Worcestershire Acute Hospitals NHS Trust

PARENTERAL NUTRITION GUIDELINES

This guidance does not override the individual responsibility of health professionals to make appropriate decision according to the circumstances of the individual patient in consultation with the patient and /or carer. Health care professionals must be prepared to justify any deviation from this guidance.

INTRODUCTION

This guideline has been developed to advise all healthcare professionals on aspects of parenteral nutrition delivery to patients. This includes reasons for PN, access routes, monitoring, complications, supply and administration along with contents of PN bags.

THIS GUIDELINE IS FOR USE BY THE FOLLOWING STAFF GROUPS:

Qualified Doctors, Qualified Nurses, Pharmacists, Dietitians

Lead Clinician(s)

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Approved by Nutrition Steering Group on:	8th January 2018
Approved by Medicines Safety Committee on:	30th April 2018
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Key amendments to this Document:

Date	Amendment	By:
March 2011	Inclusion of Parenteral Nutrition referral form Reference to NCEPOD report: PN A mixed bag (2010) Updated information on the supply of PN outside of Pharmacy opening hours Additional options for managing PN patients with liver dysfunction	KH
April 2013	Reference to Critical Care Nutrition Guidelines WHAT-CRI-006 Rewording of glutamine supplementation section Rewording of PN referral form	KH
May 2015	Additional reference to MDT assessment	
August 2017	Document extended for 6 months as per TMC paper approved on 22nd July 2015	TMC
December 2017	Sentence added in at the request of the Coroner	

December 2017	Document extended for 3 months as per TLG recommendation	TLG
March 2018	Document extended for 3 months as approved by TLG	TLG
June 2018	Document extended for 3 months as per TLG recommendation	TLG
November 2017 `	Additional information included from NICE guidance update 2017 • Inclusion of legal and ethical issues for consideration • Update to management of patients at risk of refeeding syndrome • Updated monitoring table	KH
3rd March 2020	Document extended until the end of October whilst under review	KH

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PARENTERAL NUTRITION GUIDELINES

INTRODUCTION REGARDING MALNUTRITION AND NEED FOR GUIDANCE

The need for guidelines in nutrition support

Malnutrition is a state in which a deficiency of energy, protein and/or other nutrients causes measurable adverse effects on tissue/body form, composition, function or clinical outcome. It is both a cause and a consequence of ill-health and is common in the UK. Since malnutrition increases a patient's vulnerability to ill-health, providing adequate nutrition support to patients with malnutrition should improve outcomes. Guidelines are therefore needed to emphasise the following:

1. Malnutrition is common

Many people who are unwell are likely to eat and drink less than they need. This impairment of food and fluid intake may be short-lived as part of an acute illness, or prolonged if there are chronic medical or social problems. If impaired food intake persists for even a few days, a patient can become malnourished to a degree that may impair recovery or precipitate other medical problems. This is especially true if the patient was malnourished before they became unwell.

2. Causes of malnutrition in hospital patients

- Reduced intake where patients physically cannot or will not eat enough e.g. dysphagia, oesophageal disease, unconsciousness, repeated fasting, nausea and vomiting.
- Increased requirements e.g. fever, major trauma, burns and major surgery
- increased losses and/or malabsorption e.g. in inflammatory bowel disease, high ileostomy output.

3. Malnutrition increases vulnerability to ill-health

The consequences of malnutrition include vulnerability to infections, delayed wound healing, impaired function of heart and lungs, muscle weakness and depression.

As a consequence people who are malnourished go to hospital more often for longer periods, and have higher complication and mortality rates for similar conditions. If poor dietary intake persists for weeks, the resulting malnutrition may be life-threatening in itself.

The objective of these guidelines is therefore to improve the practice of nutrition support by providing guidance to assist health care professionals to correctly identify and manage patients who require parenteral nutrition.

INDICATIONS FOR PARENTERAL NUTRITION (PN)

Parenteral nutrition (PN) should be used to prevent or treat malnutrition when the gastro-intestinal tract is unavailable for use or the intestinal function is inadequate.

PN should only be given when enteral nutrition has been considered, and excluded

Patients who cannot maintain adequate nutritional intake via the gut for:

- 3-5 days and are at high nutritional risk e.g.
  - a BMI of less than 18.5kg/m2
  - unintentional weight loss greater than 10% within the last 3-6 months
  - a BMI of less than 20kg/m2 and unintentional weight loss greater than 5% within the last 3-6months
  - hypercatabolic, septic, majoir trauma or under metabolic stress
- 7 days for patients at low nutritional risk

Remember some patients will need PN exclusively, but most patients should have a small amount of enteral nutrition also to maintain gut integrity.

Possible indications for PN are:

- Patients with severe inflammatory bowel disease.
- Intestinal atresia
- Radiation enteritis.
- Motility disorders such as scleroderma.
- Extreme short bowel syndrome.
- Patients with multi organ failure where nutritional requirements cannot be met by enteral nutrition alone.

