediately and intervene if necessary if the patient appears to show septic symptoms and becomes unwell.

- d) Liaising with the commercial homecare providers through the national NHSE contract for supply of home parenteral nutrition (HPN) to ensure they are aware of their roles and responsibilities around the care and management of the HPN patients and ensure they practise in line with this policy.

#### **4.8 LIFT Dietitian, including PN competent Dietitians managing patients in areas such as critical care or renal, are responsible for:**

- a) Assessment, ordering and (if a non-medical prescriber) prescribing PN on a rostered basis as part of LIFT, following completion of a competency training package as outlined in section 6.
- b) Assessing the patient's nutritional status, assessing appropriate route of nutritional support, calculating nutritional, fluid and electrolyte requirements, and formulating an appropriate parenteral nutrition regimen.
- c) Reviewing the patient and altering the plan of care and PN formulation as necessary.
- d) Overseeing the patient monitoring and evaluating the patient's conditions to ensure the optimal PN is ordered for the patient.
- e) Providing expert dietetic advice, support and clinical input on an individual patient basis to patients requiring artificial nutrition.
- f) Acting immediately and escalating to senior ward staff if the patient appears to show septic symptoms and becomes unwell.

#### **4.9 LIFT Pharmacist is responsible for:**

- a) Assessment, ordering and (if a non medical prescriber) prescribing PN on a rostered basis as part of LIFT, following completion of a competency training package as outlined in section 6.
- b) The assessment of concurrent medications and any potential effect on PN administration. The Pharmacist is responsible for professionally checking the Prescription chart in line with Pharmacy SOP 304
- c) Ensuring PN requests are processed and screened using the agreed out of hours tool. PN may not be dispensed unless sufficient information / expertise is evident to ensure patient safety (e.g. PN competent ward nurses).
- d) Prescribing associated medications such as line locks provided that they are qualified as non medical prescribers
- e) Offering advice on the most suitable replacement bag if the prescribed bag is unavailable or damaged.

#### 4.10 All Registered Nurses caring for patients receiving PN are responsible for:

- a) Individual nursing care of patients requiring PN.
- b) Ensuring that the care they provide to a patient receiving PN is in line with these policies and procedures and are appropriately trained as per section 6.
- c) Administering prescribed PN feed and associated medications as per the LIFT directions and prescriptions and as per this policy's instructions.
- d) Liaising with the Nutrition Nurse Specialists if there are problems or questions relating to the PN or CVAD or other relevant clinical concerns.
- e) Acting immediately if the patient appears to show septic symptoms and to follow the UHL Sepsis Pathway (B11/2014) utilising the PN Sepsis Protocol in Appendix 9.
- f) If a patient requires PN and the ward is not familiar / competent with the care of the PN patient, the nurse is responsible for escalating this as an incident to the senior nurses in the CMG.

4.11 **Student Nurses, Midwives, Nursing Associates and Health Care Assistants** are responsible for reporting any patient changes or problems with the patient receiving the PN or therapy itself to the Registered Nurse.

**Patients and/or informal carers may not provide inpatient PN or provide PN from home. Different equipment is used in the hospital environment.**

## 5. POLICY IMPLEMENTATION AND ASSOCIATED DOCUMENTS

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5.1. This policy is supported by the following procedures and information attached as appendices

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The policy is also supported by the following standard operating procedure

<b>SOP</b>	<b>Title</b>
703	<b>Process for ordering, receipt and dispensing of adult parenteral nutrition bags (March 2018, V1)</b>

## **6. EDUCATION AND TRAINING REQUIREMENTS**

- 6.1 Education and training to undertake PN procedures comprises a PN Training Day for Registered Nurses who must have already been assessed as IV medication competent. This can be booked on HELM.
- 6.2 Emphasis on full aseptic non-touch technique (ANTT) in line with EPIC 3 guidelines is vital in the management of reducing catheter related blood stream infection (CRBSI) / sepsis and training includes:
- a) Caring for the catheter site.
  - b) Changing the PN infusion daily as directed.
  - c) Monitoring, reporting and managing complications following line insertion, line maintenance and infusion of PN.
  - d) Assessing the physical needs of the patient in relation to PN.
- 6.3 All staff undertaking prescribing and ordering of PN in adults must do so in conjunction with appendix 2 and demonstrate completion of a competency training package, held by the Nutrition Support Team, Clinical Lead
- a. The wider pharmacy professional team who undertake dispensing must do this in line with the pharmacy/nutrition support team standard Operating Procedure and receive local departmental training.

## 7 PROCESS FOR MONITORING COMPLIANCE

### Key performance indicators / audit standards

Element to be monitored	Lead	Method	Frequency	Reporting arrangements
Response time to LIFT PN referrals	Clinical Lead, Nutrition Support Team	ICE analysis	Ongoing	Reported to CSI Nutrition & Dietetic Assurance Meeting
CRBSI for inpatients and home parenteral nutrition patients	Lead for Leicester Intestinal Failure Service	Prospective	Ongoing	Reported to UHL IF Nutrition MDT (also reported via IF Registry, NHSE requirement)
Number of PN competent Nursing staff	Lead Nutrition Nurse Specialist	HELM reports	Quarterly	Reported to UHL Nutrition & Hydration Committee
Review of clinical incidents	Clinical Lead, Nutrition Support Team	Datix	Quarterly	Reported to UHL Nutrition & Hydration Committee

## 8. EQUALITY IMPACT ASSESSMENT

8.1. The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriate to their needs.

8.2. As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

## 9. SUPPORTING REFERENCES, EVIDENCE BASE AND RELATED POLICIES

ALBRECHT et al (2004) Applied anatomy of the superior vena-cava- the carina as a landmark to guide central venous catheter placement. *British Journal of Anaesthesia* 92(1): 75-77

British Intestinal Failure Alliance Guidelines and Procedures [www.bapen.org.uk](http://www.bapen.org.uk)

HAMILTON (2000) Choosing the appropriate catheter for patients requiring Parenteral Nutrition. Total Parenteral Nutrition. A Practical Guide for Nurses. Edited by Helen Hamilton, Published by Churchill Livingstone.

LOVEDAY et al (2014) EPIC3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England. Journal of Hospital infection 86: s1-s170.

NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE (NICE) 2017. Nutrition support in adults: Oral nutrition support, enteral tube feeding & parenteral nutrition. [Viewed 20/10/2022]. Available from: <http://www.nice.org.uk/guidance/cg32>

NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE (NICE) 2014. Evidence update: Prevention and control of healthcare-associated infections in primary and community care [viewed 20/10/2022] available from [www.nice.org.uk/guidance/cg139](http://www.nice.org.uk/guidance/cg139)

ROYAL COLLEGE OF NURSING (2016) Standards of infusion therapy. 4<sup>TH</sup> Edition, London.

Related UHL policies and guidelines

Policy	Trust Reference
Central Venous Access Devices Policy	B13/2010
Infection prevention Policy	B4/2005
Trust Guideline for use of personal protective equipment	B9/2004
Intravenous Therapy Policy	B25/2010
UHL Policy on the Provision of a Homecare Medicines Service	B13/2019
Policy for Non Medical Prescribing	B18/2004

## **10. PROCESS FOR VERSION CONTROL, DOCUMENT ARCHIVING AND REVIEW**

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1. The updated version of the Policy will be uploaded and available through INsite Documents and the Trust's externally-accessible Freedom of Information publication scheme. It will be archived through the Trusts SharePoint system.
2. This Policy will be reviewed every three years or sooner in response to clinical risks /incidents identified.

## Introduction and Scope

This procedure details the referral process for a patient who requires consideration of parenteral nutrition (PN) via a central venous access device (CVAD) and management standards.

<b>1</b>	<p><b>Referral</b></p> <ul style="list-style-type: none"> <li>• All patients, outside of intensive care units, must be referred on ICE to the LIFT team, if Parenteral Nutrition (PN) is being considered, irrespective of whether the patient is previously known to the ward Dietitian.</li> <li>• The patient's primary consultant is responsible for identifying who may require PN. By referring the patient to LIFT they are confirming that the patient has a diagnosis of intestinal failure.</li> <li>• Full consideration must be given to the ethical issues related to the provision of artificial nutritional support. Placement of a CVAD and its subsequent use for PN is not without risk and must be in the best interest of the patient.</li> <li>• Whilst the patient is on PN, all concurrent nutritional support treatments (e.g. NG feeds) and dietary needs will be managed by the LIFT/specialist dietitians. On the cessation of PN, all patients will continue to receive dietetic input and be referred to the ward dietitian via ICE for on-going support, unless the patient has ongoing intestinal failure needs (such as a high output stoma, using definition in the High Output Stoma guidelines Trust Ref B12/2005).</li> </ul>
<b>2</b>	<p><b>Standards for Parenteral Nutrition for Type 1 Intestinal Failure (IF)</b></p> <p><b>Type 1 IF (Short term PN normally over 5 – 14 days until gastrointestinal function improves and oral/enteral nutrition can be reintroduced).</b></p> <ul style="list-style-type: none"> <li>• All inpatients will be triaged/assessed by at least one competent registered healthcare professional (LIFT or specialist dietitian) to assess appropriateness of PN prior to commencement of therapy. If the indication for PN is not clear, the patient will be discussed with the medical team and a consultant in gastroenterology, clinical nutrition and IF as required. In working hours Monday – Friday, the standard is that this initial triage will occur within 24hours of referral.</li> <li>• PN is commenced without delay within 24hours of decision making (if there is an appropriate CVAD). Monday to Friday, a standard PN bag can be ordered by LIFT for that day supply (before 1pm) if clinically appropriate. Outside of this time PN will not be supplied until the next day.</li> </ul>

