PARENTERAL NUTRITION SUPPORT POLICY FOR ADULTS
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1. Introduction

This document has been designed to assist staff in their assessment, selection, implementation and monitoring of patients receiving Parenteral Nutrition (P.N.).

This policy only applies to adults.

All acute hospital trusts should have a multidisciplinary Nutrition Support Team (NICE 2006). Where a fully operational Nutrition Team is in place, reduced PN related complications, morbidity, improved nutrient intake and clinical outcomes in addition to reduced length of stay, has been demonstrated (BAPEN 1994).

This document is intended to be a working document to help achieve these goals, and by standardizing practice, facilitate the audit process.

Feedback on this document is encouraged. Please direct comments to the Nutrition Team.

2. Acknowledgements

Management of Refeeding Syndrome document produced by Lindsay Watkins (Senior Dietitian).

The PN Policy is based on similar documents available in the Oxford Radcliffe Hospitals NHS Trust, Royal Free and Portsmouth Hospitals NHS Trust.
3. Definition

Parenteral nutrition (PN or TPN)
PN involves the provision of patients' nutrition by intravenous administration with an artificially prepared solution. PN is required when the intestine is unavailable or the intestinal function is insufficient to digest or absorb an adequate supply of nutrients. PN does not utilise the gastro-intestinal tract and therefore removes an important physiological and immunological barrier. This may therefore expose the patient to an increased risk of metabolic and septic complications. PN can provide the full range of macronutrients: ie protein, fat, carbohydrate, and micronutrients: ie vitamins, minerals and trace elements, and fluid that the patient requires (TPN or Total Parenteral Nutrition) or it can provide partial nutrition in addition to enteral and/or oral nutrition.

Enteral Nutrition (EN)
Enteral nutrition can be defined as the provision of nutrition including macronutrient and micronutrients, sufficient to meet the patients’ expected nutritional requirements, via the gastro-intestinal tract. EN can be both oral and/or administered via feeding tubes (nasogastric, gastrostomy, naso-jejunal, jejunostomy).

Nutrition Team
The Nutrition Team is a team of health professionals supervising the care for patients with nutritional problems. This multidisciplinary approach utilises the skills and training of the individuals and professionals involved, to provide optimal nutrition support for these patients.

The Nutrition Team will undertake ward rounds to review patients referred for or receiving PN. Members of the Nutrition Team can be consulted individually regarding nutrition support of patients on PN, who in turn will discuss issues with the Team.

4. Duties and Responsibilities

The Primary Medical or Surgical Team
The Consultant for the referring team maintains ownership of the patient. The patient is initially referred to the nutrition team dietitian (bleep 518) or gastroenterology registrar (bleep 636) using the Trust PN referral form. The nutrition team dietitian will then assess the patient and their nutritional requirements.

The primary clinicians will liaise with the IV Access Nurse to request a PICC line if no dedicated central venous catheter is available for PN administration. All patients requiring P.N. should be referred to the Nutrition Team prior to an insertion of a feeding line. If the patient is likely to require P.N. post operatively, this should be discussed with the Nutrition Team prior to surgery, with line insertion during theatre.

For the duration of PN administration, the primary clinicians are responsible for:
- Arranging collection of blood and urine samples (if required) as advised by the Nutrition Team. See appendix 1 for blood test monitoring guidance, appendix 2 for blood test flow chart and section 9 for Management of suspected line sepsis.
- Keeping the Nutrition Team informed and discussing continuing patient management.
Clinicians on the Nutrition Team

These are the Consultants/Registrars with an interest and expertise in nutrition, especially artificial feeding and clinical nutrition. They lead the Nutrition Ward Round and provide clinical input into the decisions relating to nutrition.

Dietitian

The Dietitian is responsible for assessing the patient’s nutritional status and estimating appropriate nutrition requirements **within 24 hours of referral (Monday to Friday)**. They will advise on the appropriateness of PN and any alternative enteral routes, consulting medical staff within the primary referring team and the Nutrition Team as appropriate. The dietitian will:

- Select an appropriate feeding regimen and will liaise with the ward Pharmacist or designated PN pharmacist regarding the regimen required.
- Consult with the Nutrition Team as appropriate and review the patient, to ensure optimal nutrition is maintained throughout according to the patient’s clinical status.

Pharmacist

The ward or PN Pharmacist will liaise with the dietitian if they receive the request for a PN regimen initially, and consult the dietitian regarding an appropriate PN regimen **within 24 hours of receipt of the request (Monday to Friday)**. They will liaise with the primary clinicians to request a prescription for the PN regimen and consult with the Nutrition Team.

IV Nurse Specialist

The IV Therapy Nurse will receive requests if a PICC line is required for the provision of PN. They will assess the patient for suitability and insert a single or dual lumen PICC line if possible/feasible within 24 hours of receipt of the request. They will recommend a multi-lumen line if other IV access is required in addition to PN, or the PN regimen is not going to provide adequate fluid and additional IV fluids will be needed. The Intravenous Nurse Specialist will provide support and training for the ward nursing and medical staff caring and managing the PICC.

Clinical Nutrition Nurse Specialist

The CNNS is part of the Nutrition Team, responsible for the assessment of the patients requiring PN. They give advice on safe and appropriate nutrition support including both parenteral and enteral feeding. They are responsible for providing education for hospital staff and community nurses on intravenous administration, care of lines, administration of feed, education and support of patients and carers. They assess the catheter site and coordinate the provision of PN alongside the dietitian and pharmacist, and other members of the nutrition team, as required. The CNNS will troubleshoot any line-related problems, ie a suspected line infection, take/authorise blood samples for culture, liaising with the IV therapy nurse and/or Consultant as required.

The Ward Nursing Staff

Registered nurses only, having undertaken relevant intravenous administration training, can be involved in setting up PN. They are responsible for the line management and administration of the PN according to the prescription and the IV fluid charts. They should undertake patient observations, alerting members of the primary medical or surgical team, and members of the NT as appropriate, to any adverse observations.
For observations guidance, please see Appendix 6.

4.1 Contact details for the Nutrition Team

Dietitian: Bleep 518
Gastroenterology SpR: Bleep 636
Pharmacist: Bleep 213
IV Therapy Nurse: Bleep 296
Nutrition Nurse: Ext 6402, bleep 515
Consultant Gastroenterologist: Ext 6781
Consultant GI Surgeon: Ext 1748

Nutrition Team Round is on Tuesday at 11.00 hours.

5. Indications for Parenteral Nutrition

P.N. is an invasive form of nutrition support and in inexperienced hands can be associated with risks from line placement, line infections, thrombosis, and metabolic disturbances. Careful consideration is required, therefore, when deciding for whom, when and how this form of nutrition support should be provided. Whenever possible, patients should be aware of why this form of nutrition support is required along with its potential benefits and risks. P.N. should only be used when it is not possible to meet nutritional requirements using the enteral route alone. Patients should only be considered for P.N. if it is thought that enteral feeding would not be established for ≥ 5 days.

Intraoperative placement of nasojejunal tubes or surgical jejunostomies should be considered in patients where it is envisaged that nasogastric feeding may fail or whereby postoperative insertion of enteral feeding tubes may be problematic.

P.N. may be useful for, but not limited to the following conditions:

- Gastrointestinal Fistulae.
- Post operative ileus, if unresponsive to motility agents by the fifth day and jejunal feeding is contraindicated.
- Short Bowel Syndrome (small intestine < 200cm, before compensatory adaptation is employed).
- Severe pancreatitis, if jejunal feeding is not tolerated.
- Multi organ failure.
- Inflammatory Bowel Disease.
- Patients with mucositis subsequent to chemotherapy.
- Radiation Enteritis

The duration of P.N. in most conditions is dependent upon the return of normal intestinal function. Provision of P.N. for less than 5 days is usually not clinically indicated as the risks
far outweigh the benefits. It is accepted, however, that on occasion this will occur as a result of early identification and intervention in particular ‘at-risk’ patients.

Long term P.N. may be required for patients with the following conditions:

- Extreme short bowel syndrome of any aetiology.
- Prolonged intestinal failure (atresia, radiation enteritis, some inflammatory or motility disorders).

5.1 PN provision out of hours

P.N. will not be available out of hours (evenings and weekends), as malnutrition is the culmination of a gradual process and should not be considered as an ‘emergency’. The use of P.N. in inexperienced hands is associated with many potential risks (NICE, 2006). P.N. prescription outside of Nutrition Team involvement may, in fact, increase the risks of complications, including sepsis and metabolic disturbances and, in particular, Refeeding Syndrome – see section 14.

Special provisions are made for Critical Care Unit (ICU/HDU) for PN use over the weekend. Standardized N4-550E (N 9gm) bags will be available to be run at a fixed rate of 30ml/hr. The Out Of Hours PN audit form (see appendix 13) must be completed for each patient initiated on PN over the weekend.