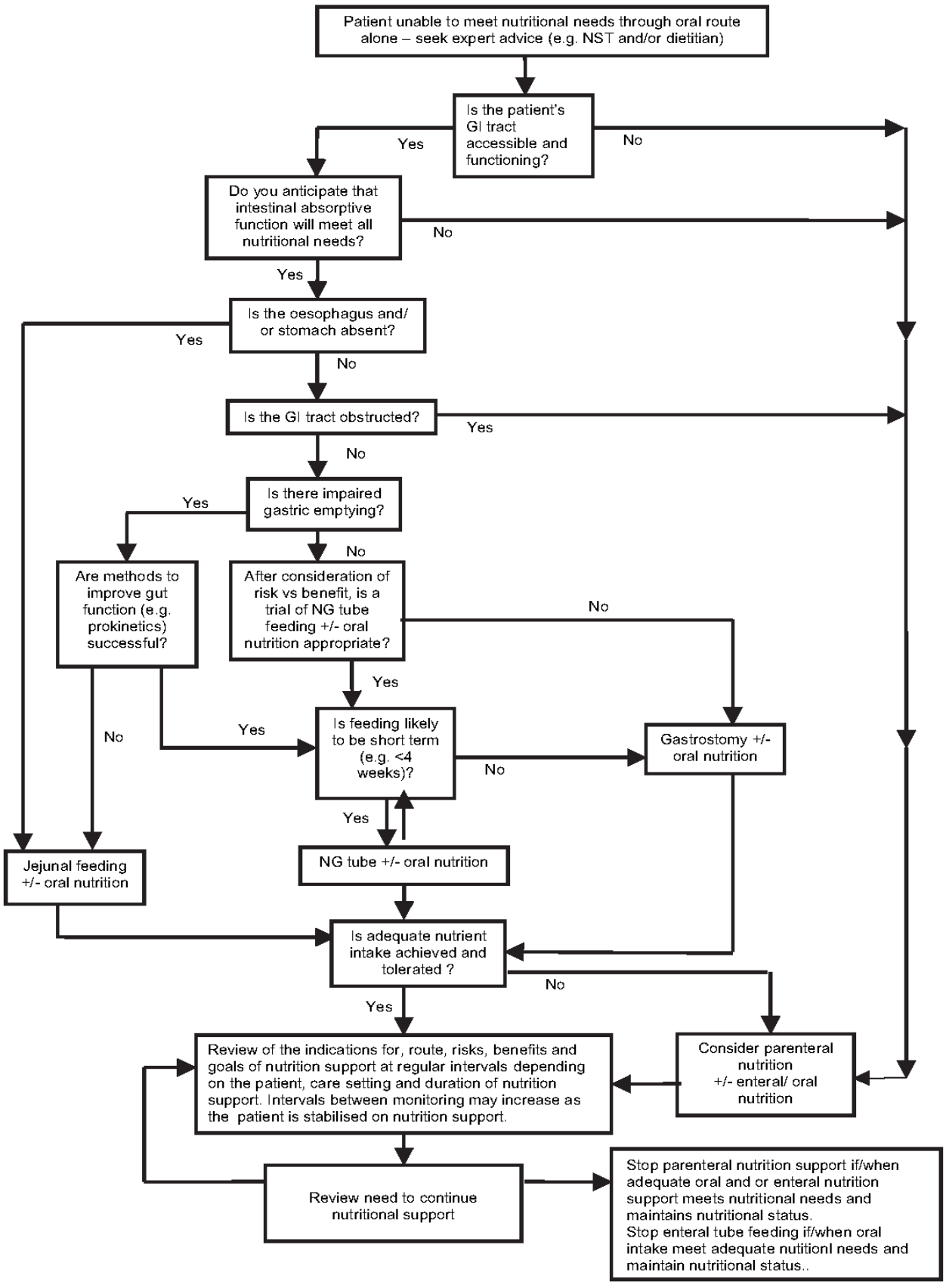
Lack of access for delivery of enteral nutrition to a functioning gastro-intestinal tract is not in itself an indication for PN. Every attempt must be made to gain access e.g. NG, NJ, PEG or PEJ tube in a timely manner to prevent further malnutrition.

Where the possibility exists that a patient may require PN this should be recognised early.

There is rarely, if ever, an indication to start adult PN out of normal working hours

NOTE – Albumin is not a good indicator of nutritional status or the effect of PN feeding. A low plasma albumin is *never* in itself an indication for parenteral nutrition.

If a patient does not have an intact and/or functional gastrointestinal tract, parenteral nutrition should be instituted within 7 days of their last meal. Critically ill patients may come to no harm if feeding is withheld for up to a week if the patient was previously nutritionally complete.



National Institute for health and Clinical Excellence: Nutrition support in adults Clinical Guideline 2006

Ethical and Legal issues

Healthcare professionals involved in starting or stopping nutrition support should:

- Obtain consent from the patient if he or she is competent
- act in the patient's best interest if he or she is not competent to give consent
- be aware that the provision of nutrition support is not always appropriate. Decisions on 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)

When such decisions are being made, the General Medical Council's treatment and care towards the end of life: decision making and the Department of Health's reference guide to consent for examination or treatment, second edition 2009 should be followed.

Healthcare professionals should ensure that people having nutritional support, and their carers, are kept fully informed about their treatment. They should also have access to appropriate information and be given the opportunity to discuss diagnosis and treatment options.

Patients who may require long term PN e.g. short bowel patients who will require home PN should be identified early and referred to a tertiary centre who are authorised to manage home PN patients. NB WAHT is only able to supply PN to wards within the acute trust.

NUTRITIONAL ASSESSMENT

The requirement for nutritional support should be recognized early. Please refer to the Trust Nutrition Screening Tool for identification and recommended action for patients at risk / with poor nutritional status.

The requirements for energy, nitrogen and most vitamins and minerals are quantitatively the same for both parenteral and enteral nutrition. These can be calculated on body weight and using the Parenteral and Enteral Nutrition Group (PENG) Guidelines. With parenteral nutrition, however, there are distinct differences in determining fluid and electrolyte balance. Consequently, the monitoring of these parameters is dependent on daily clinical opinion and biochemical monitoring.

The role of the medical team:

- Identify patients at risk of continuing nutritional compromise and refer appropriate patients for PN to the pharmacist/dietitian.
- Ensure appropriate ongoing monitoring including the required biochemical tests
- To work collaboratively with members of the Nutrition Support Team to ensure appropriate and effective nutrition support

The role of the dietitian therefore concentrates on:

- Take referrals for PN and assess the appropriateness of the use of PN in that patient.
- Initial assessment of PN requirements – recommend suitable parenteral nutrition formulations according to nutritional requirements and refeeding risk.
- Monitor patients receiving PN support with particular reference to biochemistry, signs of infection, fluid balance, and blood sugar levels and determining changes to PN regimen as necessary together with the pharmacist.
- The overseeing of the transition from PN to enteral nutrition.