	<ul style="list-style-type: none"> <li>• Out of hours supply of PN prior to LIFT triage/assessment/full MDT assessment is not recommended unless clinically urgent. An out of hours standard PN bag supply will be limited to weekend and bank holidays only and supplied daily if requested from pharmacy before 12noon for that days supply.</li> <li>• All inpatients will have a full individual nutritional assessment undertaken by LIFT/specialist dietitian at the start of PN and regular monitoring of nutritional status and review of nutritional requirements for PN throughout.</li> <li>• Nutrition specialist nurses (NSN) will lead on vascular access issues, nursing administration support and psychological/holistic patient needs. The NSN will liaise with LIFT gastroenterology, interventional radiology, vascular access, microbiology and infection prevention as required.</li> <li>• Consultant gastroenterologists/chemical pathologists/ will provide medical input for specific patients only as MDT discussion or ward based patient review. This will include those with complex biochemistry/acid-base problems, issues related to indication for PN, management of Intestinal Failure.</li> <li>• PN can only be given in areas where nursing staff are competency assessed to administer PN. The NSN will provide training on PN administration and catheter care and assess competency.</li> <li>• The NST will audit catheter related sepsis in all patients receiving PN, aiming for a rate of &lt;3/1000 catheter days led by NSN with medical support from consultant gastroenterologist and consultant microbiologist.</li> </ul>
3	<p><b>Standards for Parenteral Nutrition required in patients with Type 2 and 3 IF Inpatients (Prolonged Intestinal failure requiring PN for more than 28 days, which can be given at home if the patient is medically stable)</b></p> <ul style="list-style-type: none"> <li>• In-addition to the above, there will be dedicated LIFT medical input. A full Nutrition/Intestinal Failure MDT meeting will occur fortnightly and discuss <ul style="list-style-type: none"> <li>○ All patients progressing to Type 2 Intestinal Failure (requiring prolonged PN of more than 21days)</li> <li>○ Type 3 IF (HPN pre-discharge or if readmitted)</li> <li>○ Current HPN caseload with complications</li> <li>○ Any patient on PN with a potential catheter related blood stream infection.</li> <li>○ Identification of safe guarding issues which will then be escalated to the division head of nursing for CSI and the safeguarding team.</li> </ul> </li> <li>• LIFT MDT representation will be Medical Gastroenterology, Microbiology, Chemical Pathology, dedicated IF Dietitian, NSN, dedicated Pharmacist, liaising with the primary consultant medical team.</li> <li>• Patients with Type 2 and Type 3 Intestinal failure should be discussed with lead</li> </ul>



nutrition gastroenterologists, for consideration of transfer to the IF unit, unless their primary clinical history does not make this appropriate.

- Type 3 Intestinal Failure Patient on HPN readmitted with catheter related sepsis will be reassessed by a NSN to ensure compliance with UHL policy for administration of HPN.
- Outpatient full MDT review will be based on clinical need, occurring 1 -6 monthly. Virtual HISS clinics need to be set up to reflect telemedicine monitoring for these patient groups. Roles and responsibilities for specific areas are as follows
  - Issues related to the clinical Homecare Nursing Service, catheter management (NSN)
  - Issues related to the clinical nutritional assessment and review of HPN prescriptions (Dietitian)
  - Issues related to the medical management and issues regarding stability of formulations (Pharmacist)

All supported and led by the medical consultants.

- Outcome data for Type 2/3 IF may be reported to NHSE using the IF registry.
- CRBSI will be monitored and reported for Type 2 and Type 3 caseloads aiming for rates of <3/1000catheters days (Type 2) and <1/1000catheter days (Type 3).
- The lead for the NST will monitor and report on quality, governance and safety for this clinical group. HPN contract monitoring will be undertaken in conjunction with the UHL Homecare Pharmacy Team.

## Introduction and Scope

This procedure details the process for a prescribing and ordering parenteral nutrition (PN). Inpatient and Home PN is available as a standard multichamber bag with set amounts of constituents (nutrients, fluid and electrolytes) and tailored/bespoke PN where the amounts can be adjusted.

### Parenteral Nutrition Inpatient Prescription

1

- Parenteral Nutrition will be prescribed as part of the clinical review by LIFT or Specialist Dietitian. This can be a medic or a non-medical prescriber (NMP). Where a supplementary prescriber is working under a clinical management plan, the independent prescriber should be either a core member of the LIFT medical team or the patient's primary medical consultant.
- If there is not a prescriber available as part of the patient review, a specialist Dietitian or LIFT Nutrition Nurse Specialist or Dietitian can make suggestions based on a nutritional assessment to design and adjust the composition of a PN formulation, which is then prescribed if;
  - i. They are a qualified Nurse, Dietitian or Pharmacist with who has completed local training and is working towards or has approved competency and then has the trust extended scope role approved.
  - ii. They are professionally responsible for staying up to date within their subject and ensuring skills and competencies are maintained by regular ward rounds.
  - iii. They discuss the PN patient assessment with a member of LIFT or other PN competent specialist dietitian ie Critical Care NMP ACP.
  - iv. They discuss the suggested formulation with a prescriber who signs the PN prescription. The Dietitian, pharmacist or Nutrition Nurse should sign the prescription in the ordered by section to indicate to the dispensing pharmacist who should be contacted in case of a query. This is important especially in cases where the pharmacy copy of the PN prescription is saved electronically and then the ward copy is subsequently signed by the prescriber.
- The only PN that can be supplied without LIFT or Specialist Dietitian involvement is an out of hour's bag following the procedure in Appendix 2B.
- The LIFT or Speciality Dietitian will assess nutritional, fluid and electrolytes

	<p>requirements and determine what can be provided in the PN.</p> <ul style="list-style-type: none"> <li>• The Primary Consultants medical team retain overall responsibility for the management of fluid and electrolytes.</li> <li>• A member of medical staff or Non-Medical Prescriber (NMP) will prescribe the PN on the medication chart at the start of PN therapy. This may be paper or electronic as determined by local practice, and state; <ul style="list-style-type: none"> <li>○ Medicine: “Parenteral Nutrition”</li> <li>○ Route: “Intravenous via CVAD”</li> <li>○ Dose: OD over 24hours “APC”</li> </ul> </li> <li>• A separate PN prescription form will be completed by LIFT/Specialist Dietitian detailing the constituents of the daily PN.</li> </ul>
<p><b>2</b></p>	<p><b>PN Ordering Process</b></p> <ul style="list-style-type: none"> <li>• Where clinically appropriate standard multi-chamber bags will be used in preference to bespoke/ tailored PN based on an individual patient’s nutritional assessment.</li> <li>• All PN must be ordered to meet the contractual East Midlands Pharmacy Collaborative agreement for the supply of PN from a commercial aseptic compounding unit.</li> <li>• Standard Multi-chamber PN: <ul style="list-style-type: none"> <li>○ A range of standard bags are kept in stock for same day supply.</li> <li>○ Following a patient assessment, the most suitable standard bag will be prescribed. If the total volume to be infused needs to be less than the total volume in the bag the run rate will be adjusted to reflect this.</li> </ul> </li> <li>• Bespoke Tailored PN <ul style="list-style-type: none"> <li>○ A bespoke tailored PN bag can be ordered for next day supply.</li> <li>○ When ordering a bespoke tailored formulation, the PN provider stability matrix will be reviewed to ensure quantities of each constituent are within the minimal and maximum amount available. Any concerns should be discussed with the commercial aseptic compounding unit.</li> </ul> </li> </ul>
<p><b>3</b></p>	<p><b>PN Dispensing Process</b></p> <ul style="list-style-type: none"> <li>• The LIFT / Specialist Dietitian will inform the pharmacy department of the requirement to supply and dispense the PN. PN will be dispensed in accordance with Pharmacy SOP 703</li> </ul>

**4****Recommendations for Ordering, Prescribing and Adjusting PN Formulations  
Dosages for Adult PN**

- The following guide may be used when estimated nutritional requirements and formulating a PN bag prescription.
- Check the patient's allergy status to soya/egg/nut allergy (may require lipid free bags).
- The Summary for Product Characteristics (SPC found at [Home - electronic medicines compendium \(emc\)](#) for PN containing lipid states contraindicated in hypersensitivity to the active substances, to egg, peanut or soya protein but PN lipid emulsions do not contain peanuts. The lipid source and all other PN lipid sources contains soybean oil. There is a known risk for cross reactivity between individuals allergic to peanut protein and soya protein, but studies report a very low incident in patient consuming oral foods. As patient has already received soya bean oil from Propofol with no observed reaction, lipid can be given if it is confirmed with the patients' medical team and documented in the medical notes. If further advice is required, contact immunology.

**Fluid**

- Select a volume to best meet requirements considering if full or partial needs are to be met by the PN.

**Protein**

- Select a nitrogen source which best meets requirements.

**Calculate the required non-nitrogen energy:**

- Calculate the energy provided by the nitrogen source and minus this from total energy required (1g Nitrogen = 6.25g Protein = 25kcal).

**Lipid:**

- Aim to give <50% of the non-nitrogen energy needed as lipid aiming not to exceed 1.5g/kg/d (<1.0g/kg/d in HPN or some non lipid bags).

**Glucose:**

- Meet the remaining energy requirements with glucose (considering the fluid provided).
- Aim to provide 50-70% of the total non-nitrogen energy.
- Calculate glucose oxidation rate to avoid provision of excess glucose if patient has a low body weight <45kg (GOR 4-7mg/kg/min/day). When giving lipid free PN, caution must be given to increasing the glucose content to meet energy needs.

**Electrolytes**

- Select an amount to meet estimated requirements ensuring this is within the minimum and maximum stability requirements.

PN Constituent	Estimation of requirements: Baseline	Additional considerations	Acceptable Range for Adult PN
Fluid	Baseline 30-35 ml/kg	Less if renal impairment, fluid overloaded and/or PN only required to meet partial needs. More if significant additional losses such as a high stoma/fistula output	5 – 60ml/kg/d  Daily amounts: 1500ml – 3000ml daily (1000 – 1500ml may be required to renal patients)
Nitrogen*	0.1 – 0.3g N / day  Critical care 0.19-0.27 g N/kg/day	CVVH, large wounds, anabolic with need for repletion can have up to 0.4g N / day	0 – 0.4g/kg/d  Daily amounts:  7 – > 20g / day
Glucose*	< 70% non nitrogen kcal (NNkcal)	Non lipid bags may require more. Aim not to exceed 4mg/kg/min/day in catabolic patients	0 – 7mg/kg/d  Daily amounts: 300 – 1200kcal / day
Lipid*	0 – 50% non nitrogen kcal	Aim for <1g/kg/day for catabolic patients or those on PN > 21 days	0 – 2g/kg/d  Daily amounts: 0 – 1000kcal/day
Sodium	1 – 1.5mmol/kg	Estimate additional Na based on losses ie gastric secretions/jejunostomy may require 100mmol/litre	0 – 4mmol/kg/d  Daily amounts: 0 – 400mmol/day
Potassium	1 – 1.5mmol/kg	Less in renal impairment More in hypokalaemia	0 – 2*mmol/kg/d (if patient require more than 1.5mmol/kg/day (ideal body weight for patients with BMI > 30kg/m <sup>2</sup> ) this should be confirm and documented by medical staff before being prescribed by a NMP.  Daily amounts: 0 – 120mmol
Calcium	0.1 – 0.15mmol/kg	Less in hypercalcaemia More in hypocalcaemia	Daily amounts:0-12.5mmol/day
Phosphate	10mmol / 1000kcal or 0 - 0.5mmol/kg	Less in hyperphosphatemia / renal impairment More in hypophosphatemia or patients at risk of refeeding syndrome on initially PN	Daily amounts: 0 – 40mmol/day
Magnesium	0.1 – 0.2mmol/kg	Less in hypomagnesaemia More in hypomagnesaemia	Daily amounts: 0-20 mmol/day
Vitamins	RDA		1-2vials/day of a standard preparation daily (ie cernevit)
Trace Elements	RDA	Additional individual supplements may be possible if required ie Zinc, Se	1 -2vials/day of a standard preparation daily (ie additrac)

Acetate		The acetate content may need to be adjusted due to acid/base impairment. This should only be done on the advice of a nutrition Consultant or primary consultant team (ie in AITU)
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**5 Infusion rates**

The maximum infusion time for any PN bag is 24hrs. The minimum infusion time for any PN bag is 12hrs

**6 Making adjustments to the PN prescription based on monitoring**

Initial PN formulations will need to be altered to increase macronutrient provision to meet nutritional requirements, and the fluid and electrolyte content adjusted. It is important to look at trends in serum/urine electrolyte levels rather than base changes on single results.