6. Referring for Parenteral Nutrition

If a decision has been made that the patient needs to be referred for PN then the referring team are to complete the PN referral form

(See appendix 3 for PN referral form)

- Bleep the Dietitian on bleep 518 to notify of the referral or contact the Dietetic Dept on extension 6134.
- The referral is to be left attached to the medical notes.
- The patient will be seen within 24 hours of referral.
- The Dietitian will collect the referral form.
- Once the Dietitian has assessed the patient, a PN assessment form will be completed and left in the patient’s medical notes.

(See appendix 4 for PN initial assessment form)

- The Dietitian will advise on an appropriate PN regimen. This will be written on the PN prescription chart.

(See appendix 5 for PN prescription chart)

- The PN prescription chart will need to be signed for by a doctor from the managing team or a doctor as part of the nutrition team.
- The prescription chart will then need to be sent to pharmacy. Pharmacy will dispense the PN regimen once the completed signed prescription chart has been received.
- The Dietitian will notify pharmacy of the patients on PN that have been assessed so that they can crosscheck prescription charts with Dietitians list of patients.
- To ensure PN is available for patients already receiving PN therapy over weekends, 3 bags will need to be prescribed and ordered on a Friday, or in the event of a bank
holiday weekend then sufficient feed will be prescribed and ordered to cover the
time period.
- **All referrals for PN need to be received by 12.00pm on a Friday.**

It is imperative that the managing team consider nutritional management as part of a
patients overall care plan from day 1 to ensure timely referrals. If a patient is likely to
require PN then it is better to refer early for nutritional assessment and not wait until Friday
afternoon to refer.

It is recommended that patients on PN are nursed on wards with experience in the
administration of PN, ie gastroenterology or Upper GI/colorectal surgery wards, unless this
is not feasible for clinical reasons.

7. **Routes of administration of P.N.**

P.N. should be administered centrally through a dedicated feeding line/lumen. This
dedicated line/lumen **should not** be used for other infusions, injections or blood sampling,
even if the patient is difficult to get blood from.

**Central line**
A central venous access device (CVAD) is defined as a catheter which has its tip located
in the distal third of the superior vena cava (SVC) superior to the right atrium (Albrecht *et al*, 2004).
CVADS can be categorized into three groups:
- Acute non-tunneled catheters.
- Tunneled catheters with an anchoring cuff (Groshong or Hickman).
- Peripherally Inserted Central Catheters (PICCs).
CVADs may have single or multiple lumens and can be open-ended or valved.
The port dedicated to PN should be labeled as such. Labels are available via members of
the Nutrition team if not available on the ward.

In the case of PICC lines, a **double lumen** PICC is usually required to ensure a **dedicated
lumen for PN**. The **white port** is to be **dedicated for PN**, while the **red port** is for blood-
taking, other iv infusions/medications etc.

Refer to the Central Venous Access Devices (CVAD) Trust Policy.

8. **Complications related to central venous catheters**

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 are as follows:

*Catheter related sepsis (see section 9)*

CRS results in systemic bacterial infection, as a result of poor aseptic technique, amongst
other factors. It can be fatal if not treated.
Catheter occlusion
Whenever the catheter is disconnected, it is vital that the catheter is adequately flushed with 0.9% normal saline to reduce the risk of clot formation and subsequent infection and/or occlusion.

Haemorrhage
There is the risk of bleeding from the catheter, should the catheter cap 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.

Air embolism
Air embolism occurs when air enters a systemic vein and travels to the right ventricle via the vena cava. It causes a reduction in systemic blood circulation and can cause acute cardiac arrest and be fatal. Should the catheter cap become dislodged, or if the lumen is not clamped and left open to the air, then air can be sucked through the catheter into the venous circulation. The nurse must check all connections and security of the catheter on a regular basis.

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. It may require aspiration, or insertion of a chest drain. It may be necessary to remove the central line.

Severance of the catheter
In the case of any damage to or breakage of the catheter the following action will be taken:
Any rupture, damage or leakage from the catheter must be acted upon immediately to prevent blood loss, or formation of an air embolus.
The catheter should be clamped, proximal to the damaged area, or close to the exit site, and a sterile dressing should be applied to the affected area under strict aseptic conditions.
Inform the medical team immediately that a severance has occurred. The line may need to be removed as soon as possible.

9. Central venous catheter sepsis
What to do if a central venous catheter related sepsis is suspected
If the patient develops a core temperature out of normal range (hypothermia ≤ 35 ºC or pyrexia ≥38ºC), or has chills or rigors, the following steps should be taken:
- Obtain blood cultures from the catheter and from a peripheral vein at the same time (see appendix 11).
- The site from which the set has been taken should be indicated clearly on both the bottles and request form.
- If a patient is on antibiotics, blood cultures should ideally be taken immediately before the next dose is due.
- Inspect the catheter entry site and if signs of infection obtain a swab for culture using an aseptic non-touch technique.
- Send swabs for culture from any other wounds if they are clinically infected.
- Send other specimens according to clinical findings e.g. urine (MSU/CSU) if clinical features suggest UTI.
- Also consider chest X-ray and sputum specimen, if appropriate.
- Use peripheral access for the administration of I.V. fluids if P.N. is discontinued.
- Await the microbiology report and do not remove the catheter just yet.

10. **Antimicrobial therapy**

The choice of antibiotic is governed by the sensitivity pattern of the infecting organism. Please discuss individual cases with a Consultant Microbiologist if you are unsure how to proceed. Antibiotic therapy for established line sepsis should be given *intravenously*.

Refer to the Trust Blood Culture Policy and Procedure and the Infection Prevention and Control Trust Policy on the Management of Intravascular Catheters

11. **General guidelines on administration of parenteral nutrition**

- Prior to any manipulation of the line hands must be washed or an alcohol hand rub used. Always adhere to the Trust's hand washing policy.
- An aseptic non-touch technique must be used whenever the CVAD is accessed and during procedures involving exit sites.
- Wear **sterile gloves** when accessing the catheter and when carrying out dressing changes.
- All connections must be cleaned with a 2% chlorhexidine gluconate in 70% alcohol (e.g. green Clinell wipe) and allowed to dry before accessing.
- To detect early signs of infection monitor temperature, pulse and blood pressure at least daily.
- Use a sterile, transparent, semi-permeable dressing to cover the catheter insertion site and change the dressing 24 hours post line insertion and then every 7 days, or when the dressing becomes loose, damp or visibly soiled.
- To reduce trauma to the exit site and to prevent movement of the line all CVADS must be securely fixed with sutures or a securing device e.g. StatLock
- Cap off the catheter hub with a needle-free access device (e.g. Bionector). This will minimise interruptions to the closed system and reduce the risk of air embolism, bleeding and infection. Unless manufacturer's instructions state otherwise, this should be changed every 7 days, or every 150 uses, whichever is sooner.
- If the catheter possesses an integral clamp, keep it closed whenever the cap is removed, and at all other times except when administering or withdrawing fluids. The clamp will prevent air entry and bleeding, should the Bionector become unattached.
- To prevent line rupture as a result of exerted pressure, do not use syringes smaller than 10mls to flush CVAD.
- **Administration sets and feed** should be changed every 24 hours, using an aseptic non-touch technique.
- Drugs or other solutions must not to be added to the bag after it leaves pharmacy, as this could adversely affect stability.
• Feeding container should be covered with the bag provided during infusion, to maintain feed stability.

• **If P.N. is disconnected for any reason, the same bag and giving set must not be reconnected.**

• Existing injection sites on the administration set must not be used for the giving of additional medication, as P.N. is incompatible with numerous medications.

• **Never** attach 3-way tap to P.N. infusion lumen.

• **Never** share P.N. infusion lumen with any other infusion.

• **Never** attempt to “catch up rapidly” if the infusion is running too slowly as this may cause thrombophlebitis, metabolic and electrolyte disturbances.