- Assessment of each individual patient's nutritional status and requirements for enteral nutrition, once the gut can be used.
- Monitor patients receiving PN and determining any changes to the regimen as necessary
- Educate colleagues and ward staff in the dietetic aspects of PN

The role of the pharmacist:

- Take referrals for PN and assess the appropriateness of the use of PN in that patient.
- Advise on appropriate nutritional support (EN or PN) liaising with the dietitian and other members of the nutrition steering committee as necessary.
- Recommend suitable parenteral nutrition formulations e.g. electrolyte additions.
- Co-ordinate the supply of PN from Pharmacy.
- Advise on the administration of PN e.g. flow rate.
- Advise on the management of problems arising from parenteral feeding.

- Monitor patients receiving PN support with particular reference to biochemistry, signs of infection, fluid balance, and blood sugar levels and determining changes to PN regimen as necessary together with the dietitian.
- Educate colleagues and ward staff in the pharmaceutical aspects of PN.
- Provide advice and information to patients and their relatives regarding intravenous feeding.

ORDERING OF PN

- To start a patient on PN, complete a parenteral nutrition referral form (appendix 3) and contact either the clinical pharmacist for that ward or the pharmacy department. This should be as early as possible, but preferably no later than 11am to ensure same day initiation of patient specific PN (Monday to Friday).

- The medical team accept input from members of the Nutrition Support team to facilitate appropriate and safe use of parenteral nutrition

- The parenteral nutrition must be prescribed on the dedicated prescription chart (Service point order code WR1799) which is kept on the wards most likely to have parenterally fed patients (i.e. general surgery wards and Critical Care Units).

- Ideally, the decision on PN supply would rest with members of the nutrition steering team (usually a nutrition pharmacist and dietitian +/- nutrition lead consultant gastroenterologist), however in the absence of this team, the regime which is supplied will depend on:
    - Access for PN (peripheral administration limits the amount of calories and nitrogen in the feed).
    - Nutritional requirements (decision by pharmacist/ clinician/ dietitian). A patient should undergo a detailed nutritional assessment by a dietitian as soon as possible.
    - Electrolyte requirements from biochemical results.
    - Fluid requirements e.g. if fluid restricted.
    - Previous nutritional status- see re-feeding syndrome in complications of PN section (p16).

- The pharmacist will liaise with the clinician and dietitian on a regular basis as agreed between them to check requirements for the patient.
- It is essential that one team of clinicians takes responsibility for PN care of a patient. If there is dual responsibility for a patient, this must be agreed before beginning PN.
- The pharmacist retains the right after discussion with clinicians to veto the supply of PN for a patient.
- Vitamins (water and fat-soluble) and trace elements will be added to PN bags on a daily basis.

PROCEDURE FOR SUPPLY OF PN WHEN PHARMACY IS CLOSED

It should be noted that there is rarely, if ever, an indication to start PN outside of Pharmacy hours. Administration should be delayed until Pharmacy is able to supply a tailored PN regimen for the patient. In rare cases, PN bags are available on the Critical Care Units for these patients and may be used when Pharmacy is closed if it is deemed inappropriate to wait until Pharmacy is open.

NB Only refeeding bags are available and these contain standard amounts of vitamins and trace elements. Patients must be given additional vitamins prior to commencing parenteral nutrition in patients at risk of refeeding syndrome i.e. administer one pair of Pabrinex ampoules slow IV once a day.

Serum electrolytes should also be corrected prior to commencing PN. Refer to the 'Guideline for re-feeding syndrome' (WAHT-NUT-006). No additions must be made to the bag.

To prevent refeeding syndrome, start the feed at half rate i.e. give 50% of the patient's requirements for one or two days then full requirements thereafter. Refer to refeeding guideline detailed above.

Estimation of requirements

- The patient's energy and nitrogen requirements are based on body weight (kg) and calculated by the dietitian using the Schofield/Henry equation and PEN group guidance.
- At present, use Fresenius Kabiven PN bags, and refer to table below for "best fit regimens".
- These standard regimens will provide 20-30 kcal/kg body weight and a minimum of 1g protein (0.16 gN_2)/kg body weight.
- To prevent refeeding syndrome, patients will usually receive approximately 50% of their nutritional requirements for the first 24 to 48 hours with the rate of infusion increased as appropriate. For patients at high risk of refeeding syndrome lower initial rates of feed delivery will be advised. Please refer to Trust refeeding guidelines WAHT-NUT-006

Constituent	**Kabi refeeding**	**Kabiven 9**	**Kabiven 11**	**Kabiven 14**
IV route	Peripheral or central	Peripheral or central	Central only	Central only
Nitrogen (g)	5.14	9.0	10.8	13.5
Calories (non-protein) (Kcal)	541	1500	1600	2000
Volume (ml)	1065	2400	2053	2566
Sodium (mmol)	52.9	53	64	80
Potassium (mmol)	40	40	48	60
Calcium (mmol)	3.3	3.3	4	5
Magnesium (mmol)	6.8	6.7	8	10
Phosphate (mmol)	18.5	18	20	25
Patient weight 'best fit' (guide only)	**All patients at risk of refeeding syndrome**	<55kg	55-70kg	>70kg

Provision of Nutrients in PN solutions

- Energy, as carbohydrate (glucose) and fat (lipid emulsions) are used
- Nitrogen – a solution of essential and non-essential amino acids is used (Glutamine is 'conditionally essential' during trauma/stress and is supplemented in critically ill patients refer to appendix 1)
- Micronutrients – these are added to PN solutions aseptically in Pharmacy
- Electrolytes – sodium, potassium, calcium, magnesium can be tailored to patient requirements
- Vitlipid – fat soluble vitamins A, D2, E and K.
- Solvito – Water-soluble vitamins B1, B2, B6, B12, nicotinamide, biotin. pantothenic acid, folic acid, ascorbic acid.
- Addiphos – concentrated source of phosphate

The patient should receive vitamins and trace elements every day (hence need to inform pharmacy before 11am) If the patient receives 50% of their nutritional requirements on day one of PN, additional vitamins and trace elements should be included in the PN bag (referred to as 'double') to ensure that the patient receives the full requirement in the first 24 hours. Stability advice from Fresenius Kabi is detailed below.

