Nutritional and fluid assessment of patients with intestinal failure

Alison Culkin, Kirstine Farrer, Jeremy Nightingale and the BIFA Committee

The causes of undernutrition in patients with intestinal failure (IF) are multifactorial and may be due to physiological responses: active infection and inflammation, gastrointestinal losses of fluid/electrolytes, inability to tolerate enteral nutrition; or anatomical changes: lack of absorptive surface and/or limited vascular access (due to complications) therefore impeding the ability to infuse the optimal PN regimen. These scenarios may result in patients becoming malnourished and sarcopenic with the consequences of impaired wound healing, infections, increased morbidity and mortality. Dehydration or fluid overload are very common and must be addressed prior to optimising nutritional status. All IF patients should be individually assessed by a health care professional experienced in nutritional support.

Assessment and diagnosis

A comprehensive nutritional assessment is required at baseline and repeated at regular intervals (as in and outpatient) as patients with IF can become dehydrated, electrolyte depleted and malnourished rapidly. All patients should be assessed, monitored and educated by members of the Nutrition Support Team. Conveying the results of the assessment allows a bespoke treatment plan to be agreed with the patient/multi-professional team/referring team managing the underlying condition/relatives/carers. The assessment must be repeated in a timely manner and is dependent on clinical, anthropometric, and biochemical parameters.

The aim/goals of nutrition support should be determined at the start of treatment. For type 2 IF patients an improvement in nutritional status may be the focus especially if future reconstructive surgery is required. For type 3 IF patients it may be to replete and then maintain nutritional status, and for patients requiring palliative PN, maintaining nutrition in a way that allows as much time at home as possible and facilitates symptom control.

Key points

1. History

- A medical and surgical history (including medications), along with the anatomy of the residual gut/organs is recorded. Understanding the remaining gut will allow predictions for the route/amount/type of nutritional support needed.

2. Anthropometry

- An accurate height and weight should be measured and body mass index and percentage weight loss over 3-6 months calculated. Sudden weight changes reflect fluid balance. Weight is done at least twice a week.
- Body composition (e.g., mid arm muscle circumference (MAMC) is calculated from mid arm circumference and triceps skin fold thickness). This should be completed on a monthly basis.
- A computerised tomography (CT) scan, if available, at the level of the third lumbar vertebra (L3) is increasingly used to calculate muscle mass.

3. Biochemistry

- Urea and electrolytes largely helps assess hydration and C-reactive protein/albumin/bilirubin/white blood cell count the presence of inflammation. No one blood test gives definite information on nutritional status.
- A random urine sodium should be checked twice a week, especially if the patient has a high output stoma/fistula.
- An initial micronutrient screen including folate, iron, ferritin, selenium, zinc, copper, manganese, vitamins B12, A, D and E, should be performed with a C-reactive protein to aid interpretation. Micronutrient results should be interpreted with care if CRP is greater than 20 mg/L.

4. Clinical

- The clinical assessment aims to identify the illness, nutritional, hydration and functional status.
- Hydration is assessed from the heart rate, postural blood pressure, skin texture/oedema, jugular venous pressure and weight changes.
- The condition of the mouth and teeth should be observed and attention to mouth care given even if the patient is NBM or on sips of fluids only.

5. Dietary

- A diet history, ideally by a dietitian, will establish previous eating patterns and recent changes in them.
- The patient will be asked if their weight has recently changed and what they think their normal weight should be.
- A history of previous oral or clinically assisted nutrition and hydration will be taken.

6. Functional

- A measure of function should be made at baseline and repeated at least monthly as an inpatient and then at outpatient reviews (e.g., hand dynamometer).

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Explanation of key points

1. Knowledge of remaining anatomy helps predict nutritional/fluid support needed. For example: a patient with a jejunostomy at 70 cm will need parenteral support and much additional water and sodium. A review of medications is essential to identify if any contribute to symptoms (e.g., constipation, pain, nausea and/or vomiting), if they increase stoma/fistula output, if they might be affected by bile salt malabsorption, or if they might not be adequately absorbed in a patient with a very short, small bowel.

2. MAMC monitors changes in fat free mass in response to nutrition support. These are important as significant fluid shifts may make measurements of weight unreliable. Repeating anthropometric measurements on a monthly basis helps identify if nutritional support is improving nutritional status rather than contributing to a gain in fat mass.

   A measurement from CT scan of the entire skeletal muscle area at L3 (includes psoas and paraspinal muscles) gives a surrogate marker of the total amount of skeletal muscle. Other methods of assessing nutritional status include magnetic resonance imaging (MRI), ultrasound and bioelectrical Impedance.

3. In the absence of dehydration and renal impairment, serum creatinine reflects muscle mass and urea reflects recent protein intake. Urea and creatinine may be low in patients with reduced muscle mass and therefore biochemical dehydration can be easy to miss. Potassium, calcium and phosphate may be elevated due to dehydration whereas sodium and magnesium may be low due to losses from the intestine. It is important to note any trends especially when results remain within the normal range. A random urine sodium concentration of <20 mmol/L is a useful early warning sign that patients are becoming sodium deplete and dehydrated. This needs to be interpreted with caution in patients with AKI/CKD and those on diuretics. A random urine sample can also be useful to check for ketones (and the risk of refeeding syndrome) and glycosuria.

   Patients with IF and especially, those with short bowel are at high risk of micronutrient deficiencies. However, It may be prudent to delay measuring them until the C-reactive protein is less than 20 mg/L to avoid the influence of the acute phase response. During the acute phase response zinc and selenium concentrations fall while copper increases.

4. Rapid weight loss, thirst, a fall in postural systolic blood pressure, low urine output and a rise in serum urea and creatinine can all result from dehydration. In contrast rapid weight gain, pitting oedema of the extremities, ascites, pleural effusions and a raised jugular venous pressure can all result from overhydration.

   Active infection is easy to miss in malnourished patients as they may not mount an effective immune response and therefore will not have a pyrexia. Patients will not be able to improve their nutritional status in the presence of active infection and increased provision of nutrition may be detrimental until active infection has resolved and the patient becomes anabolic.

   Signs of micronutrient and essential fatty acid deficiencies should be looked for (e.g., skin changes of essential fatty acids, zinc, vitamin A or B vitamins).

   Poor dentition can affect intake and if the food is not chewed well a bolus bowel obstruction or blockage of the stoma/ fistula appliances may occur.

5. A diet history is required in order to establish eating patterns, food and fluid preferences, any modifications in diet or nutrition support previously tried.

   Asking a patient the weight they should achieve helps both identify patients who may have an eating disorder and helps set a target weight to be achieved with nutritional support.

   They will be asked about the route, rate and formula of any feeds given and, if stopped, the reasons for stopping them.

5. Handgrip dynamometry is valuable in determining functional capacity. Handgrip should be repeated monthly in hospital and then in outpatients in order to detect any deterioration in functional status so that amendments to the nutrition support can be instigated. Other functional tests include sit to stand, timed up and go and Situp-Squat-Stand tests (popular in managing patients with eating disorders). Bioelectrical Impedance using phase angle, if available, is an effective measure of muscle quality. Mobility should be assessed and encouraged at all stages of the patient's journey to promote muscle function and mass.

Suggested reading:

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