Nutritional Protocol for Blood and Bone Marrow Transplantation (BMT)

Scope
This protocol details pre, during and post BMT nutritional assessment and management for all forms of BMT undertaken by OxBMT, and incorporates dietary management of gut GvHD.

Pre transplant

Assessment: by Transplant Support Nurse
- MUST score - If MUST score 2 or more, immediate referral to Dietitian for advice on optimising nutritional status
- Assess factors that could affect dietary intake

Information to be given on:
- Possible side effects of BMT that can decrease oral intake
- Dietary restrictions advised once neutropenic (i.e. neutrophil count <0.5x10^9/L)
- Suitable foods to bring into hospital, and what foods are available on the unit
- Possible routes for feeding. Myeloablative transplant patients to be advised on NG insertion Day +3 or earlier and possible TPN

Advice given
- If underweight or not meeting nutritional requirements, advice given aiming to optimise nutritional status
- Nutritional supplements to be given if appropriate

Transplant admission

Assessment
- MUST assessment on admission, and then weekly by Ward Nurse or Nutrition Assistant (for further information, see MUST on Clinical Intranet under Dietetic referrals)
- Regular weights (twice weekly minimum)– take fluid retention into account
- Regular assessment of nutritional intake. Food record charts as appropriate. Compare with requirements
- Monitor nausea and vomiting, diarrhoea, mucositis, dry mouth, anorexia and taste changes
- Serum biochemistry and haematology, bowel function
- Fluid balance if receiving enteral or parenteral feeding
- Nitrogen balance for TPN fed patients

Advice given on:
- Importance of optimising nutrition
- Minimising side effects of BMT
- Food safety and avoiding high risk foods
• Altering texture of foods as appropriate
• Food fortification when intake sub-optimal
• Suitable nutritional supplements as appropriate

For artificial feeding see feeding flow charts

Foods and facilities to be available on unit
• All transplant patients to have access to a fridge
• Facilities for making simple, suitable snacks and drinks
• Choice menu to include 2-3 hot main courses and suitable sandwich. Soft and pureed meals available. Cooked breakfast available if MUST score 2 or more
• Therapeutic diets provided as necessary
• Between meal snacks
• Selection of tinned foods, bread, toast, cereals, hot drinks, milk, milk shakes available on unit at all times
• A variety of sip feeds and other nutritional supplements
• Nutritious cocktails
• All the above to be suitable for neutropenic patients

Discharge and follow up

Advice given for home on:
• Food frequency, food fortification, food textures and nutritional supplements, as appropriate
• Multi vitamin and mineral to be prescribed unless oral intake is very good
• Home enteral feeding if appropriate
• Neutropenic diet until neutrophils $>$0.5 x10$^9$/L, then good food handling and avoid very high risk foods whilst neutrophils $<$2.0 x10$^9$/L or on immuno suppression

Follow up post discharge
• Dietitian to review Allogeneic transplant patients where possible at 2 weeks, 1 month, 2 months, 3 months, and for myeloablative transplants 6 months post discharge, or more frequently if problems arise
• Patients to be weighed at each visit and weight plotted on graph to enable trends in weight change, % weight loss and whether underweight to be easily seen. Consider using grip strength monitoring and measuring micronutrients for patients with MUST score of 2 or more
• If follow up is required for Autologous patients, liaise with referring hospital
Myeloablative Allogeneic BMT feeding flow chart

- NG tube (preferably 10fr) to be placed day +3, or earlier if oral intake is <50% of requirements for 3 consecutive days
- Give 1 unit of platelets prior to insertion of NG if platelets < 50
- 10mg Metoclopramide tds or 50mg Cyclizine tds, prior to NG insertion and whilst in situ

Is patient meeting requirements orally?

- Flush tube with 50ml sterile water bd
- Consider the following:
  - Diarrhoea:
    - Do not stop feed
    - Record bowel action
    - Culture stool specimen
    - Review medication/clinical condition
    - Consider additional fluid and electrolytes
    - Consider antidiarrhoeal agents if non-infective cause
    - If diarrhoea continues consider ↓ feed rate or use alternative feed
    - If diarrhoea continues, consider TPN
  - Vomiting:
    - Review antiemetics
    - Review medication/clinical condition
    - Consider ↓ feed rate
    - If vomiting severe and doesn’t respond to above, or tube is vomited x3 consider NJ tube or TPN

Is patient tolerating feed?

- Increase feed rate to 75ml/hour for 20 hours, then rest 4 hours
- Increase feed to individualised regimen as prescribed by dietitian

As oral intake increases, feed to be gradually reduced
Once mucositis resolved and close to meeting requirements orally, NG tube may be removed

Unable to pass NG tube:
Consider TPN
Autologous and RIC Allogeneic BMT feeding flow chart

Oral intake <50% of requirements for 3 consecutive days 
OR 10% loss in body weight 
Plus unlikely to improve in next 5 days

• NG tube to be passed 
• Give 1 unit of platelets prior to insertion of NG if platelets < 50 
• 10mg Metoclopramide tds or Cyclizine 50mg tds, prior to NG insertion and whilst in situ 
• Consider refeeding risk. See refeeding guidelines on Intranet 
• Osmolite at 50ml/hour for 20 hours, followed by a 4 hour rest

Is patient tolerating feed?