• Ensure that the P.N is administered at the prescribed rate which is clearly labeled on the P.N bag and on the P.N prescription (**appendix 5**), which should be completed and signed.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
<th>Rationale</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium, Potassium, Urea, Creatinine</td>
<td>Baseline Daily until stable</td>
<td>Assessment of renal function, fluid status, Na and K status</td>
<td>Interpret with knowledge of fluid balance &amp; medication Urinary sodium may be helpful in complex cases with GI fluid loss</td>
</tr>
<tr>
<td></td>
<td>Then 1-2 x weekly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>4 – 6 hourly for the first 2 – 3 days</td>
<td>Glucose intolerance is common</td>
<td>Good glycaemic control is necessary</td>
</tr>
<tr>
<td></td>
<td>Then random BMs when stable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If on cyclical P.N ensure BMs are monitored closely in rest period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium, Phosphate</td>
<td>Baseline Daily if refeeding syndrome risk 3 x a week until stable Then weekly</td>
<td>Depletion is common and under recognised. Refeeding syndrome can be fatal.</td>
<td>Low concentrations indicate poor status</td>
</tr>
<tr>
<td>Liver Function Tests including INR</td>
<td>Baseline 2 x a week until stable Then weekly</td>
<td>Abnormalities common in Parenteral Nutrition</td>
<td>Complex. May be due to sepsis, other disease or malnutrition.</td>
</tr>
<tr>
<td>Calcium, Albumin</td>
<td>Baseline Then weekly</td>
<td>Hypocalcaemia or hypercalcaemia may occur</td>
<td>Correct serum calcium for albumin $^{2+}$ may be secondary to low Mg $^{2+}$. Low albumin reflects disease not protein status.</td>
</tr>
<tr>
<td>C-Reactive Protein</td>
<td>Baseline Then 2-3 x a week until stable</td>
<td>Assists interpretation of protein, trace element and vitamin results</td>
<td>To assist the presence of an acute phase reaction (APR). The trend of results is important.</td>
</tr>
<tr>
<td>Zinc, Copper</td>
<td>Baseline Then every 2-4 weeks, depending on results</td>
<td>Deficiency common, especially when increased losses</td>
<td>People most at risk when anabolic. APR causes Zn ↓ and Cu ↑</td>
</tr>
<tr>
<td>Selenium</td>
<td>Baseline if at risk of depletion. Further testing then dependent on baseline</td>
<td>Se deficiency likely in severe illness and sepsis, or in long-term nutrition support</td>
<td>APR causes Se ↓. Long-term status better assessed by glutathione peroxidase</td>
</tr>
<tr>
<td>Full blood count and MCV</td>
<td>Baseline 1-2 x per week until stable Then weekly</td>
<td>Anaemia due to iron or folate deficiency is common</td>
<td>Effects of sepsis may be important</td>
</tr>
<tr>
<td>Iron, ferritin</td>
<td>Baseline Then every 4 months</td>
<td>Deficiency common in long-term P.N.</td>
<td>Iron status difficult if APR (Fe ↓, Ferritin ↑)</td>
</tr>
<tr>
<td>Folate, B12</td>
<td>Baseline Then every 3-6 months</td>
<td>Deficiencies are common</td>
<td>Serum folate/B12 sufficient with full blood count</td>
</tr>
</tbody>
</table>
13. Complications of parenteral nutrition

P.N. 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** to be discussed more extensive (see section 14 and 15). Other complications include:

13.1 **Hyperglycaemia**

Hyperglycaemia is common in diabetic patients and those with stress induced insulin resistance. It should be generally treated with insulin using a sliding scale. P.N. may also cause derangement in liver biochemistry, although this is relatively uncommon and abnormalities seen in P.N. patients are more frequently due to other factors such as the presence of sepsis or side effects from other medications.

In view of the above, all patients receiving P.N. should be monitored closely.

13.2 **Fluid balance**

P.N. 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.

14. **Refeeding syndrome**

14.1 **Definition of the Refeeding Syndrome**

Severe fluid and electrolyte shifts associated with initiating nutritional support in malnourished patients and the metabolic implications which occur as a result of this (Solomon and Kirby 1990).

**Patients at risk** (Taken from NICE guidelines ‘Nutrition support in Adults’ 2006)

**Moderate Risk**

*Patient has one or more of the following:*
- BMI less than 18.5kg/m² or MUAC <23cm (Mid-upper arm circumference).
- Unintentional weight loss greater than 10% within the previous 3-6 months.
- Very little intake for greater than 5 days.

**High Risk**

*Patient has one or more of the following:*
- BMI less than 16kg/m² or MUAC <21cm.
- Unintentional weight loss greater than 15% within the previous 3-6 months.
- Very little nutritional intake for greater than 10 days.
- Low levels of potassium, phosphate or magnesium prior to feeding.

*Or patient has two or more of the following:*
- BMI less than 18.5kg/m² or MUAC <23cm.
- Unintentional weight loss greater than 10% within the previous 3-6 months.
• Those with very little intake for greater than 5 days.
• A history of alcohol abuse or drugs including insulin, chemotherapy, antacids or diuretics.

**Severely High Risk**

*Patient has both of the following*

• BMI less than 14.
• Negligible intake for greater than 15 days.

### 14.2 Pathogenesis of Refeeding Syndrome

In starvation, insulin concentrations decrease and glucagon levels rise. As a consequence, glycogen stores are rapidly converted to glucose and gluconeogenesis is activated resulting in glucose synthesis from protein and lipid breakdown products. Adipose tissue lipase is activated releasing large amounts of fatty acids and glycerol. Free fatty acids and ketone bodies replace glucose as the major energy source in starvation. In the starved state the catabolism of fat and muscle leads to loss of lean body mass, water and minerals (Love 1986, Champe and Harvey 1994).

During refeeding, there is a switch in metabolism from fat to carbohydrate with consequent insulin release, stimulated by the glucose load. With carbohydrate repletion and increased insulin production there is an increased uptake of glucose, phosphorus, potassium and water into cells; and a stimulation of anabolic protein synthesis (Champe and Harvey 1994).

The combined effect of depleted total body phosphorus during catabolic starvation and the movement of phosphorus into cells during refeeding, leads to severe extracellular hypophosphataemia often in association with hypokalaemia and hypomagnesaemia (see flow chart page 6) (Solomon and Kirby 1990, Brooks and Melnick 1995).

In spite of total body depletion the serum concentration of electrolytes can appear normal in the starved state due to alterations in renal rates of excretion. It is therefore essential to monitor electrolyte levels during the early stages of instigating enteral or parenteral nutrition, as it is during this time that biochemical shifts will occur (Solomon and Kirby 1990, Brooks and Melnick 1995).
14.3 Pathogenesis of Refeeding Syndrome (flow diagram)

- Insulin release stimulates the sodium potassium adenosinetriphosphatase Sodium/potassium (ATPase) pump (which requires magnesium as a cofactor). This drives the potassium into the cells and sodium moves out. Carbohydrate load and insulin release stimulate phosphate shifts into the cells and phosphate depletion is associated with increased urinary magnesium excretion. These phenomena lead to low extracellular phosphate, magnesium and potassium, and may precipitate the symptoms of refeeding syndrome (Solomon and Kirby 1990, Brooks and Melnick 1995).

14.4 Consequences (Solomon and Kirby 1990)

- Fluid balance abnormalities
- Altered glucose and lipid metabolism
- Hypophosphataemia
- Hypokalaemia
- Hypomagnesaemia
- Vitamin deficiency (thiamine)

These lead to cardiac, respiratory, neuromuscular, renal, metabolic, haematologic, hepatic, and gastrointestinal problems (Solomon and Kirby 1990, Brooks and Melnik 1995) (see table on page 18).

Fluid Balance Abnormalities

Refeeding syndrome can affect the body fluid distribution and it can influence many bodily functions. The fluid imbalance can cause cardiac failure, dehydration or fluid overload, hypotension, cardiac failure, pre-renal failure and also sudden death. Refeeding with carbohydrates can lead to reduction of water and sodium excretion, causing expansion of the extracellular fluid compartment and weight gain. Conversely, protein refeeding can result in weight loss and urinary sodium excretion leading to negative sodium balance.
Altered glucose and lipid metabolism

Glucose administration to a starved patient initially is beneficial as it reverses the negative nitrogen balance by suppressing gluconeogenesis and reducing amino acid usage. However, further administration of glucose can cause hyperglycaemia, metabolic acidosis, osmotic diuresis, dehydration or hypotension. Excessive glucose can be converted to fat, provoking hypertriglyceridaemia, fatty liver and abnormal liver biochemistry (LFTs). A higher respiratory quotient also occurs, resulting in increased carbon dioxide production, hypercapnia and respiratory failure.
### 14.5 Table: Clinical sequellae of altered electrolytes in Refeeding Syndrome
(Solomon and Kirby 1990, Brooks and Melnik 1995)

<table>
<thead>
<tr>
<th>Electrolytes</th>
<th>Cardiac</th>
<th>Respiratory</th>
<th>Hepatic</th>
<th>Renal</th>
<th>GI</th>
<th>Neuromuscular</th>
<th>Haematologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low phosphate</td>
<td>Altered myocardial function</td>
<td>Acute ventilatory failure</td>
<td>Liver dysfunction</td>
<td></td>
<td></td>
<td>Lethargy, weakness, seizures,</td>
<td>Haemolytic anaemia, WBC dysfunction</td>
</tr>
<tr>
<td></td>
<td>Arrhythmia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>confusion, coma, paralysis,</td>
<td>thrombocytopenia</td>
</tr>
<tr>
<td></td>
<td>Congestive heart failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>rhabdomyolysis</td>
<td>haemorrhage</td>
</tr>
<tr>
<td>Low potassium</td>
<td>Arrhythmia</td>
<td>Respiratory depression</td>
<td>Exacerbation of hepatic encephalo-pathy</td>
<td>Decreased urinary concentrating ability</td>
<td>Constipation</td>
<td>Paralysis</td>
<td>Rhabdomyolysis</td>
</tr>
<tr>
<td></td>
<td>Cardiac arrest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low magnesium</td>
<td>Arrhythmia</td>
<td>Respiratory depression</td>
<td></td>
<td></td>
<td>Constipation</td>
<td>Ataxia</td>
<td>Confusion</td>
</tr>
<tr>
<td></td>
<td>Tachycardia</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Weakness</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tetany</td>
</tr>
</tbody>
</table>
15. **Guidelines for replacement of electrolytes, thiamine and other vitamins (NICE 2006)**

When prescribing nutrition for patients at high risk of developing refeeding problems consider the following:

- Slow introduction of nutrition support, introduced at no more than 50% requirements for the first 2 days.
- Increase feeding rates to meet full needs if clinical and biochemical monitoring reveals no refeeding problems.