Day one of PN if giving 50% of formulation

Constituent	Kabiven 9	Kabiven 11	Kabiven 14
Solivito	2 Vials	2 Vials	2 Vials
Vitlipid N Adult	20ml	20ml	20ml
Additrace	20ml	15ml	20ml

Alternatively a 'refeeding bag may be used as deemed appropriate by the NST.
This contains one pair of pabrinex ampoules and:

Constituent	Refeeding
IV route	Peripheral or central
Nitrogen (g)	6
Calories (non-protein) (Kcal)	900
Volume (ml)	1500
Sodium (mmol)	58.9
Potassium (mmol)	60
Calcium (mmol)	3
Magnesium (mmol)	10.1
Phosphate (mmol)	26.5

CHOICE OF ACCESS FOR PN

General Principles

ALWAYS USE A DEDICATED LINE

ALWAYS OBSERVE STRICT ASEPTIC TECHNIQUE

ALWAYS FOLLOW TRUST PROTOCOLS FOR INSERTION AND CARE OF VASCULAR DEVICES

- When using single lumen parenteral nutrition catheters, use only for the PN i.e. no other fluids, drugs or blood sampling through the same line.
- For multi lumen catheters, use one designated port for PN and do not use for other fluids, drugs or blood sampling.
- Use a new or previously unused line for PN. If there are no new/unused lines available, insert a new line.
- Use single lumen catheters wherever possible.
- Do not use the line for taking blood samples.
- Do not use of three way taps on the line.

Choice of Catheter

- Small canula (18FG) inserted into a peripheral vein may be used **only use when insertion of a midline catheter is not possible**. Attach a short extension set. Re-site every 72 hours as per Trust policy (Policy for the Administration of Intravenous Medication) and assess site and phlebitis score daily.
- A **mid-line** device i.e. fine bore catheter inserted into a vein in the antecubital fossa such as a nutri line 15cm, 23G catheter. These are appropriate for use when feeding is to continue for no more than 2 weeks. Do not use when the patient is likely to have high nutritional requirements or fluid restriction as high osmolarity bags can not be used through these lines.
- **Central venous catheter**. This should be wherever possible a tunnelled line, dedicated to PN feeding. Appropriate for use when:-
    - PN is expected to continue for more than 2 weeks
    - Peripheral access is not possible
    - Unusual needs e.g. marked fluid restriction
    - In need of high amount of calories or nitrogen.
    - Patients who already have a central line in situ e.g. Critical Care patients

LINE INSERTION AND CARE

Peripheral Line

Use a small 18FG canula. Cover with a sterile adhesive dressing. Change the site every 72 hours as per Trust Policy and assess site and phlebitis score daily.

The application of a GTN 5mg patch distal to the catheter insertion site (fingertip side) may be considered to prevent phlebitis, but is generally not required. Beneficial evidence for this is not conclusive. If used, prescribe the GTN patch on the drug chart and replace the patch every 2 days.

Central Line

A central line should be used for longer term feeding e.g. >7 days. The line must be a single lumen line dedicated to PN feeding. This line should ideally be a tunnelled line inserted using a strict aseptic technique.

ADMINISTRATION OF PN

- PN must be prescribed before administration.
- Before attaching the PN to the patient, check the following:-
    - Prescription
    - Patient name
    - The unit number and date of birth- if stated on the bag
    - The date of administration- if stated on the bag
    - The expiry date on the bag
    - Route of administration (i.e. central or peripheral)
    - Site and line for administration
- Gently shake the bag (the bag should look smooth i.e. no separation of the bag- if in any doubt, contact the pharmacist).
- Attach the bag to the dedicated feeding line using **strict aseptic technique.**
- Always use a volumetric pump, setting the rate as detailed on the PN bag.
- Do not speed up the rate of the PN if the bag is running late, but do inform your ward clinical pharmacist on the next working day.
- On the intravenous infusion chart, record the time and date the PN started.
- Complete infusion rate on the fluid balance chart.
- PN bag and giving set must be changed every 24 hours, unless otherwise agreed.
- If the bag is detached from the patient for any reason e.g. re-siting of a line, never re-attach the same bag. Prescribe intravenous fluids to maintain hydration until the next bag of PN is available.
- If 50% of the bag is prescribed, discard the remaining feed after 24 hours.

MONITORING OF PATIENTS ON PN

- See below for table of recommended monitoring of biochemical and other parameters.
- Where possible, take blood samples first thing in the morning to allow results to be available in time for manufacture/supply of PN. Please mark these samples as urgent for new PN patients or those with any biochemical derangement.
- **Monitor blood sugars minimum every 8 hours initially then every 12 hours. If:-**
  - Gradual onset of hyperglycaemia, prescribe sliding scale of actrapid insulin.
  - BM reads above 20mmol/l, stop PN until under control even if on insulin infusion.
- **Monitor and maintain good oral care whilst on PN**
- Weigh the patient before commencing PN and at least weekly whilst the patient is receiving PN support.

Weekend Monitoring

It is not possible to change content of PN bags over a weekend. If a patient's blood results are unstable or their condition changes such that electrolyte requirements may significantly change, blood levels should be checked and if necessary PN stopped. This decision should be made by the doctor in charge of that patient. The patient should be maintained on fluids until PN can be re-formulated on the next working day.