Consideration must also be given to the possible causes for any disturbance and the overall clinical condition of the patient. For example low serum zinc may be present as a result of sepsis and low albumin levels, rather than a true nutritional deficiency.

There will be natural daily variation in electrolytes concentrations so it is important to establish at what level adjustments must be made to the PN regimen. Also, when interpreting blood results and adjusting PN regimens, consider the time lag between ordering PN and administration. If it is >12hours separate electrolyte infusions may be required.

PN Electrolyte adjustments (for patients with normal kidney function)

Electrolyte	Clinical significant adjustments	
	Multiples	Considerations if severe GI losses
Sodium	40mmol	Multiples of 50 - >100mmol
Potassium	20mmol	May need total >100mmol daily
Magnesium	5 – 10mmol	May need total >15mmoldaily
Phosphate	10mmol	-
Calcium	2.5 – 5mmol	-

**7 Altering the Rate of PN infusion**


- Any alteration to the prescribed rate of PN infusion is to be discussed with LIFT or Medical Staff. A patient may be unable to tolerate an increased rate in volume or contents.
- If an alteration is made to the infusion rate of the PN the prescriber must alter the patient’s prescription form. If LIFT or Speciality Dietitian is not available they should be informed at the earliest opportunity.

**8 Discontinuing the PN**

- This decision should be based on a detailed nutritional assessment, unless there is a clinical urgency to stop the infusion (such as suspected sepsis).

- Inform the LIFT/Speciality Dietitian as soon as possible. If the medical team decide to discontinue the PN over a weekend or bank holiday please inform pharmacy.
- PN is costly and wastage should be kept to a minimum.

### Example Clinical Management Plan for use by Supplementary Non Medical Prescribers

University Hospitals of Leicester   
**Appendix 3**

<b>Name of Patient:</b>		<b>Patient medication sensitivities/allergies:</b>	
<b>Patient identification e.g. ID number, date of birth:</b>			
<b>Independent Prescriber(s):</b>		<b>Supplementary Prescriber(s):</b>	
<b>Condition(s) to be treated:</b> Intestinal failure		<b>Aim of treatment:</b> Improve or maintain nutritional, fluid, electrolyte and micronutrient status	
<b>Medicines that may be prescribed by SP:</b>			
<b>Preparation:</b> <b>Nutrition &amp; Fluids</b>	<b>Indication:</b>	<b>Dose schedule:</b>	<b>Specific indications for referral back to the IP</b>
<b>Parenteral Nutrition (PN)</b> (amino acids, glucose, lipid emulsions, sodium, chloride, acetate, potassium, calcium, magnesium, phosphate, vitamin and trace element preparations)	Intestinal failure	<u>Dose for individual PN constituents</u>  Fluid: 5 – 75ml/kg/d Daily amounts: 1500ml – 4000ml daily (1000 – 1500ml may be required to renal patients)  Nitrogen: 0 – 0.4g/kg/d (Daily amounts: 7 – > 20g / day)  Glucose 0 – 7mg/kg/d (Daily amounts: 300 – 1200kcal / day)  Lipid 0 – 2g/kg/d (Daily amounts: 0 – 1000kcal/day)  Sodium 0 – 4mmol/kg/d (Daily amounts: 0 – 400mmol/day)  Potassium 0 – 2*mmol/kg/d (Daily amounts: 0 – 120mmol)  Calcium 0 – 0.2mmol/kg/d (Daily	Adverse effects or intolerance to PN  Any serious concerns regarding fluid, electrolyte, metabolic or liver complications  Chloride and Acetate adjustments due to acid-base balance: if patient requires a change this will be discussed with medical staff and documented before being prescribed by a NMP  *Potassium : if patient require more than 1.5mmol/kg/day (ideal body weight for patients with BMI > 30kg/m <sup>2</sup> ) this should be confirmed and documented by medical staff before

		<p>amounts:0- 12.5mmol/day)</p> <p>Phosphate 0 – 0.5mmol/kg/d (Daily amounts: 0 – 40mmol/day)</p> <p>Magnesium 0 – 0.2mmol/kg/d (Daily amounts: 0-20 mmol/day)</p> <p>Micronutrients: 1-2vials/day of a standard preparation daily (ie cernevit, additrace)</p> <p>1 -2vials/day of a standard preparation daily (ie additrace)</p>	<p>being prescribed by a NMP.</p> <p>Micronutrients: If a patient requires additional single supplements ie selenium this will be discussed with medical staff and documented before being prescribed by a NMP</p>
<p><b>IV fluids and electrolytes:</b> 0.9% sodium chloride, 5% dextrose with or without additional electrolytes such as magnesium sulphate</p> <p>Phosphate (IV) as phosphate polyfusor</p>		<p>1000 – 3000ml daily</p> <p>4 – 20mmol Magnesium daily in IV fluid</p> <p>5 – 40mmol Potassium daily in IV fluid</p> <p>25 – 50mmol Phosphate daily</p>	<p>Any serious concerns regarding fluid, electrolyte, metabolic</p>
<p><b>Oral Electrolytes</b> Phosphate: Magnesium:</p>		<p>16-32mmol phosphate Sandoz 8 – 20mmol daily as magnesium aspartate or magnesium glycerophosphate</p>	
<p><b>Micronutrients</b> (vitamin and trace element preparations): Forceval or generic micronutrient supplement, Pabrinex, Cernevit, Addivan, Nutratrain, NutrilYTE</p>		<p>1 capsule daily</p> <p>1 pair twice a day for 3 days</p> <p>1 vial (5 – 10ml) as per standard dose</p>	<p>Any concerns relating to micronutrient status.</p>
<p><b>Catheter Flushes or locks</b> IV: Taurolidine Citrate 4% (2ml) IV: 0.9% normal Saline (10ml)</p>	<p>Prevention of CVC infection</p>	<p>Taurolidine Citrate 4% (2ml) 0.9% normal Saline (10ml)</p>	<p>Any concerns relating to catheter e.g. catheter related bloodstream infection or patency.</p>
<p><b>Anti-secretory</b> Oral Proton pump inhibitors, H2 antagonists</p>	<p>Intestinal Failure</p>	<p>Lansoprazole 15-30mg bd Omeprazole 20-40mg od-bd Esomeprazole 20-40mg od-bd</p>	<p>Any serious concerns regarding fluid and electrolyte complications,</p>
<p><b>Anti-motility</b> Loperamide, codeine</p>	<p>Intestinal Failure</p>	<p>Loperamide 2mg qds increasing to a maximum of 12mg qds.</p>	<p>Any serious concerns regarding fluid and</p>



phosphate		Codeine 30mg qds to a maximum of 60mg qds	electrolyte complications, Renal impairment with eGFR < 50
<b>Oral Rehydration Solutions</b>		St Marks ORS 1000 - 2000ml daily or dioralyte 2 - 10 sachets daily	Any serious concerns regarding fluid and electrolyte complications, Renal impairment with eGFR < 50
<p><b>Guidelines or protocols supporting Clinical Management Plan:</b>  Parenteral and enteral nutrition group (PENG) handbook of the British Dietetic Association (BDA)  European Society of Parenteral and Enteral Nutrition (ESPEN) guidelines: Chronic intestinal failure in adults (2016) Clinical Nutrition, 35:247e307.  NICE guidelines on nutrition support in adults (2006) Clinical guideline 32. British Society of gastroenterology guidelines on the management of short bowel (2006)  <b>Current UHL policies:</b>  Management of Parenteral Nutrition via a Central Venous Access Device in Adults: Policy &amp; Procedures (Trust Ref B22/2015)  Clinical Guideline for the Nutrition and Dietetic Assessment and Management of Adult Inpatients' risk of Refeeding syndrome (Trust Ref C55/2015)  Adults with a High Output Stoma (HOS) Guideline A: 1200-1800ml/day B: &gt;1800ml/day (Trust Ref B12/2005)  UHL Adult Intravenous Medicine Administration Guide.</p> <p><b>BNF Section 9.3: Intravenous Nutrition:</b> All parenteral nutrition (PN) used at University Hospital of Leicester NHS Trust (including commercially available 'standard' multichamber bags and bespoke tailored compounded PN within the stability matrix.  INPATIENT PN: Specific products as per East Midlands Pharmacy Collaborative contract for supply of adult inpatient PN.  HOME PN: Products as per NHSE National Framework for supply of HPN Contract.</p>			
<b>Frequency of review and monitoring by:</b>			
<p><b>Supplementary prescriber:</b>  <b>Daily – twice weekly</b> (Monday to Friday) to maintain nutritional, fluid, electrolyte and micronutrient status the following parameters will be monitored: weight, biochemistry, fluid balance, temperature, urinalysis, capillary blood glucose, urine output sodium, oral food and fluid intake  <b>Monthly:</b> measurement of body composition including mid arm circumference, tricep skinfold thickness and mid arm muscle circumference plus handgrip strength for functional capacity</p>		<p><b>Supplementary prescriber and independent prescriber:</b>  The parameters mentioned in SP column plus the clinical progress of patient and plans for discharge (in patients)</p>	
<p><b>Process for reporting ADRs:</b></p> <ul style="list-style-type: none"> <li>• Notify independent medical prescriber</li> <li>• Documentation in patient's medical notes</li> <li>• If indicated, report via the MHRA Suspected Adverse Drug Reactions Yellow Card scheme</li> <li>• Complete the Trusts Datix form</li> </ul>			
<p><b>Shared record to be used by IP and SP:</b></p> <ul style="list-style-type: none"> <li>• To be filed in patient's medical notes</li> <li>• PN prescription to be kept on the ward in the patients nursing folder until completed and then file in patient's medical notes</li> <li>• Outpatient prescriptions, electronic unsigned copies kept on secure shared drive, signed originals sent to homecare provider, signed copies kept in LIFT, NST office</li> </ul>			

<b>Agreed by independent prescriber(s)</b>  Signature: Name:	<b>Date</b>	<b>Agreed by supplementary prescriber(s)</b>	<b>Date</b>	<b>Date agreed with patient/ carer</b>
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## Introduction and Scope

This procedure details the referral process for a patient who requires urgent “out of hours” supply of parenteral nutrition to commence PN when the LIFT or Speciality Dietitian is not available. It also covers urgent supply of a known PN patient whose current PN bag is no longer available or clinically suitable.