Provide immediately before and during the first 10 days of feeding:

- Oral thiamine 200-300mg daily
- Vitamin B co strong 1 or 2 tablets three times per day (Or full dose daily intravenous vitamin B preparation, if necessary)
- Balanced multivitamin supplement once daily

Provide oral, enteral or intravenous supplements of the following unless pre-feeding plasma levels are high:

- Potassium – likely requirement 2-4 mmol/kg/day
- Phosphate – likely requirement 0.3-0.6 mmol/kg/day
- Magnesium – likely requirement 0.2 mmol/kg/day (IV) or 0.4 mmol/kg/day (oral)

N.B. Pre-feeding correction of low plasma levels is **UNNECESSARY**

**Guidelines for replacement of electrolytes, thiamine and other vitamins**

These recommendations are specific to Surrey and Sussex NHS Trust. They are a guideline only and should be used in conjunction with clinical assessment and other relevant local Trust policies regarding IV preparations.

15.1 **Potassium**

**Patient on intravenous therapy only**

Seek advice from pharmacist. Refer to local SASH potassium supplementation guidelines.

**N.B. ready to use preparations of potassium chloride only may be used.**

Potassium **may not** be added to intravenous infusion fluids under any circumstances. The maximum concentration of potassium chloride that may be administered is 40mmol/100ml and this must be via a central venous line only. Telemetry must always be used when administering concentrations of potassium of greater than 40mmol/L. Potassium must never be administered as a bolus injection. (Separate protocols exist for the addition of potassium chloride to haemofiltration fluids.)
Patient able to tolerate oral or enteral therapy

- **Potassium higher than 3 mmol/L**
  Sando K.
  Two tablets TWICE daily (total potassium 48 mmols)
  N.B. Use IV therapy if patient has diarrhoea or high output stoma.

- **Potassium 2.5 - 3 mmol/L**
  Sando K
  Two tablets THREE times daily (total potassium 72 mmols)
  May need IV therapy

- **Severe – less than 2.5 mmol/L or symptomatic**
  IV (peripheral): 40mmol in 1L sodium chloride 0.9% over 4 hours, repeat if necessary
  IV (central line only, restricted to Critical Care/CCU/A&E Resus only): 40mmol in 100ml sodium chloride 0.9% can be given using infusion pump with ECG monitoring. Undiluted potassium chloride must NOT be administered.

15.2 Phosphate

Patient on intravenous therapy only
Seek advice from pharmacist.
(Phosphate polyfusor 500mls infused over 12 hours provides 50 mmols of phosphate)

Patient able to tolerate oral or enteral therapy

- **Moderate – Asymptomatic - Phosphate 0.4-0.6 mmol/L**
  Phosphate Sandoz: Two tablets twice daily (total phosphate 64.4 mmols)
  N.B. Consider IV therapy if patient has diarrhoea or high output stoma.

- **Moderate – Symptomatic - Phosphate 0.4-0.6 mmol/L**
  or Severe - Phosphate less than 0.4mmol/L
  Oral therapy not appropriate. Use I.V. therapy as above.

Note
ICU and acutely ill patients with low phosphate may not be due to refeeding syndrome. This can occur with ventilator assisted patients, post anaesthetic, may be due to malabsorption/sepsis/fistula output/ consequences of surgery.

15.3 Magnesium

- **Mild (greater than 0.5mmol/L)**
  Seek advice of pharmacist.
  Usual dose 12mmol magnesium.

- **Severe (less than 0.5mmol/L)**
  Usual dose 20mmol magnesium (see table page 24).
15.4 Thiamine

Thiamine (vitamin B1) is an essential co-factor for various enzyme activities for carbohydrate metabolism. If feeding is commenced in a thiamine depleted patient, further depletion will occur, and this can lead to Wernicke’s encephalopathy and Korsakoff’s syndrome (with permanent neurological disability).

Patient on intravenous therapy only

- **Moderate risk of refeeding** (see criteria – page 14) and **High risk of refeeding** (see criteria – page 14).
  
  High strength vitamins B&C (Pabrinex) injection.
  5mls of ampoule 1 plus 5mls of ampoule 2 in 50-100ml sodium chloride 0.9% or glucose 5%. Administer over 15-30 minutes. N.B. risk of anaphylaxis.
  Once daily for three doses only.
  Full micronutrient supply will be in daily parenteral nutrition prescription (Cernevit and Decan).

Patient on enteral therapy (NG/PEG/JEJ)

- **High risk of refeeding** (see criteria – page 14).
  
  High strength vitamins B&C (Pabrinex) injection.
  5mls of ampoule 1 plus 5mls of ampoule 2 in 50-100ml sodium chloride 0.9% or glucose 5%. Administer over 15-30 minutes. N.B. risk of anaphylaxis.
  Once daily for three doses only.
  Followed by enteral thiamine 100mg, three times daily for 10 days. Thiamine tablets can be dispersed in 10ml of water – leave for 10 minutes (N.B: unlicensed administration method, must only be used on the advice of a pharmacist)

- **Moderate risk of refeeding** (see criteria)
  
  Thiamine 100mg, three times daily for 10 days. Thiamine tablets can be dispersed in 10ml of water – leave for 10 minutes (N.B: unlicensed administration method, must only be used on the advice of a pharmacist)

Patient able to tolerate oral therapy

- **High risk of refeeding** (see criteria).
  
  High strength vitamins B&C (Pabrinex) injection
  5mls of ampoule 1 plus 5mls of ampoule 2 in 50-100ml sodium chloride 0.9% or glucose 5%. Administer over 15-30 minutes. N.B. risk of anaphylaxis.
  Once daily for three doses only.
  Followed by enteral thiamine 100mg, three times daily for 10 days plus multivitamin one tablet once daily.
  (SASH do not have a multi-vitamin and mineral preparation on formulary at present).

- **Moderate risk of refeeding** (see criteria)
  
  Enteral thiamine 100mg, three times daily for 10 days.
  Plus multivitamin one tablet once daily.
15.5 **Supplementation of micronutrients**

It is suggested that full supplementation for 2 weeks after full requirements are achieved is beneficial for patients who are considered to be at risk of refeeding syndrome (there is no specific evidence on how long to supplement).

15.6 **Recommendations for PN feeding in practice**

**COMMENCING FEEDING**

(Refer to full guideline for definition and list of at risk patients)

- Determine level of re-feeding risk.
- Check baseline potassium, phosphate, magnesium, calcium, adjusted calcium.
- Replete electrolytes as indicated above (pages 19-20).
- Replete thiamine as per guideline above (page 21).

Start feeding at 20kcal/kg -> moderate risk of refeeding.
Start feeding 10kcal/kg -> high risk of refeeding.
Start feeding at 5kcal/kg -> severely high risk refeeding.
**DO NOT** wait for electrolyte blood level to be within normal range start slow feeding.

N.B. There is no literature to suggest a safe lower limit for when to start feeding. Monitoring of biochemistry is essential.