Monitoring Parameter	Frequency	Rationale	Interpretation
Sodium, potassium, urea, creatinine	Baseline, daily until stable, then 1 or 2 times a week	Assessment of renal function, fluid status, and Na and K status	Interpret with knowledge of fluid balance and medication. Urine sodium may be helpful in complex cases with gastrointestinal fluid loss
Glucose	Baseline, 1 or 2 times a day (or more if needed) until stable, then weekly	Glucose intolerance is common	Good glycaemic control is necessary
Magnesium, phosphate	Baseline, daily if risk of refeeding syndrome, 3 times a week until stable, then weekly	Depletion is common and under recognised	Low concentrations indicate poor status
Liver function tests including International Normalised Ratio (INR)	Baseline, twice weekly until stable, then weekly	Abnormalities common during parenteral nutrition	Complex. May be due to sepsis, other disease or nutritional intake
Calcium, albumin	Baseline, then weekly	Hypocalcaemia or hypercalcaemia may occur	Correct measured serum calcium concentration for albumin. Hypocalcaemia may be secondary to Mg deficiency. Low albumin reflects disease not protein status
C-reactive protein	Baseline, then 2 or 3 times a week until stable	Assists interpretation of protein, trace element and vitamin results	To assess the presence of an acute phase reaction (APR). The trend of results is important
Zinc, copper	Baseline, then every 2–4 weeks, depending on results	Deficiency common, especially when increased losses	People most at risk when anabolic. APR causes Zn ↓ and Cu ↑
Selenium	Baseline if risk of depletion, further testing dependent on baseline	Se deficiency likely in severe illness and sepsis, or longterm nutrition support	APR causes Se ↓. Long-term status better assessed by glutathione peroxidase
Full blood count and MCV	Baseline, 1 or 2 times a week until stable, then weekly	Anaemia due to iron or folate deficiency is common	Effects of sepsis may be important
Iron, ferritin	Baseline, then every 3–6 months	Iron deficiency common in longterm parenteral nutrition	Iron status difficult if APR (Fe ↓, ferritin ↑)
Folate, B12	Baseline, then every 2–4 weeks	Iron deficiency is common	Serum folate/B12 sufficient, with full blood count
Manganese	Every 3–6 months	Excess provision	Red blood cell or whole

POSSIBLE COMPLICATIONS OF PN & MANAGMENT

Nutrition Related Complications

RE-FEEDING SYNDROME

Hyperglycaemia and electrolyte imbalances can occur in patients receiving parenteral nutrition following a period of malnutrition (>5 days without feed).

Action: Refer to 'Guideline for re-feeding syndrome' (WAHT-NUT-006)
Start feed at half rate i.e. give 50% of requirements for one or two days, then full requirements thereafter. (In extreme cases, the starting rate may need to be reduced to less than 50% of requirements over 24 hours and the feed rate may need to be increased over a period of up to 7 days)
Supplement electrolytes as needed.
Ensure adequate vitamin B intake before starting feed (e.g. with IV Pabrinex or oral thiamine 200mg od and Vit B co strong 1 tds)
Prescribe sliding scale insulin for patients with diabetes or impaired glucose tolerance.

The reverse may also occur with hypoglycaemia being caused by stopping parenteral feeding too quickly.

Action: Halve the rate of PN administration on the last day.

OVER FEEDING

This may occur when parenteral nutrition exceeds the patients' nutritional requirement. Signs of overfeeding include raised plasma glucose and urea.

Action: Reduce the protein and glucose content of the PN regimen in discussion with a dietitian.

PLASMA TURBIDITY/LIPAEMIA

This indicates that a patient's capacity to eliminate fat may be impaired.

Action: Reduce or delay the infusion of lipid and consider changing lipid formulation.

FLUID IMBALANCE

This is a common complication and can result in dehydration or fluid overload.

Action: Measure and record all fluid losses and/or weigh the patient daily. Allowing for insensible losses, balance fluid input with output.

ELECTROLYTE IMBALANCE

Action: Adjust composition of PN solution.

LIVER DYSFUNCTION

Rises in liver enzymes may occur, they are usually benign, reversible and self limiting.

Action: If liver enzymes continue to rise, one or more of the following may be adopted:
Cyclical feeding i.e. giving feed over 18 hours to allow a "feed free time"
Use of fat free PN regimen
Changing the lipid used within the regimen.

Catheter Related Complications

THROMBOPHLEBITIS

A common complication with peripherally administered PN. Signs and symptoms include pain and erythema at the site of infusion. Prevention of thrombophlebitis is addressed in section III Delivery Technique.

Action: Remove line and re-site a new catheter.
The application of a GTN 5mg patch distal to the catheter insertion site may be considered, but beneficial evidence for this is not conclusive.

CATHETER OCCLUSION

May be due to line kinking, luminal deposits of lipid sludge or thrombosis.

Action: Perform chest x-ray to check line position. Providing the position is satisfactory, flush the line with 10ml of 20% ethanol solution. If lipid sludge is suspected, allow 3ml 70% ethanol injection to dwell in the catheter for one hour.

FIBRIN OCCLUSION

Action: Urokinase may be used to dissolve the occlusion.

CENTRAL VEIN THROMBOSIS

Central vein thrombosis may occur after several weeks of treatment.

Action: Confirm diagnosis by venography; refer to Trust policy on Central Venous Catheter line care management. Consider early use of thrombolytic therapy.

Catheter Related Infections

EXIT SITE INFECTION

Defined as erythema around or pus exuding from the central line exit site. Blood cultures are negative and there are no signs of systemic sepsis.