### **1 Definition of “Out of Hours” PN supply**

#### NEW REFERRALS TO COMMENCE PN

- “Out of hours” refers to weekend (Saturday, Sunday) and Bank holidays only. LIFT/Specialty Dietitians aim to assess patients within one working day so if the patient requires PN Monday – Friday this should be managed by them. If LIFT or Speciality Dietitian is not available to assess and prescribe PN during normal working hours (Monday to Friday) they will inform medical and pharmacy teams and, in these circumstances, out of hours supply and dispensing of PN can occur if urgent.
- There are two out of hour PN bags used in the trust, with separate guidance for patients on critical care units to other areas of the trust.

#### KNOWN PN PATIENTS WHOSE PREVIOUSLY ORDERED PN IS NO LONGER AVAILABLE OR SUITABLE

- Contact main site pharmacy department or on-call pharmacy if the PN bag to be infused that day is no longer available (for example missing or damaged (leaking, a non-homogenous appearance (cracked))). If an equivalent PN bag is available (Bespoke PN ordered for subsequent days or the same standard bag) this will be supplied. If only a non-equivalent standard bag is available the medical team will need to assess whether this is appropriate to meet the patient’s clinical needs, in comparison to the original prescription or withhold PN until further LIFT review.

#### Home PN patients readmitted to UHL

- A patient’s own HPN bag should not be bought into UHL to be administered. This is for several reasons.
  - a) To administer the HPN in UHL a valid prescription is required which will not be available out hours prior to LIFT review.
  - b) Homecare bags can differ in appearance and constituents when compared with a standard UHL PN bag.

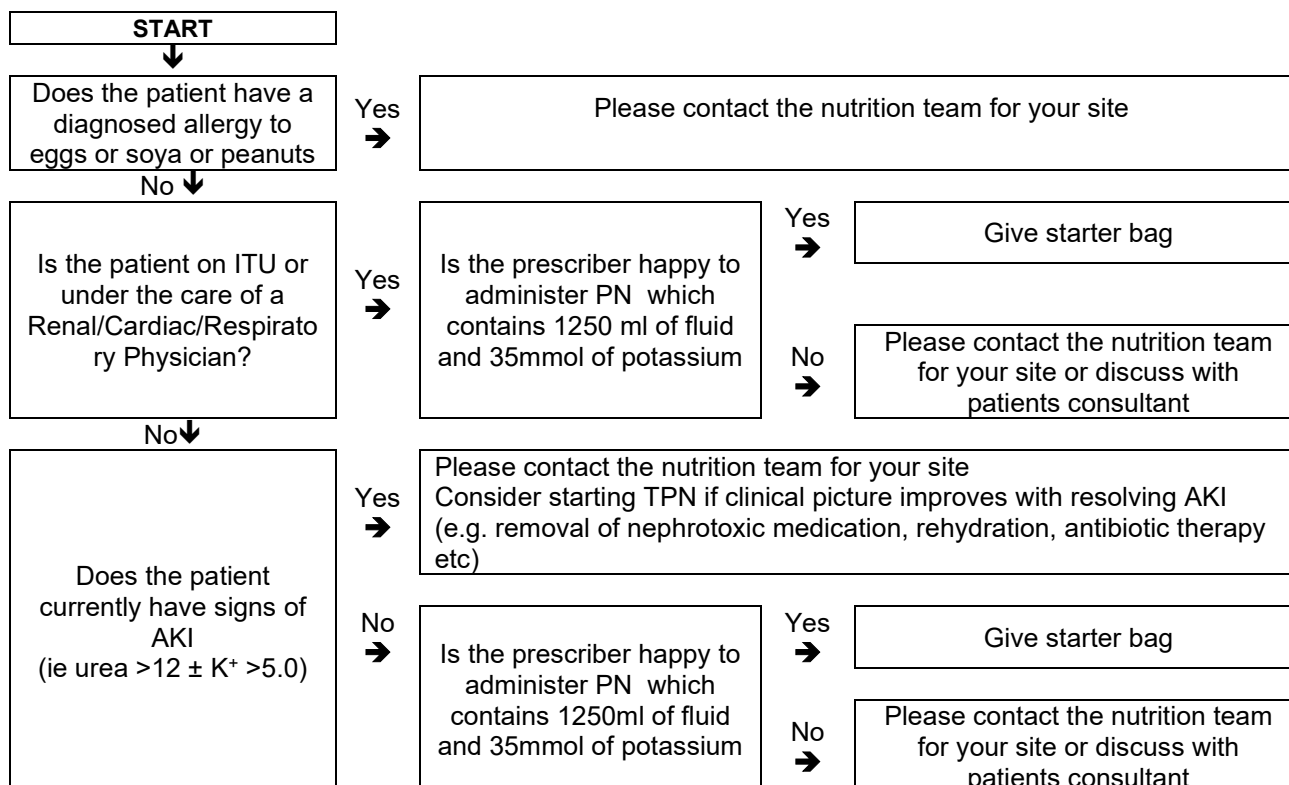
	<p>c) Home PN bags are transported under a strict quality controlled cold chain. Any breach of this (i.e. the patient transporting their own PN to hospital) breaks the cold chain and increases infection risk.</p> <ul style="list-style-type: none"> <li>• If the medical team wish to recommence PN in a HPN patient out of hours they should follow the procedure in section 2 and confirm that a standard PN bag meets the patient’s nutritional requirements and the patient is not being assessed for a potential catheter related sepsis.</li> <li>• On a rare occasion that a HPN patient is admitted with the HPN bag still running through a pump, this should be discontinued immediately by PN trained staff, and the pump and lead secured for return to the home care company/to patient.</li> </ul>
<b>2</b>	<p><b>Referral for “out of hours” PN</b></p> <ul style="list-style-type: none"> <li>• Complete the “out of hours” PN request form and contact pharmacy (main site department or on call pharmacist). PN will only be supplied on receipt of a fully completed request form, with all statements below acknowledge and with a signed prescription form.</li> <li>• A separate form must be completed for each day of PN required until the LIFT can order (Monday – Friday).</li> <li>• There is a separate “out of hours” request form for Adult Critical Care Use.</li> </ul>
<b>3</b>	<p><b>Onward referral to LIFT</b></p> <ul style="list-style-type: none"> <li>• All patients supplied an “out of hours” PN bag must be referred to LIFT/Speciality Dietitian at the time of making the pharmacy request.</li> <li>• Pharmacy should email the completed form to the LIFT team and add the patient details onto the dispensing PN handover as per the SOP.</li> </ul>

## Pharmacy Out Of Hours PN request form – NON AICU PATIENT LOCATION

**TPN will only be supplied on receipt of a fully completed request form, with all statements below acknowledged and a signed prescription form.  
Please contact your ward pharmacist or the on-call pharmacist before sending**

**Separate forms must be completed for each day of feed required**

Date parenteral nutrition required			
Patient's Name			
Consultant's Name			
S number		Date of birth	
Ward and Site		LRI / LGH / GGH (delete as appropriate)	
Brief notes of indication for TPN			
Doctor to review the patient's blood results and documented Urea and Potassium below. (Bloods must be within 24 hours of feed date)			
Serum Potassium Level		Date of result	
Serum Urea Level		Date of result	
<b>In order to establish verify the appropriateness of the starter bag the medical staff must follow the flow chart below</b>			



Please email completed form to LIFT

Statements to be confirmed by the medical team	
I confirm that any out of hours commencement of PN is critical to patients well being	Yes / No
I confirm that the patient has a dedicated central line for TPN and its position has been confirmed.	Yes / No
I have confirmed that the patient does not have a diagnosed egg, soya or peanut allergy	Yes / No
I confirm that the PN been prescribed on the regular part of the medication chart or ePMA chart	Yes / No
I am happy to use part of a LIPOFLEX Plus bag (Starter Bag) which has <b>35mmol</b> of potassium and has <b>1250mls</b> total fluid	Yes / No
I have requested for daily TPN 1 Blood set on ICE and I take responsibility for collecting samples if phlebotomy service is not available (TPN1 profile or U&Es, FBC, LFTs, Blood Glucose, Bone profile, Magnesium, Phosphate)	Yes / No
I confirm that this has been discussed with the patients consultant/registrar who has requested PN	Yes / No
Completed on behalf of :- (Registrar/Consultants Name)	
Signature: _____	
Print Name: _____ Grade (Specify) _____	
Date: _____ Bleep/Contact details: _____	
<b>Please contact LIFT (ext 6988) if you have any further questions</b>	

### Action for Doctor

The Doctor completing this form needs to arrange a medical signature to sign the out of hours prescription <u>Note the PN will only be supplied on receipt of a fully complete request form in pharmacy with all statements above acknowledged and a signed prescription form</u>
A copy of this request form and prescription must be filed in the patient's medical notes
Confirm receipt of forms in pharmacy if sending by fax

### Action for pharmacist

Give the request form and prescription to the requesting Doctor. (Copies of the form are on the H: drive)
Dispense the TPN bag once a signed prescription is received and send a copy of the TPN prescription to the Ward with the bag (a faxed or actual copy of both is acceptable)
Add the patient to the electronic PN dispensing handover
Store the completed Request Form in the TPN folder with the accompanying TPN prescription

Emailed to nutrition team by:	Date and time:
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## Introduction and Scope

The aim of this procedure is to set out the UHL requirements for biochemical monitoring of a patient receiving parenteral nutrition. This applies to the nurses and medical team responsible for caring for the patient receiving PN.