- Send off for further potassium, magnesium, calcium and phosphate levels **6-12 hrs** after initiation of feeding.
- Follow replacement guidelines if electrolytes low.
- Monitor potassium, magnesium, phosphate, calcium, adjusted calcium daily until levels within normal ranges, then 3 times week for 2 weeks

**NICE 2006**: recommends in the ‘severely high risk’ patient: to restore circulatory volume and monitor fluid balance and overall clinical status closely. Also, to monitor cardiac rhythm continually in these patients and any other who develop cardiac arrhythmias.
Patient at high risk of developing refeeding if:

One or more of the following:
- BMI <16kg/m² or MUAC <21cm
- Unintentional weight loss of >15% within the previous 3-6 months
- Very little or no nutrient intake for >10 days
- Low levels of potassium, phosphate or magnesium prior to any feeding

Two or more of the following:
- BMI <18.5Kg/m² or MUAC <23 cm
- Unintentional weight loss >10% within the previous 3-6 months
- Very little or no nutrient intake for >5 days
- A history of alcohol misuse or some drugs such as insulin, chemotherapy, antacids or diuretics

Immediately before feeding, give THIAMINE supplement (NICE 2006):

- High strength vitamins B & C (Pabrinex I & II) injection ONCE daily for at least 3 days
- Ensure full micronutrient supply in daily parental nutrition prescription

Oral:
- Thiamine 100mg THREE times/day and Vitamin B Co Strong 1-2 tabs THREE times/day for 10 days
- Multivitamin 1 tablet ONCE daily until on full rate feeding

NG/PEG/NJ administration:
- Disperse 200-300mg Thiamine in 10ml of water – leave it until dissolved (10 minutes) and give ONCE daily for 10 days
- Vitamin B Co strong 1-2 tabs THREE times/day for 10 days, if not possible then consider Pabrinex I & II
- Give multivitamin – Dalivit 0.6ml (14 drops).
- Continue until on full rate feeding

No risk identified

Commence PN as per advice from nutrition team

Yes to any of the above

Start feeding as per Nutrition Team’s advice

Commence PN as per advice from nutrition team
If level >0.5 mmol/L
IV: 12mmol (5ml of 50% Magnesium sulphate) in 100ml NaCl 0.9% over 20mins

If level <0.5mmol/L
IV: 20mmol (10ml of 50% magnesium sulphate) in 100ml NaCl0.9% over 60mins

N.B. Magnesium Glycerophosphate tablet are an unlicensed preparation with poor absorption, use IV therapy when magnesium levels are low

If level 0.4-0.6mmol/L
IV: 50mmol (500ml of phosphate polyfusor) over 12 hours
Oral or enteral: Phosphate Sandoz 2 tabs BD (64mmol)

If level <0.4mmol/L
IV: 50mmol (500ml of phosphate polyfusor) over 24hours
Oral or enteral: not appropriate. Use IV therapy

N.B.
• Half the dose in renal impairment or in patients less than 40kg
• Administer with caution in patients with hypertension, cardiac failure, peripheral or pulmonary oedema as phosphate polyfusor contains 162mmol/L of sodium
• ITU and acutely ill patients might have low phosphate level alone due to ventilator and post anaesthetic
• Check plasma Calcium level, if high consider correcting calcium level before phosphate supplementation

If level 3.0-3.5mmol/L
Oral or enteral: Sando K 2 tabs BD (48mmol)

If level 2.5-3mmol/L
Oral or enteral: Sando K 2 tabs TDS (72mmol)

If level <2.5mmol/L
Oral or enteral: not appropriate. Use IV therapy
IV (peripheral): 40mmol in 1L sodium chloride 0.9% can be given using infusion pump with ECG monitoring.
Undiluted potassium chloride must NOT be administered.

• Replace electrolytes as above if levels are low
• DO NOT wait for electrolyte level to be within normal range before commencing feed
• If patient requires more than 2 replacements, check urinary (24hour collection) magnesium, phosphate and potassium
• Contact dietician to alter feed rate if required

Monitor:
• Daily (including weekends) serum U&Es, glucose, bone profile, magnesium in the first 2 weeks then twice weekly
• Daily fluid balance
• Daily catheter site inspection
• Daily temperature, blood pressure, concurrent drug therapy, blood glucose
• Twice-weekly LFTs, FBC, CRP

Check U&Es, LFTs, magnesium, phosphate & calcium
16. Legal and Ethical implications of Artificial Nutrition Support

The provision of nutrition support is not always appropriate. Decisions on withholding or withdrawing nutrition support can be difficult. Decisions that involve the withholding or withdrawing of nutrition support require a consideration of both ethical and legal principles (both at common law and statute including the Human Rights Act 1998).

It is important to note:

- It is a general legal and ethical principle that valid consent must be obtained before starting treatment for a patient. A health professional who does not respect this principle may be liable both to legal action by the patient and action by their professional body.
- For consent to be valid it must be given voluntarily, by an appropriately informed person who has the capacity to consent.
- For capacity the person must be able to comprehend and retain the information material to the decision, the consequences of having or not having the treatment and be able to use that information in the decision making process.
- No one is able to consent to or refuse treatment on behalf of another competent adult where that adult cannot consent for himself.
- The competent adult has the absolute right to decide what treatment he does or does not wish to receive even where refusal may result in death.
- Where the patient lacks the capacity to make a decision for himself, the law requires a doctor to provide such treatment and care as are in the patient’s best interests.
- ‘Best interests’ are not confined to ‘medical best interests’ and are not necessarily the same as the wishes of the patient.
- In considering what is in the ‘best interests’ of the patient the doctor should consult with family and carers and take their views into account in the decision making process.
- In respect of those patients detained under the Mental Health Act 1983, healthcare professionals should not make the assumption that such patients lack the capacity to consent and as with all other patients, an assessment should be undertaken as to whether or not such patients retain the capacity to consent to the treatment under consideration.
- Regard should be given to communication difficulties with the help of relatives, carers, interpreters and speech and language therapists.
- Patient autonomy and the right to self determination do not extend to the patient insisting on receipt of a particular treatment regardless of its nature.
- Distinction has to be drawn between those cases where a patient’s life can be prolonged indefinitely by treatment or provision of nutrition, but only at a cost of great suffering and those cases where the ‘incompetent’ patient is in the final stages of life and although treatment would prolong the dying process, this would be at the cost of comfort and dignity.
• Each case must be considered individually and decisions as to the provision, withholding or withdrawal of nutrition reached objectively.

• Decisions involving the withholding and withdrawal of treatment can be particularly difficult and at times contentious and in these circumstances consideration should be given to the GMC guidance ‘Withholding and Withdrawing Life-prolonging Treatments: Good Practice in Decision-making’ and legal advice sought if appropriate.

• If there is any doubt as to the patient’s capacity or what is or is not in their best interests, the Trust Consent policy should consulted. If indicated, legal advice should be sought and, if appropriate, the Court’s intervention sought.

Additionally:

• If an illness is regarded as being in the terminal phase and the treatment plan is to provide only compassionate and palliative care, an artificial supply of nutrients or fluid need only be given to relieve symptoms and such provision should not necessarily be used to prolong survival.

• In cases where the benefits of specialized nutrition or fluid support are in doubt, a planned ‘time-limited’ trial may be useful.

• Treatment plans for patients should include decisions on fluid and/or nutrient provision, especially when there are either existing or possible future deficits in fluid or nutrient intake.

Decisions on instigating nutrition support should ideally involve individuals with expertise in clinical nutrition such as dietitians, specialist nutrition nurses, pharmacists and clinicians with relevant training.

In the real world, however, there are many malnourished patients within the hospital setting and, hence, it is important that all healthcare professionals understand the importance of malnutrition and its treatment in patient care.

*N.B. Parts of the Mental Capacity Act 2005 came into force on 1st April 2007. When a patient has no relatives or friends, and lacks the capacity to make a decision regarding their treatment, those involved must consult with an Independent Mental Capacity Advocate (IMCA).*
17. Consultation and Communication with Stakeholders

PN policy compiled in consultation with Gastroenterology and General Surgical specialties, Dietetics department, Pharmacy, ICU and Microbiology. This is to be in conjunction with the Nutrition Steering Group (NSG). The NSG is a management body attended by representatives from interested parties and members of the Nutrition Support Team. It oversees policies and guidelines relating to artificial nutrition and is responsible for the development and coordinating nutrition support services.

18. Approval and Ratification

To discuss at the Digestive Diseases Group (DDG) meeting and in consultation with the Nutrition Steering Group.

19. Review and Revision Arrangements

As per Trust Guidelines every 3 years, due for 2014.

20. Dissemination and Implementation

- Post on dedicated P&P page of intranet.
- Notification on E-Bulletin.
- Available on intranet.
- Implementation achieved through Study Day education programme.

21. Monitoring Compliance

Annual ward based audit of indications, duration and complications of PN administration including refeeding syndrome and line sepsis. (see appendix 12 for Audit forms)
22. General references/Suggested reading


NCEPOD - a Mixed Bag, June 2010 - an enquiry into the care of hospital patients receiving parenteral nutrition www.ncepod.org.uk

SASH - an organisation wide policy for the management of central venous access catheters and devices (CVAD’s) sept 2010

BAPEN - standards and guidelines for nutrition support of patients in hospitals 1996

BAPEN - current perspectives on PN in adults 1996


Human Rights Act 1998 Chapter 42. Published by The Stationery Office.


GMC Guidance 'Withholding and Withdrawing Life-prolonging Treatments: Good Practice in Decision-making' (accessed 29 March 2007).

Appendix 1 - Biochemical monitoring

- Order the bloods requested by the Nutrition Team. Blood results are required urgently, to allow the Nutrition Team to prescribe feed.
- Without this information, the Nutrition Team will be unable to make any further decisions regarding the patients’ feeding regimen.