Action: Confirm diagnosis by sending line swab and peripheral/through line blood for culture.
Treat empirically with a single dose of flucloxacillin 1g (or vancomycin 1g if penicillin allergic or MRSA infection suspected e.g. patient known to be colonised with MRSA). Amend therapy if required once culture results are available.
Clean daily with Chlorhexidine in 70% alcohol as in trust CVC policy (use povidone iodine solution for patients sensitive to chlorhexidine).
Remove the catheter if there is evidence of progression of infection. Removal may also be required to control infection with the following organisms:

- Staphylococcus aureus (including MRSA)
- Co-agulase negative staphylococci
- Pseudomonas sp. and other Gram negatives
- Mycobacterium sp.
- Fungi (including Candida sp.)
- Glycopeptide-resistant enterococcus (GRE)

(NB the line may be salvaged by surgical incision and drainage)

Intraluminal therapy (antibiotics "locks") may be indicated for localised catheter related infection, which does not involve the above-mentioned microorganisms. They should not be used if there is evidence of progression to systemic sepsis, septic thrombophlebitis or septic emboli. In rare cases the salvaging of precious lines in patients with poor venous access may be indicated. The use of antibiotic "locks" must be discussed with the Consultant Microbiologist prior to use.

TUNNEL INFECTION

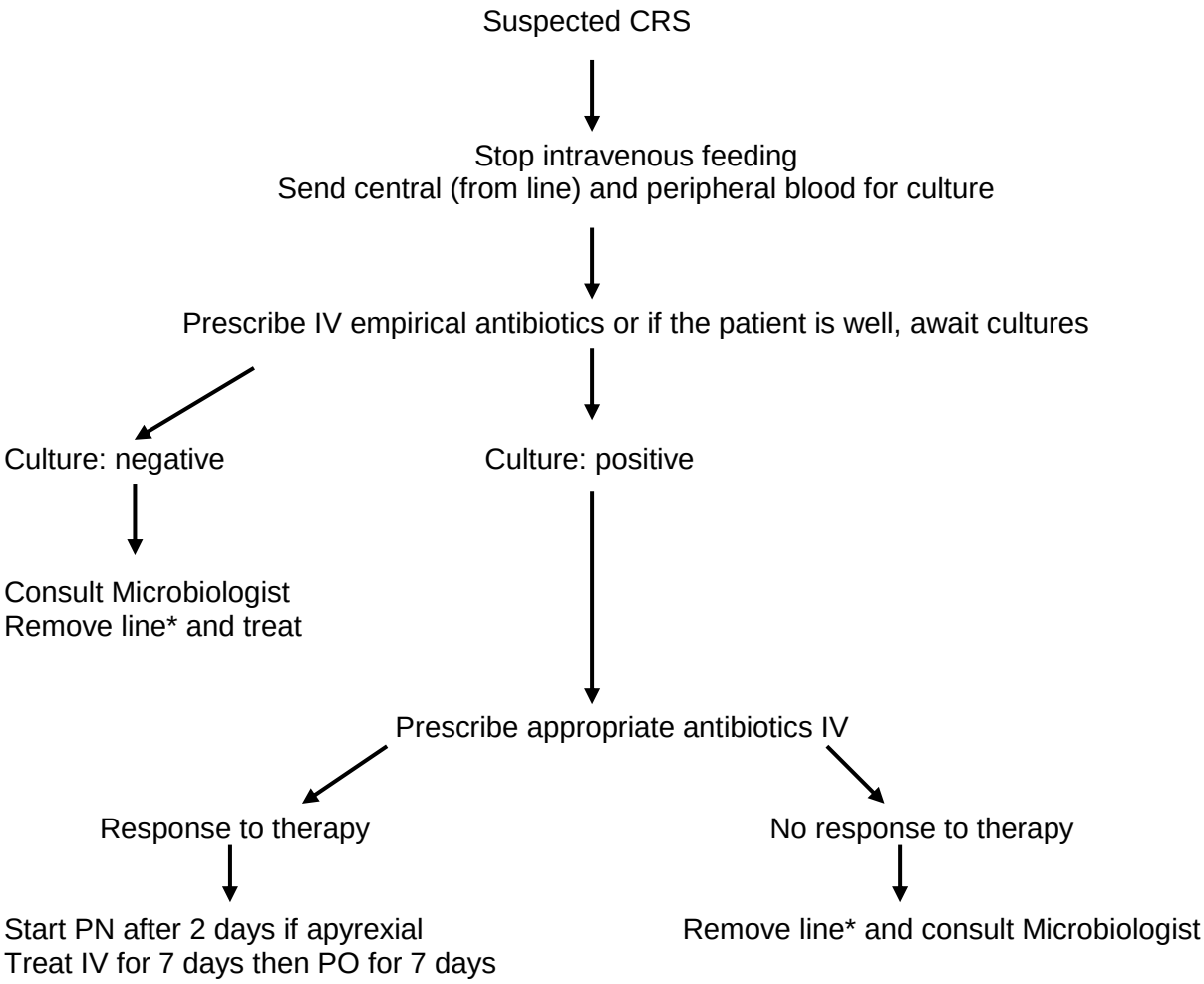
Defined as erythema and tenderness overlying a subcutaneous tunnelled catheter. Blood cultures are usually negative and there are no signs of systemic sepsis.

Action: Confirm diagnosis by sending central (through line) and peripheral blood for culture.
Treat empirically with flucloxacillin 1g (or vancomycin 1g if penicillin allergic or MRSA infection suspected e.g. patient known to be colonised with MRSA) Administer intravenously for up to two days and then orally, if possible, with flucloxacillin 500mg qds (or erythromycin 500mg qds, or antimicrobials with activity against MRSA if appropriate) for 10-14 days or until resolution of the infection.
Modify antibiotic choice according to isolates.
If there is no clinical improvement within 7 days of treatment, treat as for catheter related sepsis.

CATHETER RELATED SEPSIS (CRS)

Defined as clinical sepsis with positive blood cultures in the absence of infection elsewhere (e.g. chest, urinary tract etc.). CRS is difficult to diagnose and all possible causes of sepsis should be considered. CRS is confirmed when blood cultures yield the same organism as culture from the tip of the removed central line.