Yes

Increase feed rate to 75ml/hour for 20 hours 
Rest for 4 hours

Is patient tolerating feed?

No

Diarrhoea:
• Do not stop feed 
• Record bowel action 
• Culture stool specimen 
• Review medication/ clinical condition 
• Consider additional fluid and electrolytes 
• Consider antidiarrhoeal agents if non infective cause 
• Consider ↓ feed rate or use alternative feed 
• If diarrhoea continues, consider TPN

No tolerating

Increase feed to individualised regimen as prescribed by dietitian

As oral intake increases, feed to be gradually reduced
Once mucositis resolved and close to meeting requirements orally, NG tube may be removed

Vomiting:
Review antiemetics 
Review medication/clinical condition 
Consider ↓ feed rate 
Consider NJ feeding 
If vomiting severe and doesn’t respond to above, or tube is vomited x3, consider TPN

Unable to pass NJ or NG tube: 
Consider TPN

Consider the following:

• If diarrhoea continues, consider TPN

NB: Low threshold for passing NG if patient:
• Is aged 60 or over
• Has BMI <18.5 or 10% weight loss in 6 months prior to BMT
• Has co morbidity that would increase infection risk e.g. COPD or HIV +ve 
• Receiving a cord transplant
Total Parenteral Nutrition (TPN) in BMT

Criteria for starting TPN

- Patient receiving <50% nutritional requirements on 3 or more consecutive days OR
- Unable to take 50% nutritional requirements due to severe mucositis OR
- 10% or more loss of body weight in the last 6 months

PLUS

- Unable to site enteral tube OR
- Tube vomited, and unable to repass due to mucositis OR
- Patient not tolerating enteral feeding i.e. severe vomiting, or diarrhoea >1000ml, which is not responding to treatment

PLUS

- Unlikely to improve greatly in the next 5-7 days

PLUS

- No medical contra indications to TPN

Administration of TPN

- TPN administration as per hospital guidelines
- Where ever possible, some enteral nutrition should be maintained even though receiving TPN
- TPN should be given through a dedicated lumen. If all lumens have been used, then administer Taurolock (Taurolock Classic, 3ml or enough to fill the lumen) down 1 lumen and then use for TPN only
- Taurolock should be left in the dedicated lumen for at least 2 hours before withdrawing and starting TPN.
- Monitor BMs daily and if greater than12 refer to Diabetes Specialist Nurse

Criteria for stopping TPN

- Taking 50% of nutritional requirements enterally, plus mucositis/diarrhoea/vomiting resolving
- Clinical condition contra indicates TPN

Estimating nutritional requirements

Energy

BMR to be estimated using Oxford equation
Adjustment to be made for metabolic stress
Combined factor for activity and diet-induced thermogenesis to be added

Stress factors in BMT

| No obvious signs of stress | 10% |
| Infection or grade 4 mucositis | 20% or more |

Protein

1.25-1.45g protein/kg (0.2-0.23g nitrogen/kg)
Dietary management of Gut Graft versus Host Disease (GvHD)

The dietary management of gut GvHD depends on the severity of the symptoms and whether the GvHD is responding to medication.

**Diarrhoea less than 1000ml/24 hours**
If a patient has watery diarrhoea of less than 1000ml that is not responding to steroids and anti-diarrhoeal, advise on a temporary low fibre diet and consider low lactose, low caffeine, low acid diet. As symptoms resolve they should gradually reintroduce the restricted foods as tolerated. Consider the need for nutritional supplements or enteral feeding.

**Diarrhoea greater than 1000ml/24 hours**
If a patient has watery diarrhoea of >1000ml/24 hours that is not responding to 1-2mg/kg Methyl prednisolone and anti-diarrhoeal after 48 hours, consider TPN and NBM. As symptoms resolve foods can be introduced using a step wise approach:

- **Step 1** - Clear fluids. At this stage elemental or semi-elemental enteral feeding could be started. Continue TPN
- **Step 2** - Introduce very easily digested foods such as rice, rice cakes and soya milk, and then plain chicken and fish and white bread. Initially portions should be small and frequent. Continue TPN unless meeting requirements with enteral feeding
- **Step 3** – Low lactose, low fibre, low caffeine, low acid and initially low fat diet
- **Step 4** – Continue to re-introduce foods as tolerated until having a normal diet
Consider need for dietary supplements or enteral feeding

**Monitoring:**
- Weight and BMI, consider measuring mid upper arm circumference (MUAC) or grip strength if evidence of fluid over load
- Symptoms – nausea and vomiting, bloating, abdominal pain, flatulence and diarrhoea
- Biochem including Magnesium
- Nutritional intake

**Pancreatic enzymes**
If a patient reports evidence of steatorrhoea, measure faecal elastase and consider use of pancreatic enzymes.

**Micronutrients**
If likely prolonged history of malabsorption and/or history of very poor nutritional intake check micronutrient levels starting with zinc, Vitamin B12, Folate and Vitamin D. If any are low, replace and do full micronutrient screen. Consider need for Calcium supplementation with prolonged use of steroids.

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**Review**
Incorporation of separate nutrition protocols into one

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Circulation
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