<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium, Potassium, Urea, Creatinine</td>
<td>Baseline*, Daily until stable, Then twice a week</td>
</tr>
<tr>
<td>Magnesium, Phosphate</td>
<td>Baseline*, Daily until stable (if risk of refeeding syndrome), Three times a week until stable (if no risk of refeeding syndrome), Then weekly (or per nutrition team advice)</td>
</tr>
<tr>
<td>Calcium, Albumin</td>
<td>Baseline*, Then weekly</td>
</tr>
<tr>
<td>Liver Function Tests, including INR</td>
<td>Baseline*, Twice weekly until stable, Then weekly</td>
</tr>
<tr>
<td>Glucose</td>
<td>Baseline*, At least once a day (or more if needed) until stable, Then random BMs and at least weekly</td>
</tr>
<tr>
<td>C-reactive protein</td>
<td>Baseline*, Then twice a week until stable</td>
</tr>
<tr>
<td>Zinc, Copper, Selenium</td>
<td>Only if specifically requested by the Nutrition Team</td>
</tr>
<tr>
<td>Full blood count, MCV</td>
<td>Baseline*, Twice a week until stable, Then weekly</td>
</tr>
<tr>
<td>Iron, Ferritin</td>
<td>Baseline*, Then every 3-6 months (for those patients on long-term parenteral nutrition)</td>
</tr>
<tr>
<td>Folate, Vitamin B12</td>
<td>Baseline*, Then every 2-4 weeks</td>
</tr>
<tr>
<td>Fluid balance</td>
<td>DAILY – NB incorporate PN fluid volume in calculations</td>
</tr>
</tbody>
</table>
Appendix 2 - Flow chart for patients on parenteral nutrition

<table>
<thead>
<tr>
<th>Date</th>
<th>Na+</th>
<th>K+</th>
<th>Urea</th>
<th>Creat</th>
<th>PO4-</th>
<th>Mg++</th>
<th>Ca++</th>
<th>CRP</th>
<th>BM</th>
<th>Alb</th>
<th>Bili</th>
<th>ALP</th>
<th>ALT</th>
<th>INR</th>
<th>HB</th>
<th>WBC</th>
<th>PLT</th>
<th>Urine Na+</th>
<th>Weight</th>
</tr>
</thead>
</table>


### Appendix 3 - Surrey & Sussex NHS Trust Parenteral Nutrition Referral Form

<table>
<thead>
<tr>
<th>Name</th>
<th>At the time of starting PN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight</td>
</tr>
<tr>
<td></td>
<td>Height</td>
</tr>
<tr>
<td></td>
<td>BMI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consultant requesting PN</th>
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</table>

<table>
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<tr>
<th>Indication for PN (Why is enteral feeding not possible?)</th>
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<table>
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<tr>
<th>Expected duration of PN (days)</th>
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<table>
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<tr>
<th>Treatment goals of PN</th>
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</table>

<table>
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<tr>
<th>Co-morbidities &amp; relevant PMH</th>
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</thead>
</table>

<table>
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<tr>
<th>Has the patient had gastrointestinal surgery?</th>
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<table>
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<tr>
<th>If so, what is the altered anatomy of the GIT?</th>
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</table>

<table>
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<tr>
<th>Name &amp; Contact bleep number of referring team</th>
<th>Name</th>
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<td>Signed</td>
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<td>Date</td>
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</table>

**PLEASE ATTACH THIS FORM TO THE NOTES AND CONTACT THE PN DIETITAN ON BLEEP 518 or GASTRO SPR ON BLEEP 636**

**PLEASE NOTE, PN WILL NOT BE INITIATED OUT OF HOURS**

**PLEASE NOTE: IT IS THE RESPONSIBILITY OF THE WARD TEAM TO ORGANISE APPROPRIATE MONITORING FOR PATIENTS RECEIVING PARENTERAL NUTRITION.**

**PLEASE REFER TO THE BIOCHEMICAL MONITORING SHEET FOR DETAILS REQUIRED (Appendix 1)**
# Appendix 4 - PARENTERAL NUTRITION (PN) – INITIAL PATIENT ASSESSMENT

**WARD:** ________________

**CONSULTANT:** ________________

**REFERRAL DATE:** ____________

| Name: | Weight:  kgs  
|---|---|
| Patient Details: (use patient ID sticker if available) | (estimated/actual)  
| DOB: | Date:  
| NHS No.: |  
| MRN No.: |  

| Full requirements at start of feeding:  
|---|
| Date:  
| Energy: kcal  
| Nitrogen: g  
| Fluid (baseline): ml  

### Indication for PN:
- 1. Non functioning gut.
- 2. Failure of enteral nutrition. Limited enteral tube feeding (in surgical/critical care patients). PN needed to supplement EN.
- 3. No access for enteral nutrition.
- 5. Obstruction.
- 6. Perforated/leaking gut.
- 7. Fistulae.
- 8. Pre-op nutrition.
- 9. Inaccessible GI tract.
- 10. Intractable vomiting.
- 11. Major surgery – GI tract expected to be unusable for 5-7 days.
- 12. Other._________________________________________________

### Refeeding Risk:
- YES/NO

If YES ensure full dose daily IV Vitamin B + C (Pabrinex I & II) prescribed

[For 3 doses in total]

1st dose prior to commencing feeding.

### Treatment Goal:
- Date of Initial Assessment:
- Assessment Completed By:
- Contact No / Bleep No.

### IV Access Available: YES/NO
- No. of days line in situ:
- Type of Line: Acute CVC PICC Tunnelled Line (Hickman/Groshong)

If no IV Access, has a plan been made? YES/NO

Planned Line Placement:
PARENTERAL NUTRITION (PN) – INITIAL PATIENT ASSESSMENT

DIETITIAN / PHARMACIST (Circle Designation)

DATE: ____________
Appendix 5 - PARENTERAL NUTRITION (PN) PRESCRIPTION
Patient Name: __________________ MRN: __________________ NHS number: __________________

<table>
<thead>
<tr>
<th>DATE</th>
<th>ROUTE</th>
<th>REGIMEN</th>
<th>RATE</th>
<th>DURATION</th>
<th>PRESCRIBER SIGNATURE</th>
<th>BATCH NO.</th>
<th>TIME STARTED</th>
<th>GIVEN BY CHECKED BY</th>
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</tr>
</tbody>
</table>

**NUTRIENT PROVISION / 24 hour**

<table>
<thead>
<tr>
<th></th>
<th>TOTAL VOLUME</th>
<th>ENERGY (KCALs)</th>
<th>NITROGEN (G)</th>
<th>SODIUM (mmols)</th>
<th>POTASSIUM (mmols)</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

*Pharmacist Note: Is this more than 14 days? If so report to High Cost Drug Team.*
Appendix 6 - Summary of Nursing Duties

Central Venous Access Devices
A single lumen of the catheter should be identified, labeled, and designated for the use of P.N. only. Compliance with an aseptic non-touch technique. Weekly dressing changes and Bionector change.

Fluid Balance
An accurate fluid balance is essential prior to estimating the patient’s nutritional and fluid requirements for the next day. Please ensure the following are filled in accurately:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral fluids</td>
<td>Urine volume</td>
</tr>
<tr>
<td>Drugs</td>
<td>Vomit volume</td>
</tr>
<tr>
<td>Parenteral nutrition</td>
<td>Gastric aspirate volume</td>
</tr>
<tr>
<td>IV fluids</td>
<td>Stoma output</td>
</tr>
<tr>
<td></td>
<td>Fistula output</td>
</tr>
<tr>
<td></td>
<td>Drain output</td>
</tr>
<tr>
<td></td>
<td>Loose stools</td>
</tr>
</tbody>
</table>

Weights
Daily for any patients receiving PN, if possible. Weight change of more than 1kg/d should alert ward staff that the patient is having problems maintaining fluid balance. The patient’s medical team should be informed immediately.

Observations
(4-6 hourly) to highlight early signs of catheter related sepsis, fluid overload, or wound infections: Blood Pressure, Temperature, Pulse, Respiration, Blood sugar analysis (BM stick). If the patient develops pyrexia ≥38 °C, or has a rigor, the doctor should be alerted at once.

Oral Hygiene
Encourage patient to brush teeth at least twice/day, with assistance as required. Regular mouth care/mouthwashes; more often if the patient is nil by mouth. Observe for cracking of lips or signs of infection/soreness. Inform doctor if this is suspected and treat accordingly.

Administration of PN
Bags should be administered in the correct sequence as labeled on the bag and PN administration record. This is important to ensure nutrients are increased in accordance to clinical condition e.g. Refeeding Syndrome risk patients.

PN administration record should be signed.

Storage of PN
Unless PN is being administered within an hour of delivery to the ward, PN bags should be stored in the ward fridge at 2 - 8°C.

PN bags should be removed from the fridge half an hour before use.