In order to optimise parenteral nutritional support, the following biochemical measures are necessary. Blood samples must be delivered to Chemical Pathology promptly on the day of request to enable the next day's feeding to be planned.

Blood Monitoring	Frequency	Rationale		Interpretation
(TPN 1 blood profile on ICE) U&E's Glucose LFT FBC Bone Profile Mg	Daily reducing to three times a week if stable	Sodium Potassium Urea Creatinine	Assessment of renal function, fluid status, Na and K status	Interpret with knowledge of fluid balance & medication. Urinary sodium may be helpful in complex cases with GI fluid loss.
Urine sodium B1, B2, B6, Vit A, Vit D, Beta Carotene selenium, zinc, Caeruloplasmin, Folate, Ferritin, and copper (TPN 2 and 3 profile on ICE)	As necessary and instructed by LIFT	Magnesium Phosphate	Depletion is common and under recognised. Refeeding syndrome can be Fatal.	Low concentrations indicate poor Status.
		LFT	Abnormalities common in Parenteral Nutrition	Complex. May be due to sepsis, other disease or malnutrition.
		Calcium, Albumin	Hypocalcaemia or hypercalcaemia may occur	Correct serum calcium for albumin level. HypoCa <sup>2+</sup> may be secondary to low Mg <sup>2+</sup> . Low albumin reflects disease not protein status.

# Guideline for daily cleaning, inspection and redressing the Parenteral Nutrition (PN) line insertion and exit site


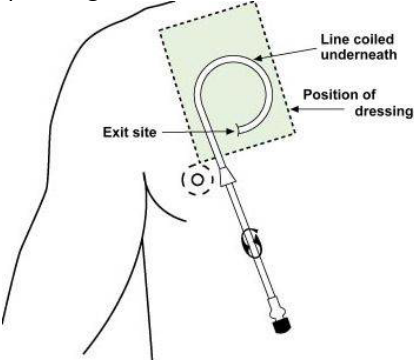

## Introduction and Scope

This procedure is for observation and replacement of the dressing and applies to nursing staff caring for PN patients.

The insertion and exit site of the PN line should be inspected daily as per UHL Vascular Access Policy and Care Bundle.

<b>1</b>	<p><b>Type of Dressing</b></p> <p>Use a semi-permeable transparent dressing which must be changed every 7 days or when-soiled or loose.</p> <p>Gauze based dressing must only be used:</p> <ul style="list-style-type: none"> <li>• If there is moisture and/or exudate</li> <li>• If clinical staff feel it is indicated after assessment. (HPN patient may request (usually due to sensitivity))</li> </ul> <p>Gauze type dressing should be changed daily.</p>
<b>Cleaning, inspection and Redressing</b>	
<b>2</b>	<p>Gather equipment:</p> <ul style="list-style-type: none"> <li>Dressing trolley</li> <li>Equipment cleaning wipes (i.e., Chlor-clean / Distell wipes) to clean the trolley</li> <li>Disposable apron</li> <li>Clean gloves</li> <li>Basic sterile dressing pack</li> <li>Alcohol hand rub</li> <li>Sterile gloves (if not already in dressing pack)</li> <li>2% Chlorhexidine gluconate in 70% isopropyl applicator</li> <li>Semi-permeable transparent or gauze dressing if indicated (large enough to allow line to be looped underneath)</li> <li>Microbiology wound swab if required. (If site dry, include sterile water to moisten swab)</li> </ul>
<b>3</b>	Explain the procedure to the patient, ensuring privacy and comfort.
<b>4</b>	Clean the trolley with Chlor-clean / Distell wipes.
<b>5</b>	Assemble equipment tidily, as above and place on bottom shelf of trolley / bedside 'work-surface'.
<b>6</b>	Clean hands. Put on apron.
<b>7</b>	Open dressing pack onto work surface, touching only outside and corners. This is now your aseptic field. Open all other sterile items onto aseptic field using aseptic non-touch technique.
<b>8</b>	Remove old dressing without touching the line or insertion / exit site. Inspect site for



	<p>sign of redness, tenderness, swelling or exudate. If it is a PICC line note the line marking, hold the line and peel the dressing upwards. Observe the external lumen of the catheter for kinks or damage. Ask patient, if there is any pain at the insertion / exit site or if they are experiencing any loss of function in their arm. Observe for swelling of the arm and neck.</p> <p>If exudate, swelling, and redness noted;</p> <ul style="list-style-type: none"> <li>• Stop PN immediately.</li> <li>• Refer to the medical team and Nutrition Nurses.</li> <li>• Swab the site before cleaning the skin.</li> </ul>
<p><b>9</b></p>	<p>If patient has a Hickman line check that the Dacron cuff on a Hickman line is <b>not visible</b>. Inform Nutrition Nurse Specialist and medical staff immediately if the cuff can be seen.</p>  <p><b>DO NOT USE THIS CENTRAL LINE</b></p>
<p><b>10</b></p>	<p>Clean hands with alcohol and put on Sterile gloves.</p>
<p><b>11</b></p>	<p>Decontaminate the exit site with a single use applicator of 2% Chlorhexidine gluconate in 70% isopropyl working away from the entry point. Allow to dry.</p>
<p><b>12</b></p>	<p>Please refer to vascular access policy/contact vascular access team regarding cleaning and securing device for PICC line.</p>
<p><b>13</b></p>	<p>Apply sterile dressing of choice with loop of Hickman Line underneath the dressing (to negate the need for further taping) using an aseptic non-touch technique.</p>   <p>PICC</p> <p>Hickman Line</p>
<p><b>14</b></p>	<p><b>Suture removal</b></p> <ul style="list-style-type: none"> <li>• If the patient has a tunnelled PN line the sutures at the incision site (the neck) may be removed after 7 – 10 days</li> </ul> <p>The suture at the exit site may be removed at 21 days at the earliest providing the cuff is not at risk of slipping out when these are removed (it is common to allow these to grow out to avoid unnecessary tension on the cuff).</p>
<p><b>15</b></p>	<p>The line marking in the PICC line should be noted at least once in a shift. If the line marking has moved more than 1 cm notify medical team.</p>

<b>16</b>	Remove gloves and dispose of used materials in to a clinical waste bag. Discard clinical waste bag per Trust Policy.
<b>17</b>	Clean the trolley with Chlor-clean/ Distell wipes. Return to storage.
<b>18</b>	Clean hands.
<b>19</b>	Note the date of the dressing change. All dressing changes must be recorded in TPN care plan.

## INTRODUCTION AND SCOPE

This procedure is used to change the PN feed bag. This applies to the nursing staff caring for a patient with PN.

Administration of PN bags should only be undertaken by staff who have completed PN training.

<b>1</b>	<p>Gather Equipment</p> <ul style="list-style-type: none"> <li>Dressing Trolley</li> <li>Equipment cleaning wipes (i.e., Chlor-clean / Distell wipes) to clean the trolley</li> <li>Disposable apron</li> <li>Alcohol hand rub</li> <li>Basic dressing pack</li> <li>Securing Tape (i.e., Micropore tape)</li> <li>Sterile gloves x1 pair</li> <li>2% Chlorhexidine gluconate in 70% alcohol wipe x4</li> <li>1 10ml prefilled 0.9% sodium chloride syringe ( PosiFlush acceptable if packaging is not damaged )</li> <li>PN order form</li> <li>Medication prescription</li> <li>PN bag (must be checked against prescription and order form)</li> <li>Giving set</li> <li>Sharps bin</li> <li>Cleaned charged volumetric infusion pump (on separate drip stand not attached to drip stand at bed head as this can pull out the central line)</li> </ul>
<b>2</b>	Check patients temperature prior to hanging PN to aid identification of feeding line sepsis.
<b>3</b>	Clean hands. Put on apron.
<b>4</b>	Clean the trolley with equipment cleaning wipes.
<b>5</b>	Assemble equipment tidily, as above and place on bottom shelf of trolley
<b>6</b>	Explain the procedure to the patient, ensuring privacy and comfort.
<b>7</b>	Two registered nurses must check the PN bag details against the order form, medication chart and patient wrist band at the patient's bedside. Also check the saline flush.
<b>8</b>	If previous bag still hanging, switch off pump and close roller clamp on giving set and remove from pump.
<b>9</b>	Hang PN bag (with light protection cover) on drip stand. Roll back light protective cover and expose bag connections. Snap off port cover.
<b>10</b>	Remove gauze from patient's feeding line and close clamp on vascular access device. Clean hands.
<b>11</b>	Open dressing pack onto top of dressing trolley, touching only the corners. If a sterile waste bag is included in the pack, this may be pulled over one hand and used as a sterile glove to set out the contents of the tray. When the aseptic field is set the

	waste bag should be attached half way down the trolley for the clinical waste. Open all sterile equipment onto aseptic field using aseptic no-touch technique (ANTT). Use two 2% Chlorhexidine gluconate in 70% alcohol wipe, clean the port of the PN bag for 30 seconds and leave to air dry.
12	PosiFlush may be added to the sterile field without cleaning if the packaging is intact
13	Open sterile gloves on a dry clean surface nearby – this should not be the aseptic field.
14	Clean hands by applying alcohol hand rub and put on one pair of sterile gloves without touching outside of them.
15	Pick up the new giving set on the aseptic field and close roller clamp space.
16	Wearing sterile gloves pick up giving set chamber leaving most of the line on the aseptic field and insert giving set to the bag using ANTT principles.
17	Prime the line by gravity and leave on the sterile field. (N.B. run fluid through to expel all air).
18	Remove the sterile towel from the pack and place near to patient's line.
19	Scrub the line and needle free port of the PN line for 30 seconds with 2% Chlorhexidine gluconate in 70% isopropyl wipe using different parts of the wipe, using a second wipe at the same time to clean the Hickman line and clip and PN line using different parts of the wipe (if attached).
20	Manoeuvre the sterile field under the line and then place the line onto it.
21	Remove first set of contaminated gloves and discard.
22	Clean hands by applying alcohol hand rub and put on second set of sterile gloves once hands dry.
23	Disconnect existing line from patient and discard.
24	Remove air bubbles from pre filled saline syringe.
25	Attach the 10 ml saline syringe to needle-free port and flush the line using a brisk push-pause technique – ie flush briskly, pausing briefly after injecting 1ml of fluid.
26	Connect to the primed feeding line to needle free port (firmly but not tightly).
27	The needle free device should be changed once a week.
28	Wrap a single layer of gauze around hub connection and secure with hypoallergenic tape with ends folded over.
29	Observe and change dressing as indicated in 'Guidelines for cleaning and re-dressing the catheter entry site'.
30	Insert the giving set into volumetric pump and close door. Set volume and rate of infusion as prescribed Open roller clamp and the clamp on the feeding line.
31	Discard waste as per UHL policy. Drain PN bag down sluice before discarding into yellow bag.
32	Clean the trolley with equipment cleaning wipe (ex; Chlor-clean/ Distell wipe) and return to storage.
33	Clean hands.
34	Document bag change on prescription / order form / Ward infusion pump check chart and record procedure in nursing notes and on fluid chart.