Action:



*Consider each case on an individual basis. In patients with poor venous access, salvaging precious lines may be indicated through the use of 'line lock' and/or systemic antibiotic therapy, consult microbiologist.

Empirical choice of antibiotics

Flucloxacillin 1g qds iv and 'extended interval' gentamicin iv (see antibiotic guidelines for dosage calculation and monitoring recommendations). If the patient is allergic to penicillin, or MRSA infection is suspected e.g.patients known to be colonised with MRSA, use gentamicin and vancomycin or teicoplanin (care in impaired renal function). Amend therapy if required once culture results are available.

TERMINATION OF PN

Parenteral nutrition should not be terminated until oral or enteral tube feeding is well established or if it has been deemed inappropriate to continue PN if the patient is dying. The patient needs to be taking a minimum of 50% of their nutritional requirements (as assessed by the dietitian) via the enteral route. It is important that all members of the multidisciplinary team are involved in the decision to terminate PN. It is advised to reduce the rate of the last bag of PN to half (i.e. 50% of the bag is given on the last day).

PN CHECKLISTFOR NURSING STAFF

(For further detail refer to main PN policy)

Use dedicated feeding line only for PN.

Don't add anything to PN bags, put anything through same line or take blood samples through the dedicated line.

If the patients condition has changed significantly since PN was ordered, contact Dr to check if still appropriate e.g. fluid balance or U&Es.

ADMINISTRATION

If stated-Check name, unit no, DOB, date of admin and expiry on bag.

Gently shake the bag before giving.

Use a volumetric pump to administer PN.

Write the time and date PN started on prescription chart.

MONITORING

Monitor blood sugars minimum 8 hourly.

Keep accurate fluid balance.

Measure core temperature daily and respiration and pulse 6 hourly.

REMEMBER

Use strict aseptic technique.

Monitor and record daily observations of exit site/tunnel for infection/inflammation as per trust policy.

Never speed up the rate of PN from that prescribed. (NB rate of infusion may be slowed with advice from pharmacy).

Change bag and giving set every 24 hours unless otherwise agreed.

If bag is detached, never re-attach the same bag. Discard the remaining solution.

PN CHECKLIST FOR MEDICAL STAFF

Wherever possible use the gastrointestinal tract for feeding.

Use dedicated feeding line only for PN.

Ensure that insertion details of line / cannula is recorded in the patient's medical notes or Trust peripheral vascular device record sheet.

Don't add anything to PN bags or put anything through same line.

Don't take blood through the same line.

If possible maintain a small amount of oral / enteral intake whilst on PN Refer to the dietitian.

If patients condition has significantly changed since PN was ordered consider if PN is still appropriate e.g. fluid balance, U&E's, oral intake.

Consider the risk of refeeding syndrome and manage appropriately (refer to Trust guideline WAHT-NUT-006)

ORDERING

Complete the PN referral form and contact pharmacy/dietitian ASAP when PN is indicated.

Out-of pharmacy hours – consider need (can the start be delayed?) Refer to and prescribe on dedicated parenteral nutrition prescription chart.

ADMINISTRATION

See main policy for choice of line.

Avoid using a venflon for feeding - See main policy.

Prescribe the PN on the designated prescription chart.

MONITORING

See table for monitoring needed before starting PN.

Mark all biochem requests as URGENT- PATIENT ON PN.

Request blood samples for the morning.

See attached table for suggested monitoring.

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APPENDIX 1:

GUIDANCE ON THE USE OF GLUTAMINE SUPPLEMENTATION IN PN

Glutamine levels are reduced during critical illness and catabolic states such as sepsis. Supplementation may improve gut mucosal atrophy and permeability, possibly leading to reduced bacterial translocation. Other potential benefits are enhanced immune cell function, decreased pro inflammatory cytokine production, and higher levels of glutathione and antioxidative capacity. However, although some studies have demonstrated a reduction in infective complications, a faster recovery of organ dysfunction and reduced mortality, this has not been demonstrated in all studies and further evidence is needed.

Criteria for supplementation

- Critically ill patients with sepsis or major trauma who are on the Critical Care Units at WRH or AH and who are likely to require parenteral nutrition for at least 5 days

Contraindications

- Severe renal impairment (creatinine clearance <25ml/min)
- Severe hepatic impairment
- Severe metabolic acidosis.

Dose of Glutamine

There is no established optimum dose for parenteral glutamine supplementation, but evidence suggests that a dose of 1.5-2.5ml/kg body weight of Dipeptiven (equivalent to 0.3g to 0.5g N_2 L-alanine-L-glutamine per kg body weight per day) achieves a greater effect than a lower dose. It is therefore proposed to give glutamine based on patient weight as detailed below. Seriously ill patients with gastrointestinal failure receiving parenteral nutrition should probably receive glutamine supplementation for at least 6 days to derive maximum benefit. Duration should not exceed 3 weeks.

Glutamine will be incorporated into the standard parenteral nutrition regimens prepared / ordered by pharmacy for patients satisfying the above criteria.

Estimated weight (kg)	Dose of Dipeptiven® (N2 L-alanine-L-glutamine)
Less than 60 or with renal impairment	100mls (20g)
60 - 100	150ml (30g)

Nitrogen level calculation

When calculating nitrogen requirements, only Alanine content should be taken into account. Alanine accounts for 1.2g of Nitrogen in 100mls Dipeptiven® therefore if this is added to a 9gN regimen, the total amount of Nitrogen can be interpreted as providing 10.2gN in total.