Pharmacy should be informed of any unused bags.
Appendix 7 - Policy for setting up parenteral feeding infusion

Equipment:
P.N. for infusion
Clean dressing trolley
Infusion pump and 1 infusion giving set
1 pair of non-sterile gloves and plastic apron
Clean plastic injection tray
2% chlorhexidene in 70% alcohol wipe
10 ml 0.9% saline flush

- 2 qualified nurses to check P.N and 0.9% saline flush with prescription. Check name, expiry date, and type of feed, feeding rate and duration of P.N. Observe the fluid for colour, creaming, cracking or particles.
- Explain the procedure to the patient and give reassurance.
- Decontaminate hands using the 6 stage technique plus wrists.
- Clean trolley and plastic tray surface with 70% alcohol wipes (detergent wipe first if trolley or tray visibly soiled). Allow to dry for 30 seconds. Whilst tray and trolley drying gather all necessary equipment.
- Draw up 0.9% saline flush with a needle using an aseptic non-touch technique.
- Dispose of needle and use syringe package to protect syringe hub.
- At the bedside expose IV port.
- Check central venous access device insertion site for signs of infection and that the dressing is dry and intact.
- Wash hands and put on plastic apron and non-sterile gloves.
- Hang the feed, remove the cover from the port and after closing roller clamp on giving set connect infusion giving set using an aseptic non-touch technique.
- Squeeze drip chamber until half full with fluid. Open roller clamp and prime the giving set with fluid, making sure there is no air. Close roller clamp.
- Clean injection port with a 2% chlorhexidine and 70% isopropyl alcohol wipe and allow to dry for 30 seconds.
- Check patency of device with a 0.9% normal saline flush before connecting PN.
- Insert giving set into infusion pump and set volume and rate as prescribed.
- Open the roller clamp on the giving set.
- Dispose of waste as clinical waste.
- Remove apron and gloves and wash hands.
- Complete documentation on fluid balance chart, prescription chart, and patient’s nursing notes.
Appendix 8 - Disconnecting the infusion and flushing the catheter

Equipment:
1 x 10 ml ampoule of Sodium Chloride 0.9% for flushing
Plastic tray
1 pair non-sterile gloves and plastic apron
10 ml syringe
1 needle
2% chlorhexidine and 70% isopropyl alcohol wipe

To ensure and maintain patency always flush the central venous access device before connecting new infusion. If the infusion is discontinued, for whatever reason, for any period of time the line should be flushed according to this protocol.

- Decontaminate hands using the 6 stage technique plus wrists.
- Clean plastic tray surface with 70% alcohol wipes (detergent wipe first if trolley or tray visibly soiled). Allow to dry for 30 seconds. Whilst tray drying gather all necessary equipment.
- Draw up 0.9% sodium chloride flush with a needle using an aseptic non-touch technique. Dispose of needle and use syringe package to protect syringe hub.
- Wash hands and put on plastic apron and non-sterile gloves.
- At the bedside expose IV port.
- Check central venous access device insertion site for signs of infection and that dressing is dry and intact.
- Stop infusion pump and ensure the giving set roller clamp and catheter clamp are closed.
- Disconnect the infusion giving line from the catheter.
- Clean injection port with a 2% chlorhexidine and 70% isopropyl alcohol wipe and allow to dry for 30 seconds.
- Inject the flush solution into the catheter. Flush catheter lumen using a brisk push-pause technique – i.e flush briskly, pausing briefly after injecting 1ml of fluid.
- Clamp the catheter while injecting the final 1ml of solution. This maintains positive pressure and prevents back flow of blood therefore reducing possible clot formation.
- Dispose of waste as clinical waste.
- Remove apron and gloves and wash hands.
- Complete documentation .If the PN bag has been disconnected (for whatever reason) the remaining infusion fluid must be discarded and a new giving set and bag of PN used.
Appendix 9 - Changing a central venous catheter dressing

Maintain a sterile, transparent, semi-permeable occlusive dressing e.g. IV3000
Change dressing 24 hours post insertion and then weekly, or when moisture collects under the dressing or the dressing becomes soiled or loose.
Change PICC securing device (e.g. StatLock or GripLock) weekly, or when securing device becomes soiled or loose.

Equipment
Clean dressing trolley
Apron and non-sterile gloves
Dressing pack
2% chlorhexidine gluconate in 70% alcohol (e.g. ChloraPrep 3ml wand)
Transparent semi-permeable dressing
StatLock
Sterile gloves

Procedure
- Explain procedure to patient.
- Clean hands with soap and water.
- Put on apron.
- Prepare equipment.
- Wearing gloves carefully remove old dressing and StatLock without touching the exit site and discard.
- Observe for any redness/tenderness/swelling or discharge from the catheter insertion site. For acute non-tunnelled line check both flanges secured by sutures.
- Notify medical team if any of the above is present, or if the patient complains of pain or discomfort. Obtain swab for culture if necessary.
- Clean hands with alcohol hand gel.
- Apply sterile gloves.
- Using 2% chlorhexidine gluconate in 70% alcohol (e.g. ChloraPrep 3ml. wand), clean the area ensuring a contact time of at least 30-60 seconds and allow to air dry
- Secure line with new StatLock where applicable. Apply transparent dressing. Date dressing
- Dispose of equipment as clinical waste.
- Clean hands.
- Document procedure and condition of insertion site in the care-plan.
Appendix 10 - Guidelines for changing a needle-free connector (Bionector)

Purpose
Minimise infection risk from overuse or leakage of intravenous connector.

Frequency of change
Routine frequency of change:
• Unless manufacturer’s instructions vary the needle-free connector should be changed every seven days, or every 150 uses, whichever is the sooner.
In addition the device should be changed:
• When it has been removed for any reason
• If it appears damaged or contaminated, is leaking, or if blood is seen in the catheter or connector

To reduce catheter manipulation, coordinate this procedure with flushing, blood sampling or drug administration

Procedure
• Clean hands.
• Put on a plastic apron.
• Prepare patient and locate catheter.
• Clean hands again with alcohol gel and put on clean pair of sterile gloves.
• Check catheter is clamped (un-valved catheter) and remove needle-free connector.
• Hold end of lumen with sterile gauze to prevent contamination.
• Disinfect open lumen hub with the 2% chlorhexidine in 70% alcohol impregnated wipe (e.g. green Clinell and allow to dry).
• Attach new Bionector
• Dispose of all used items and gloves as per clinical waste. Clean hands.
• Complete documentation.
Appendix 11 - Obtaining blood samples for culture from a CVAD.
NB Always take a peripheral blood culture sample before taking CVAD blood culture samples.

**Equipment:**

Clean tray
Blood culture set
2 x 10ml syringe or Vacuette adaptor (NB Vacuette system not suitable for blood sampling from PICC)
10 ml 0.9% N/Saline flush for each lumen
2% Chlorhexidine gluconate/70% alcohol wipes
Non-sterile gloves and apron

- Clean hands with soap and water
- Prepare equipment required on a clinically clean tray using an aseptic non-touch technique
- Put on a plastic apron
- Prepare patient and perform necessary checks. Locate the line. Stop any infusions and protect infusion sets with sterile hubs using an aseptic non-touch technique
- Remove the flip-off caps from the blood culture bottle(s) and disinfect the rubber diaphragms of the culture bottles with a 2% Chlorhexidine gluconate/70% isopropyl alcohol* impregnated swab. **Leave for at least 30 seconds to dry.**
- Clean hands with alcohol gel and apply non-sterile gloves
- Clean Bionector thoroughly with a 2% chlorhexidine gluconate in 70% alcohol impregnated swab and allow to dry (e.g. green Clinell wipe). Hold catheter to stabilise and to prevent re-contamination.
- Attach Vacuette adaptor and bottle, or empty 10mls syringe, to catheter hub and aspirate sample. Repeat until all samples obtained.
- Administer a 10 ml 0.9% sodium chloride flush to all used lumens using a push-pause method and positive pressure finish
- Clean catheter hub with 2% chlorhexidine gluconate in 70% alcohol and allow to dry. Restart infusions as required
- Dispose of all used items and gloves as clinical waste
- Clean hands and complete documentation
- Label the bottles clearly with appropriate patient information (a minimum of two unique patient identifiers, plus date and time of sample and location of patient) after the blood culture bottles have been inoculated and prior to leaving the patient’s bedside
- **Do not remove or obscure** the barcodes labels on the bottles
- Fill in a blue Microbiology request form with **legible** appropriate patient and clinical information:
  - a minimum of two unique patient identifiers,
  - date and time of sample,
  - patient location, consultant and contact details for results,
  - site of blood culture e.g. ‘Line culture – blue lumen’.
  **NB** If peripheral culture state ‘Peripheral culture’ & anatomical site e.g. ‘left antecubital fossa’)
- All blood culture episodes should be documented in the patient’s notes including:
  - Date and time taken
  - CVAD and lumen details and anatomical site (e.g. left antecubital fossa) for peripheral blood culture
  - Indication(s) for taking
- If the central line is removed, the last 4 cm should be snipped off into a sterile universal container using a pair of sterile scissors. The tip should then be sent to the laboratory for culture.
Appendix 12 - AUDIT – PARENTERAL FEEDING IN ADULTS

Date of Referral: [Date]
Day of Week: [Day]
Consultant: [Name]
AM or PM Request:
AM: [AM]
PM: [PM]

Indication for Parenteral Nutrition

☐ Not Documented

☐ Non functioning gut.