## Procedure for attaching / priming an extension set to a dedicated PN PICC line

This procedure is used to add / change a PICC line extension set used for the purpose of extending the PICC line and making the hub more accessible to those manipulating it.

### INPATIENT:

- This applies to all health care professionals caring for a patient with PICC line
- PICC extension sets with needle-less ports attached are changed daily in hospital.

### COMMUNITY;

- This applies to all health care professionals contracted to provide services to UHL caring for or teaching and assessing a patient with a PICC line.
- PICC extension sets and needle-less ports are changed once a week in the community by a company nurse.
- PICC line extension is to be placed over neck and taped to chest for community patients to manipulate hub safely

<b>1</b>	Gather equipment: Dressing trolley Equipment Cleaning wipe (i.e., Chlor-clean or Distell wipes) to clean the trolley Disposable apron Alcohol hand rub Basic sterile dressing pack including sterile towel Securing tape (i.e., Micro-pore tape) Sterile gloves 3 x 2% Chlorhexidine Gluconate in 70% alcohol wipes 10ml 0.9%NaCl pre filled syringe ( posi flush acceptable if outer packing is intact) 1x Extension set Needle free port for weekly change Tubigrip or similar product to protect extension set Sharps bin
<b>2</b>	Clean hands. Put on apron.
<b>3</b>	Clean the trolley with Chlor-clean / Distell wipes.
<b>4</b>	Assemble equipment and place on bottom shelf of trolley / bedside 'work-surface'.
<b>5</b>	Explain the procedure to the patient, ensuring privacy and comfort.
<b>6</b>	Clamp feeding line. If old bag still hanging, switch off pump and clamp the giving set (roller clamp) and line.
<b>7</b>	Clean hands by applying alcohol hand rub.
<b>8</b>	Open dressing pack onto top of dressing trolley, touching only the corners. If a sterile waste bag is included in the pack, this may be pulled over one hand and used as a sterile glove to set out the contents of the tray. When the aseptic field is set the waste bag should be attached half way down the trolley for the clinical waste. Open all sterile equipment onto aseptic field using aseptic non-touch technique (ANTT).
<b>9</b>	Check 0.9% Sodium Chloride prefilled syringe against prescription and leave it in the sterile field.
<b>10</b>	Open sterile gloves on a dry clean surface nearby – this should not be the aseptic

	field..
11	Expose end of the patient's PICC line and remove gauze flag and discard.
12	Clean hands by applying alcohol hand rub put on non sterile gloves.
13	Remove sterile towel from pack and place near to patient's line. Do not put the line onto it until it has been cleaned.
14	Scrub the hub and needle free port of the PN line for 30 seconds with 2% Chlorhexidine Gluconate in 70% alcohol wipe using different parts of the wipe, using a second wipe at the same time to clean the PICC line and clip and PN line (if attached).
15	Place the line on the sterile towel.
16	Remove gloves and discard. Clean hands by applying alcohol hand rub and put on sterile gloves.
17	Attach the needle free port to the new extension set and prime using the pre filled saline syringe. ( Do this on the sterile field of the dressing pack)
18	Check PICC clamp is closed. Disconnect old extension set and/or Needle free port from hub at the end of feeding line.
19	Connect extension set directly to PICC line using ANTT. <b>There should not be a Needle free port at this junction.</b>
20	Connect the primed extension set to the PICC and use the remaining saline to flush the PICC. The needle free port is at the working end of the PICC.
21	<b>Either:</b> Connect PN as per protocol or Wrap single layer of gauze around hub connection and secure with a tape (i.e., micro-pore) <b>with ends folded over.</b>
22	Replace tubigrip or similar over PICC line and extension to prevent displacement
23	Discard waste as per UHL policy.
24	Clean the trolley with equipment cleaning wipe (ex: Chlor-clean / Distell wipes) Return to storage.
25	Clean hands.
26	Document medication administration on prescription and record procedure in nursing notes.

## Introduction and Scope:

- This procedure is used to remove air from the giving set. This applies to the nursing staff caring for a patient with PN.
- Air in the giving set should not occur if the giving set chamber is half full and the giving set is primed slowly and correctly before connection on the bag change.

1	Gather equipment Dressing Trolley Equipment cleaning wipes (i.e., Chlor-clean / Distell wipe) to clean the trolley Disposable apron Alcohol hand rub Basic sterile dressing pack Securing tape(i.e., Micropore tape) Sterile gloves 2% Chlorhexidine gluconate in 70% alcohol wipe x3 Alcohol hand rub Sharps bin
2	Clean hands. Put on apron.
3	Clean the trolley with Chlor-clean / Distell wipes.
4	Assemble equipment tidily, as above and place on bottom shelf of trolley / bedside 'work-surface'.
5	Explain the procedure to the patient, ensuring privacy and comfort.
6	Switch off pump and close roller clamp on giving set and remove from pump
7	Open dressing pack onto top of dressing trolley, touching only the corners. If a sterile waste bag is included in the pack, this may be pulled over one hand and used as a sterile glove to set out the contents of the tray. When the aseptic field is set the waste bag should be attached half way down the trolley for the clinical waste. Open all sterile equipment onto aseptic field using aseptic no-touch technique (ANTT).
8	Expose end of the patient's feeding line and <b>close clamp on double thickness part of line</b> , remove gauze flag and discard.
9	Apply alcohol hand rub and wearing non sterile carefully remove sterile towel from pack and place near to patient's line.
10	Scrub the needle free port of the PN line for 30 seconds with 2% Chlorhexidine gluconate in 70% alcohol wipe using different parts of the wipe, using a second wipe at the same time to clean the Hickman line/PICC and clip and PN line
11	Place the line onto the sterile towel.
12	Disconnect the giving set from the needle-free port of the hickman/PICC and put it onto aseptic field.
13	Discard gloves and clean hands with alcohol rub.
14	Apply sterile gloves.
15	Prime the line. If bubbles present, manipulate giving set as taught run fluid through to expel all air.
16	Remove first set of contaminated gloves and discard. Put on second set of sterile

	gloves.
<b>17</b>	Pick up giving set from aseptic field and connect to feeding line (firmly but not tightly).
<b>18</b>	Wrap single layer of gauze around hub connection and secure with micropore tape <b>with ends folded over.</b>
<b>19</b>	Insert the giving set into volumetric pump and close door. Set volume and rate of infusion as indicated. Open roller clamp and the clamp on the feeding line if closed.
<b>20</b>	Discard waste as per UHL policy.
<b>21</b>	Clean the trolley with Chlor-clean / Distell wipes. Return to storage.
<b>22</b>	Clean hands.
<b>23</b>	Document procedure in nursing notes.



# Taking Blood Cultures from Parenteral Nutrition (PN) Catheter

**This procedure is used to remove blood for culture. This must be undertaken by TPN trained staff.**

1	Gather equipment Dressing Trolley Equipment cleaning wipes (ex: Chlor-clean / Distell wipes to clean the trolley) Disposable apron Alcohol hand rub Basic sterile dressing pack Securing tape (i.e., Micropore tape) Sterile gloves 5x 2% Chlorhexidine gluconate in 70% isopropyl alcohol wipe 10ml prefilled 0.9% NaCl syringe (posi flush acceptable if packing intact) 20ml luer-lock syringe. 2x green needles Blood culture bottle x2 (Aerobic and Anaerobic) Sharps bin
2	Clean hands with soap and water. Put on apron.
3	Clean the trolley with Chlor-clean / Distell wipes.
4	Assemble equipment tidily, as above and place on bottom shelf of trolley / bedside 'work-surface'.
5	Explain the procedure to the patient, ensuring privacy and comfort.
6	Switch off pump and close roller clamp on giving set and remove from pump.
7	Open dressing pack onto top of dressing trolley, touching only the corners. If a sterile waste bag is included in the pack, this may be pulled over one hand and used as a sterile glove to set out the contents of the tray. When the aseptic field is set the waste bag should be attached half way down the trolley for the clinical waste. Open all sterile equipment onto aseptic field using aseptic no-touch technique (ANTT).
8	Remove dust tops from blood culture bottles and scrub with 2% Chlorhexidine gluconate in 70% isopropyl wipe (one wipe per bottle) for 30 seconds using different parts of the wipe. Leave bottles next to sterile field.
9	Check 0.9% Sodium Chloride against prescription with another qualified nurse and add to the sterile field on the trolley.
10	Expose end of the patient's feeding line and <b>close clamp on double thickness part of line (only for Hickman line)</b> , remove gauze flag and discard.
11	Open x1 pair of sterile gloves on a dry clean surface nearby – this should not be the sterile field.
12	Clean hands with alcohol hand rub put on non sterile gloves.
13	Remove sterile towel from pack and place near to patient's line.
14	Scrub the hub and needle free port of the PN line for 30 seconds with 2% Chlorhexidine gluconate in 70% isopropyl alcohol wipe using different parts of the wipe, using a second wipe at the same time to clean the Hickman line and clip and PN line using different parts of the wipe (if attached).

15	Place the line onto the sterile towel.
16	Remove gloves and discard. Clean hands by applying alcohol hand rub and put on sterile gloves.
17	<p>Disconnect feeding line and discard. Withdraw 20ml of blood (which may include TPN solution) and place this on the sterile field - This will be the blood sent for culture and sensitivity.</p> <p>It may help if the patient</p> <ul style="list-style-type: none"> <li>• is sitting upright</li> <li>• has chin down</li> <li>• breathes in</li> <li>• arm over head</li> </ul>
18	Flush the catheter lumen using the prefilled saline syringe applying a brisk push-pause technique – ie flush briskly, pausing briefly after injecting 1ml of fluid.
19	<p><b>Either:</b></p> <p>Connect PN as per protocol</p> <p>or</p> <p>Wrap single layer of gauze around hub connection and secure with a tape (i.e., micro pore) <b>with ends folded over.</b></p>
20	Inject 5-10 ml blood into each bottle using a clean green needle for each.
21	Label bottles and microbiology form on ICE as "CVC / Hickman, Right/Left, feeding-line blood cultures".
22	Discard waste as per UHL policy.
23	Clean the trolley with Equipment cleaning wipes (i.e., Chlor-clean / Distell wipes). Return to storage.
24	Clean hands.
25	Document procedure in nursing notes.
26	Ensure that peripheral blood cultures are taken at the same time if following the line sepsis protocol.