APPENDIX 2:

MINIMUM MONITORING OF PATIENTS BEFORE STARTING AND DURING TPN ADMINISTRATION

BASE LINE- BEFORE STARTING TPN	MONITOR DAILY THROUGHOUT	MONITOR DAILY UNTIL STABLE	MONITOR TWICE WEEKLY THROUGHOUT	MONITOR WEEKLY THROUGHOUT	ONCE STABLE MONITOR 2-3 TIMES A WEEK
Sodium Potassium Urea Creatinine Phosphate Magnesium Calcium Glucose Liver function Serum albumin Total protein Full blood count Zinc Triglycerides Folate Vitamin B12	Fluid balance Enteral nutrition intake Temperature Pulse Respiration Glucose (8 hourly initially then daily)	Sodium Potassium Urea Creatinine Phosphate Magnesium	Liver function Serum albumin Calcium Full blood count Weight (if poss)	Triglycerides Zinc Other trace elements if on long term feeding-longer than 4 weeks (Selenium, Molybdenum, Chromium, Copper)	Sodium Potassium Urea Creatinine Phosphate Magnesium

Worcestershire Acute Hospitals NHS Trust

Please attach patient sticker here or record:

Name:.....
NHS No:
Hosp No:
D.O.B:..... Male Female
Consultant:..... Ward:.....

Worcestershire NHS
Acute Hospitals NHS Trust

REQUEST AND CHECKLIST FOR PARENTERAL NUTRITION (PN)

Patient main diagnosis……

Please confirm indication for parenteral nutrition (PN)	Yes	No	Advice
	Please tick		
1. Will intestinal absorptive function meet the patient's nutritional needs?			Only if no is answered for both questions will PN be indicated (move on to question 4)
2. Is it expected that enteral nutrition will meet the patient's requirements within 5 days?			
3. If yes answered for Q1 and the patient is unable to swallow, can access be gained for enteral nutrition (e.g. NG, NJ, PEG tube as appropriate)			If yes, PN is not indicated and enteral feeding should be commenced.
4. Have a full set of bloods been taken in the last 24 hours? (U&Es, LFTs, calcium, magnesium and phosphate)			If no, must be done (and corrected*) prior to commencement of PN

*Please refer to Guideline for the management of re-feeding syndrome WAHT-NUT-006

Aid to choice of PN regimen	Yes	No	Advice
	Please tick		
5. Does the patient have a clean, unused CVAD (central venous access device) lumen?			If no, new CVAD must be placed for PN
6. Is PN likely to be required for < 2 weeks?			
If PN is likely to be required for > 2 weeks, peripheral access may be suitable in the short term but may result in the patient not meeting nutritional requirements. Recommend CVAD placement.			

The medical team accept input from members of the Nutrition Steering Committee or their delegated representatives (for pharmacists/dietitians) to facilitate appropriate and safe use of parenteral nutrition support.

Signature of Requesting Doctor……..…. Print:……..……

Designation……..……..... Bleep……. Date…….....…

On completion – contact the ward pharmacist to ensure your request is dealt with promptly (refer to ward notice board for bleep numbers). Please refer to a dietitian for a full nutritional assessment. Requests must be received by a pharmacist BEFORE 11am to ensure same day supply of patient specific PN

CONTRIBUTION LIST

Key individuals involved in developing the document

Name	Designation
Keith Hinton	Clinical Pharmacy Team Lead
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Rachel Montgomery	Chief Pharmacist Clinical Services
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Mr Makar	Consultant Urologist
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Circulated to the following CD's/Heads of dept for comments from their directorates / departments

Name	Directorate / Department
Mr Graham James	Divisional Medical Director Surgery
Dr Antony Scriven	Divisional Medical Director Medicine
Dr Julian Berlet	Divisional Medical Director TACO

Circulated to the chair of the following committee's / groups for comments

Name	Committee / group
Alan Catterall	Director of Pharmacy
Alison Smith	Medicines Optimisation Committee

Monitoring Tool

This should include realistic goals, timeframes and measurable outcomes.

How will monitoring be carried out?

Who will monitor compliance with the guideline?

Page/ Section of Key Document	Key control:	Checks to be carried out to confirm compliance with the policy:	How often the check will be carried out:	Responsible for carrying out the check:	Results of check reported to: *(Responsible for also ensuring actions are developed to address any areas of non-compliance)*	Frequency of reporting:
	WHAT?	**HOW?**	**WHEN?**	**WHO?**	**WHERE?**	**WHEN?**
8, 14	Management of refeeding syndrome	Audit of compliance with trust guideline WAHT-NUT-006	Once a year	Pharmacy/Dietetics	Nutrition and Hydration Steering committee	Once a year
15-17	Complications relating to intravenous catheters	Survey/audit	Once a year	Nutrition support team	Nutrition and Hydration Steering committee	Once a year

Supporting Document 1 - Equality Impact Assessment Tool

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

		Yes/No	Comments
1.	**Does the policy/guidance affect one group less or more favourably than another on the basis of:**		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Transgender	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
	• Disability - learning disabilities, physical disability, sensory impairment & mental health problems	No	
2.	**Is there any evidence that some groups are affected differently?**	No	
3.	**If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?**	N/A	
4.	**Is the impact of the policy/guidance likely to be negative?**	No	
5.	**If so can the impact be avoided?**	N/A	
6.	**What alternatives are there to achieving the policy/guidance without the impact?**	N/A	
7.	**Can we reduce the impact by taking different action?**	N/A	

If you have identified a potential discriminatory impact of this key document, please refer it to Human Resources, together with any suggestions as to the action required to avoid/reduce this impact.

For advice in respect of answering the above questions, please contact Human Resources.

Supporting Document 2 – Financial Impact Assessment

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

	Title of document:	Yes/No
1.	Does the implementation of this document require any additional Capital resources	No
2.	Does the implementation of this document require additional revenue	No
3.	Does the implementation of this document require additional manpower	No
4.	Does the implementation of this document release any manpower costs through a change in practice	No
5.	Are there additional staff training costs associated with implementing this document which cannot be delivered through current training programmes or allocated training times for staff	No
	Other comments:	

If the response to any of the above is yes, please complete a business case and which is signed by your Finance Manager and Directorate Manager for consideration by the Accountable Director before progressing to the relevant committee for approval