☐ Failure of enteral nutrition. Limited enteral tube feeding (in surgical/critical care patients). PN needed to supplement EN.

☐ No access for enteral nutrition.

☐ Post-op ileus.

☐ Obstruction.

☐ Perforated/leaking gut.

☐ Fistulae.

☐ Pre-op nutrition.

☐ Inaccessible GI tract.

☐ Intractable vomiting.

☐ Major surgery – GI tract expected to be unusable for 5-7 days.
Evidence that enteral nutrition been attempted

Evidence that enteral nutrition been considered

**Documented plan for duration of PN**

- Yes
- No

- 1-5 Days
- 6-8 Days
- 9-14 Days
- More

**Nutritional Assessment**

Did a Pharmacist assess the patient?  
Was this before the Parenteral Nutrition was given?

Did a Dietitian assess the patient?  
Was this before the PN was given?

Requirements documents in notes?

Is the patient a refeeding risk?
**Intravenous Access**

Site of line insertion:

Type of Line:  PICC  Acute CVC  Tunnelled Line

Was this line put in specifically for PN?

Yes  No

Is this the first line inserted for feeding?

Yes  No

Has the check x-ray results been documented (including PICC line tip position)?

Yes  No

No. of days line in situ at time of commencing PN?

1-4 Days  5-8 Days  9-12 Days  More

Is there evidence of Nursing Care Plan for line in situ.

Yes  No

Comment :-

_____________________________________________________________________

**Line Sepsis**

Yes  No

Blood cultures (BC) taken:

Peripheral BC:

Yes  No  Results:________________

Line BC:

Yes  No  Results:________________
**Monitoring**

During the last 24 hours, have the following been documented?

<table>
<thead>
<tr>
<th></th>
<th>Initial assessment:</th>
<th>On Completion:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Random Blood Sugar</td>
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<tr>
<td>4-6° Blood Sugar</td>
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<tr>
<td>Fluid Balance – Input/Output</td>
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<tr>
<td>U&amp;Es</td>
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During the last 7 days have the following been documented?

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<tr>
<th></th>
<th>Initial assessment:</th>
<th>On Completion:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Phosphate</td>
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<tr>
<td>Magnesium</td>
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<tr>
<td>Adjusted Calcium</td>
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<td>[ ]</td>
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<tr>
<td>Weight</td>
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<tr>
<td>MUST Completed</td>
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<td>[ ]</td>
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</table>

**PN Chart**

Has the correct/advised regimen been documented on the prescription chart?  

[ ] YES  [ ] NO

Has the PN prescription been signed for?  

[ ] YES  [ ] NO
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Number of days on PN</td>
<td></td>
</tr>
<tr>
<td>Enteral Feeding</td>
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<tr>
<td>Oral Feeding</td>
<td></td>
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<tr>
<td>RIP</td>
<td></td>
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<tr>
<td>PN related complications</td>
<td></td>
</tr>
</tbody>
</table>

*PLEASE SEND ALL COMPLETED FORMS TO LINDSAY WATKINS, SENIOR DIETITIAN, DIETETIC DEPARTMENT, ESH (EXT 6134)*
Appendix 13 - OUT OF HOURS ICU INITIATION OF PN

Date: Day of Week: Consultant:

**Malnutrition assessment (NICE 2006):**

- BMI of less than 18.5 kg/m²
- Unintentional weight loss greater than 10% within the last 3–6 months
- BMI of less than 20 kg/m² and unintentional weight loss greater than 5% within the last 3–6 months
- Eaten little or nothing for more than 5 days and/or are likely to eat little or nothing for 5 days or longer
- Poor absorptive capacity and/or high nutrient losses and/or increased nutritional needs from causes such as catabolism

**Indication for PN (please tick relevant box):**

- Non functioning gut.
- Failure of enteral nutrition (EN)/ PN needed to supplement EN
- Limited enteral tube feeding (in surgical/critical care patients).
- No access for enteral nutrition.
- Post-op ileus/ obstruction
- Perforated/leaking gut.
- Fistulae.
- Pre-op nutrition.
- Intractable vomiting.
- Major surgery – GI tract expected to be unusable for 5-7 days.

Other _______________________________________________________

**Enteral nutrition considered/attempted:** _______________________

**Planned duration of PN:** ________________________________
**Name of the strategy / policy / proposal / service function**

**PARENTERAL NUTRITION SUPPORT POLICY FOR ADULTS**

**Date last reviewed or created & version number.**

*New policy*

**1. Who is the strategy / policy / proposal / service function aimed at?**

Clinical staff involved in the assessment, selection, implementation and monitoring of patients receiving Parenteral Nutrition (P.N.).

**2. What are the main aims and objectives?**

This policy has been designed to assist staff in their assessment, selection, implementation and monitoring of patients receiving Parenteral Nutrition (P.N.).

**4. Consider & list what data / information you have regarding the use of the strategy / policy / proposal / service function by diverse groups?**

This policy is for adults only to any patients who need the procedure. Children needing this procedure would be treated at a specialist hospital Trust. The decision for 16-18 year olds would be on an individual basis depending on body habitus and underlying medical condition.

**5. Is the strategy / policy / proposal / service function relevant to any of the protected characteristics or human rights below?**

If *YES* please indicate if the relevance is **LOW, MEDIUM or HIGH**

**Low**

- The policy **may not be relevant** to the Equality General Duty* as stated by law
- Little or no evidence is available that different groups may be affected differently
- Little or no concern raised by the communities or the public about the policy etc when they are consulted – (recorded opinions, not lack of interest)

**Medium**

<table>
<thead>
<tr>
<th>Names of assessors carrying out the screening procedure (min of 2- author / manager and staff member / patient representative)</th>
<th>Name of lead author / manager &amp; contact number</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Kally Alexandropoulou (Author)</td>
<td>Kally Alexandropoulou x6781</td>
</tr>
<tr>
<td>• Sally Knight (Equality &amp; Engagement)</td>
<td></td>
</tr>
</tbody>
</table>

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*(Please return to Lindsay Watkins, Dietetic Dept, Ext 6134)*

**APPENDIX 13 - EQUALITY IMPACT ASSESSMENT**
The policy may be relevant to parts of the Equality General Duty* in the policy etc regarding differential impact.
- There may be some evidence suggesting different groups are affected differently.
- There may be some concern by communities and the public about the policy.

**High**
- There will be relevance to all or a major part of the General Equality Duty* in the policy regarding differential impact.
- There will be substantial evidence, data and information that there will be a significant impact on different groups.
- There will be significant concern by the communities and relevant partners on the potential impact on implementation of the policy etc.

<table>
<thead>
<tr>
<th>Protected Characteristics</th>
<th>Patient, their carer or family</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Disability</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Gender Reassignment</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Race/ Ethnic Communities / groups</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Religion or belief</td>
<td>?</td>
<td>NO</td>
</tr>
<tr>
<td>Sex (male female)</td>
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<td>NO</td>
</tr>
<tr>
<td>Sexual Orientation (Bisexual, Gay, heterosexual, Lesbian)</td>
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</tr>
<tr>
<td>Marriage &amp; Civil Partnership</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Pregnancy &amp; Maternity</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Human Rights</td>
<td>Yes, 2 &amp; 8</td>
<td>NO</td>
</tr>
</tbody>
</table>

6. What aspects of the strategy / policy / proposal / service function are of particular relevance to the equality strands? Religion or Belief- constituents of the nutrition to be checked. The right not to be tortured or treated in an inhuman or degrading way, the right to freedom of thought, conscience and religion.

7. Does the strategy / policy / proposal / service function relate to an area where there are known inequalities? If so which and how?

None known

8. Please identify what evidence you have used / referred to in carrying out this assessment. Discussion with clinical staff and authors

9. If you identify LOW relevance only can you introduce any minor changes to the strategy / policy / proposal / service function which will reduce potential adverse impacts at this stage? If so please identify here.

Check on constituents of nutrition for religion & belief.
1. Please indicate if a Full Equality Impact Assessment is recommended. (required for all where there is MEDIUM & HIGH relevance) NO

1. If you are not recommending a Full Equality Impact assessment please explain why.

The policy is based on national guidance (NICE 2006) and good practice, consideration to Human Rights Act 1998, Mental Capacity Act 2005 and Mental Health Act 1983

1. Signature of author / manager
2. Date of completion and submission

- **Human Rights**
  1. the right to life
  2. the right not to be tortured or treated in an inhuman or degrading way
  3. the right to be free from slavery or forced labour
  4. the right to liberty
  5. the right to a fair trial
  6. the right to no punishment without law
  7. the right to respect for private and family life home and correspondence
  8. the right to freedom of thought, conscience and religion
  9. the right to freedom of expression
  10. the right to freedom of assembly and association
  11. the right to marry and found a family
  12. the right not to be discriminated against
  13. the right to peaceful enjoyment of possessions
  14. the right to an education
  15. the right to free elections

**Change history**

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Author/Procedure Lead</th>
<th>Details of change</th>
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