This procedure is used to remove blood for chemical analysis therefore the first 10ml blood must be discarded. This applies to all health care professionals caring for a patient with PN.

1	<p>Gather equipment</p> <p>Dressing Trolley                      Equipment cleaning wipes (ex: Chlor-clean / Distell wipes) to clean the trolley                      Disposable apron                      Alcohol hand rub                      Basic sterile dressing pack including sterile towel                      Securing tape (ex: Micropore tape)                      Sterile gloves                      2% Chlorhexidine gluconate in 70% isopropyl alcohol wipes x5                      10 ml luer-lock syringe                      1x 10ml 0.9% sodium chloride prefilled syringe ( posi flush acceptable if packing intact)                      1x 20ml luer lock syringe                      Blood bottles (as needed for relevant tests)</p>
2	Clean hands. Put on apron.
3	Clean the trolley with equipment cleaning wipes (ex: Chlor-clean / Distell wipes).
4	Assemble equipment tidily, as above and place on bottom shelf of trolley / bedside 'work-surface'.
5	Explain the procedure to the patient, ensuring privacy and comfort.
6	Switch off pump and close roller clamp on giving set and remove from pump.
7	Open dressing pack onto top of dressing trolley, touching only the corners. If a sterile waste bag is included in the pack, this may be pulled over one hand and used as a sterile glove to set out the contents of the tray. When the aseptic field is set the waste bag should be attached half way down the trolley for the clinical waste. Open all sterile equipment onto aseptic field using aseptic no-touch technique (ANTT).
8	Open prefilled syringe onto sterile field.
9	Expose end of the patient's feeding line and <b>close clamp on double thickness part of line (only for Hickman line)</b> , remove gauze flag and discard.
10	Clean hands and apply alcohol hand rub put on non sterile gloves.
11	Remove sterile towel from pack and place near to patient's line.
12	Scrub the hub and needle free port of the PN line for 30 seconds with 2% Chlorhexidine gluconate in 70% alcohol wipe using different parts of the wipe, at the same time using a second wipe to clean the Hickman line and clip and PN line using different parts of the wipe (if attached).
13	Place the line down onto the sterile towel.
14	Remove gloves and discard. Clean hands by applying alcohol hand rub and put on sterile gloves .

15	Disconnect feeding line, withdraw 10ml blood in 10ml syringe and <b>discard</b> .
16	Withdraw further 20ml in 20ml syringe and place on sterile field. This will be the blood sent for chemical analysis, Haematology etc.
17	Flush with 10ml 0.9% Sodium Chloride. Ensure needle-free port is free from blood. Proceed with changing the PN bag or wrap single layer of gauze around hub connection and secure with hypoallergenic tape with ends folded over if the PN is no longer required.
18	Dispatch labelled bottles for chemical analysis to lab with request forms in transparent bag. *HIGH RISK specimens should be dealt with as per UHL Clinical Microbiology User Handbook .
19	Discard waste as per UHL policy.
20	Clean the trolley with Chlor-clean / Distell wipes. Return to storage.
21	Clean hands.
22	Document procedure in nursing notes.

# Sepsis protocol for management of suspected PN Catheter related blood stream infection

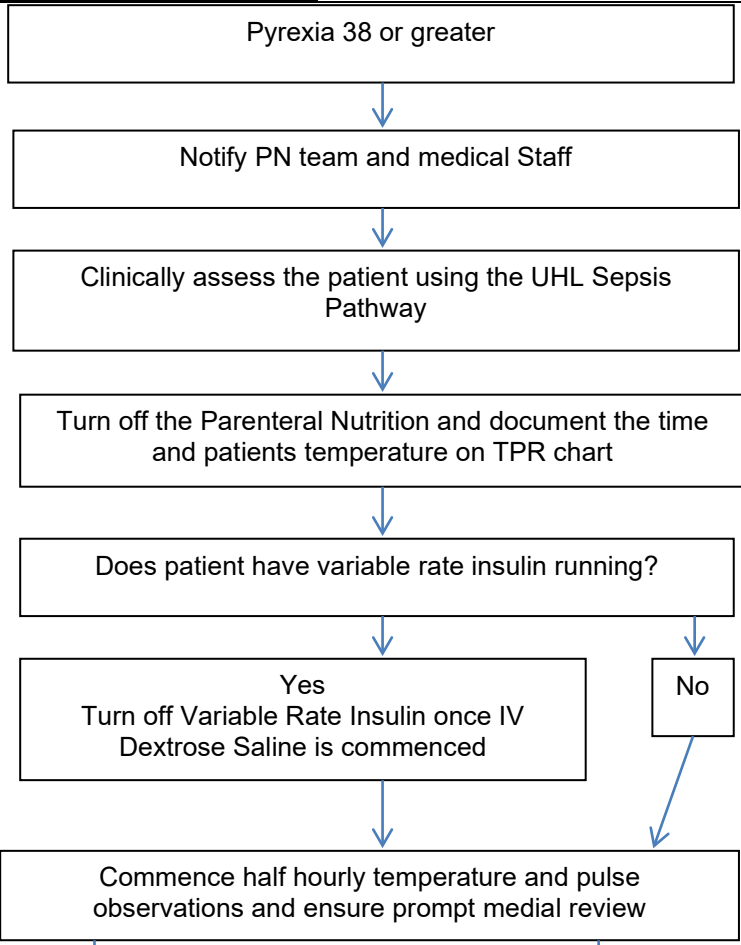
## Appendix 12

**Paracetamol** - This will artificially reduce the pyrexia and cool the patient masking the sepsis.

**Sepsis Six – actions to minimise the risk of escalating severe sepsis;**

- Oxygen
- Blood cultures
- Antibiotics
- Fluids
- Lactate and haemoglobin
- Insert catheter and monitor urine output

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**If temperature drops** within 40mins of PN stopping take PN Central line blood cultures - (See *Supplement 7; Taking blood cultures from feeding line*) **Peripheral blood cultures should be taken at the same time as the PN line culture.** Do not use the line until results are back.

**If temperature remains raised**

- Look for other foci of infection\*\*see below
- Consider Antibiotics
- Consider restarting PN bag as this has excluded line sepsis
- Routine culture at next bag change

**\*\*Undertake septic screen**  
MSU / CSU  
Sputum  
Wound swabs  
Other losses

Nursing and medical reassessment of patient temperature and clinical condition 30 min after feed stopped

**This established pathway is used to aid diagnosis of PN line sepsis. This applies to all Nursing and Medical staff responsible for caring for the patient receiving Parenteral Nutrition.**

# Complications of Central Venous Access Devices & Parenteral Nutrition



Complications related to central venous catheters, if left untreated, can become a medical emergency. Any complications, therefore, must be conveyed to the medical team immediately and their instructions followed promptly. The most commonly described complications associated with central line catheters and Parenteral Nutrition are as follows:

Complication	Signs and symptoms	Action
Pneumothorax	Usually associated with insertion of the central line. This is when air enters the pleural space between the pleural membranes that surround the lungs. The nurse must observe the patient for signs of respiratory distress, e.g. chest pain and/or breathlessness.	Needs urgent medical attention-If severe may need chest aspiration or chest drain insertion.
Haemorrhage	The catheter entry site must be observed for signs of bleeding following insertion of catheter and blood pressure monitored at regular intervals.	Pressure dressing over insertion site for 10 -15 min. or maybe the needless connector become dislodged or if the lumen is not clamped and left open to the air. The nurse must check all connections and security of the catheter on a regular basis.
Catheter related sepsis(CRS)	Monitor TPR. Catheter related sepsis results in systemic bacterial infection, as a result of poor aseptic technique, amongst other factors. It can be fatal if not treated.	<b>See Sepsis Protocol (Appendix 9 of the Adult PN policy)</b>
	The following infection screen is recommended:-	Peripheral blood cultures. Central line blood cultures. Sputum specimen. MSU / CSU. Output from fistulae / stomas / wounds.
Venous thrombosis	Patients face or arm becomes swollen. May occur because: <ul style="list-style-type: none"> <li>• Catheter tip is situated high in the vena cava or in the subclavian vein.</li> <li>• Solution infused has a very high osmolality.</li> <li>• There is a catheter-related sepsis.</li> </ul> patient is dehydrated	Diagnosis should be confirmed by ultrasound. Contact Vascular Access team.

<b>Complication</b>	<b>Signs and symptoms</b>	<b>Action</b>
Catheter occlusion	These can occur from debris, fibrin or lipids. The volume of fluid usually held by the catheter is 2 mls.	Try changing position of patient or elevate the arm, attempt a gentle flush with 5 ml of normal saline which may remove debris.
Fibrin	If line is sluggish or occluded.	Diagnosis should be confirmed by Venogram. Urokinase may be given however this will not remove the fibrin sheath but will break down any clots within the lumen. Contact Vascular Access team for advice.
Lipids	If line is sluggish or occluded.	Diagnosis should be confirmed by Venogram. 70% ethyl alcohol solution may be given. This should not be instilled as this may cause the line to deteriorate. Contact Vascular Access team for advice.
Air embolism	This can occur if the line becomes disconnected or breaks. If the patient becomes confused, restless and hypotensive then an air embolism should be considered.	In these circumstances the feed should be stopped, the line clamped above the break, the patient lain on their left side, and the foot of the bed elevated. The doctor should then be contacted urgently.
Air in the line	This may occur if the line is not primed sufficiently leaving air bubbles in the line.	See Appendix 8 above for removal of air from the PN line
Elevated liver enzymes. Fatty infiltration. Jaundice. Intra-hepatic Cholestasis.	Liver disease is less common if parenteral feeding is used without excess glucose calories and with MCT/LCT lipid.	Increase of LFT's may reduce when PN is stopped. ? remove Consider imaging to investigate biliary tree. Discuss with LIFT team.
Fluid balance	Parenteral Nutrition usage inevitably contributes to a significant fluid load and it is essential that fluid balance is monitored carefully in all patients receiving parenteral nutrition.	Care must be taken to include fluids from all other sources e.g. oral, enteral tube feeding, other intravenous fluids and or intravenous medication.
Hyperglycaemia/ Rebound hypo-glycaemia	Hyperglycaemia is common in diabetic patients and those with stress induced insulin resistance. It should be generally treated with insulin using a sliding scale.	All patients receiving parenteral nutrition should be monitored closely.

<b>Complication</b>	<b>Signs and symptoms</b>	<b>Action</b>
Deficiencies of electrolyte and trace elements	Parenteral Nutrition overrides many homeostatic mechanisms and presents a large osmolar load to the circulation. Rapid and serious derangement of biochemistry can occur including the Refeeding Syndrome (see UHL Refeeding Syndrome policy).	All patients receiving parenteral nutrition should be monitored closely ( Appendix 12)
Miscellaneous	<p>Haemothorax</p> <p>Hydrothorax</p> <p>Chylothorax</p> <p>Haemo-/hydropericardium and tamponade</p> <p>Arrhythmias</p> <p>Tracheal puncture</p> <p>Malposition of sub-clavian catheter in internal jugular vein</p> <p>Major venous thrombosis:</p> <p>Superior vena cava obstruction</p> <p>Axillary vein thrombosis</p> <p>Pulmonary embolus</p> <p>Right atrial thrombi</p> <p>Arterial puncture (carotid)</p> <p>Haematoma</p> <p>Nerve injury</p>	Seek specialist advice as appropriate.





When fluids are not being infused through the vascular access device because the PN is running less than 24 hours, the following procedure for flushing the line will need to be followed.

When a line is not used frequently it will need to be flushed with 10ml of 0.9% sodium chloride weekly via the needle free port.

<b>1</b>	<p>Gather Equipment</p> <ul style="list-style-type: none"> <li>Dressing Trolley</li> <li>Equipment cleaning wipes(i.e., Chlor-clean / Distell wipes) to clean the trolley</li> <li>Disposable apron</li> <li>Alcohol hand rub</li> <li>Basic sterile dressing pack</li> <li>Securing Tape (i.e., Micropore tape)</li> <li>Sterile gloves</li> <li>2% Chlorhexidine gluconate in 70% isopropyl alcohol wipe x3</li> <li>1x10 ml 0.9% Sodium Chloride prefilled syringe (posi flush is acceptable if packaging intact)</li> <li>Alcohol hand rub</li> <li>Transparent / Gauze dressing if required (large enough to allow line to be looped underneath for Hickman line)</li> <li>Sharps bin</li> </ul>
<b>2</b>	Clean hands. Put on apron.
<b>3</b>	Clean the trolley with equipment cleaning wipes.
<b>4</b>	Assemble equipment tidily, as above and place on bottom shelf of trolley
<b>5</b>	Explain the procedure to the patient, ensuring privacy and comfort.
<b>6</b>	If previous bag still hanging, switch off pump and close roller clamp on giving set and remove from pump.
<b>7</b>	Remove gauze from patient's feeding line and <b>close clamp on double thickness part of line</b> , remove gauze flag and discard.
<b>8</b>	Open dressing pack onto top of dressing trolley, touching only the corners. If a sterile waste bag is included in the pack, this may be pulled over one hand and used as a sterile glove to set out the contents of the tray. When the aseptic field is set the waste bag should be attached half way down the trolley for the clinical waste. Open all sterile equipment onto aseptic field using aseptic no-touch technique (ANTT).
<b>9</b>	Check 0.9% Sodium Chloride against prescription with another registered nurse and open onto the sterile field.
<b>10</b>	Open sterile gloves on a dry clean surface nearby – this should not be the aseptic field.
<b>11</b>	Clean hands by applying alcohol hand rub and put on non sterile gloves.
<b>12</b>	Remove the sterile towel from the pack and place near to patient's line.
<b>13</b>	Scrub the hub and needle-less port of the PN line for 30 seconds with 2%

	Chlorhexidine gluconate in 70% isopropyl alcohol wipe using different parts of the wipe, using a second wipe at the same time to clean the Hickman line and clip and PN line using different parts of the wipe (if still connected to PN).
<b>14</b>	Place the cleaned the line onto the sterile towel.
<b>15</b>	Remove contaminated gloves and discard. Clean hands by applying alcohol hand rub and put on sterile gloves once hands dry.
<b>16</b>	Remove air bubbles from saline syringe.
<b>17</b>	Disconnect PN line from vascular access and discard (take Blood culture if suspecting line sepsis-follow appendix 9)
<b>18</b>	Attach the 10 ml syringe to Needle-less port and flush the line with 09% Sodium Chloride using a brisk push-pause technique – i.e flush briskly, pausing briefly after injecting 1ml of fluid
<b>19</b>	Wrap single layer of gauze around Needle-less port and secure with hypoallergenic tape with ends folded over.
<b>20</b>	Discard waste as per UHL policy.
<b>21</b>	Clean the trolley with equipment cleaning wipe (ex; Chlor-clean/ Distell wipe) and return to storage.
<b>22</b>	Clean hands.

	<b>Rationale</b>	<b>Frequency</b>	<b>Action</b>
<b>Fluid balance</b>	To monitor hydration.	Constantly.	Measure daily input / output. Observe for thirst, lethargy, low urine output, ankle oedema / postural hypotension or breathlessness.
<b>Weight</b>	To monitor hydration state and effects of feeding.	Twice weekly.	Weigh twice weekly in MUST Tool (in similar clothing, at same time of day, on same scales). Record weight.
<b>Blood Sugar</b>	To ensure patient tolerates glucose load of feed.	4 hourly for first 72 hours then twice daily if STABLE.	BM 4 hourly for first 72 hours. If patient stable, reduce frequency. Consider referral to inpatient Diabetes team if BM > 12 mmols consistently.
<b>Temperature, pulse and respiration</b>	To detect signs of infection / line malposition. (Tachyarrhythmia may suggest line malposition).	4 hourly.	Monitor 4 hourly whilst on PN
<b>Line entry and dressing sites</b>	To detect signs of localised infection. (warmth, redness, tenderness, exudate and swelling).	Observe catheter entry / exit site daily.	Observe site/s daily for discharge. Review as part of full clinical condition review.
<b>Biochemical</b>	To monitor fluid and electrolyte balance, clinical condition and nutritional state.	Daily to twice weekly	U&E's, LFT's, Bone, Glucose, Mg, FBC, trace elements, and random urine as required.

**Introduction and Scope:**

- This procedure is used to lock the PN vascular access device with Taurolock®. This applies to all health care professionals caring for a patient with PN via Hickman / PICC / Portacath / CVC.
- Taurolock® is a derivative of the amino acid taurine, has been used as an antimicrobial in preventing local and systematic infections. The taurolidine is mixed with 4% citrate is marketed in the UK as a medical device however it should be prescribed on the medication chart and for practical purposes standard UHL policy for IV medication administration will apply.

1	Gather equipment: Dressing trolley Equipment cleaning wipes (i.e., Chlor-clean / Distell wipes ) to clean the trolley Disposable apron Alcohol hand rub Basic sterile dressing pack Securing tape (i.e., Micropore tape) Sterile gloves (if not in pack) 4x 2% Chlorhexidine Gluconate in 70% isopropyl alcohol wipe 1x 5ml luer-lock syringe 1x Pink blunt-fill needle 1x 10ml 0.9% Sodium Chloride prefilled syringe. (Posi flush is acceptable if packaging intact) 1xTaurolidine with Citrate 4% - 5 ml amp (Taurolock®). Medication prescription chart Sharps bin Clinical waste bag
2	Clean hands. Put on apron.
3	Clean the trolley with equipment cleaning wipes and wait to dry.
4	Assemble equipment tidily, as above and place on bottom shelf of trolley / bedside 'work-surface'.
5	Explain the procedure to the patient, ensuring privacy and comfort.
6	Clamp feeding line. If old bag still hanging, switch off pump and clamp giving set (roller clamp).
7	Clean hands with Alcohol rub.
8	Open dressing pack onto top of dressing trolley, touching only the corners. If a sterile waste bag is included in the pack, this may be pulled over one hand and used as a sterile glove to set out the contents of the tray. When the aseptic field is set the waste bag should be attached half way down the trolley for the clinical waste. Open all sterile equipment onto aseptic field using aseptic non-touch technique (ANTT).
9	Check 0.9% Sodium Chloride prefilled syringe against prescription with another qualified nurse and open onto the sterile field.

10	<b>In Hospital</b> – Check Taurolidine Citrate 4% ampoule against prescription with another qualified nurse. <b>Homecare nurses</b> – Check Taurolidine Citrate 4% prefilled syringe against prescription.
11	Scrub vial for 30 seconds with 2 x 2% Chlorhexidine Gluconate in 70% isopropyl alcohol wipes using different parts of the wipe and place on aseptic field.
12	Expose end of the patient's feeding line and <b>close clamp on double thickness part of line</b> , remove gauze flag and discard.
13	Clean hands and put on non sterile gloves.
14	Remove sterile towel from pack and place near to the patient's line.
15	Scrub the hub and needle free port of the PN line for 30 seconds with 2% Chlorhexidine Gluconate in 70% alcohol wipe using different parts of the wipe, using a second wipe at the same time to clean the Hickman line and clip and PN line (if attached).
16	Place the sterile field under the line.
17	Remove gloves and discard. Clean hands by applying alcohol hand rub and put on sterile gloves .
18	Pink blunt-fill needles are required if using glass ampoules - pick up and connect syringe to needle, insert into Taurolidine Citrate 4%, draw up a quantity sufficient to fill the lumen completely of vascular access device. This is usually being between 1ml to 1.5ml. <b>(Consult the manufacturer's instructions for the specific fill volume).</b>
19	Remove air bubbles from syringe and leave on the sterile field.
20	Check Hickman line / CVC clamp is closed, disconnect old line from needle free port at the end of feeding line.
21	Connect the saline syringe to central line hub and flush.
23	Connect the taurolock filled syringe to the needle free port and infuse the exact amount to fill the vascular access device only. Discard syringe.
24	Wrap single layer of gauze around hub connection and secure with micropore tape <b>with ends folded over.</b>
25	Dispose of waste as per UHL policy.
26	Clean the trolley with Chlor-clean / Distell wipes. Return to storage.
27	Clean hands.
28	Document medication administration on prescription and record procedure in nursing notes.
29	Before the catheter is used next time the Taurolock should be aspirated removed from the catheter and discarded. In the event aspiration is not possible the procedures can continue without the removal of the taurolock.

