Intestinal failure (known as ‘short bowel syndrome’) occurs when a large portion of the intestine is unable to function, resulting in malabsorption of nutrients, electrolytes and gastrointestinal secretions (Forbes, 1997). Patients with intestinal failure usually fall into one of three groups: those with an end stoma, enterocutaneous fistula or enterocolic anastomosis.

High volumes of fluid loss from the bowel can lead to severe dehydration and electrolyte disturbance, and artificial nutritional support may be necessary to prevent malnutrition. Patients may also have to cope with a complex, often restrictive, treatment regimen involving the precise timing of food, medication and fluid (Wood, 2001). The physical and social consequences of this complex condition can have a detrimental effect on a patient’s quality of life.

**Clinical features** The clinical features of intestinal failure include intractable diarrhoea or a high stomal output, weight loss, dehydration, vitamin and mineral deficiency, and malnutrition (Scolapio and Fleming, 1998). Acute intestinal failure is usually temporary and often attributable to infection or perioperative complications. Chronic intestinal failure results from intestinal resection(s), gastrointestinal disease or small bowel dysfunction (Nightingale, 2001). The principal causes of intestinal failure are listed in Table 1.

**Management** Specific management depends on the amount, type and integrity of the remaining bowel, as the presence of even part of the large bowel can significantly increase absorption (Nightingale, 2001). The aim is to maximise gastrointestinal function and, where necessary, supplement fluid and nutrient intake by the least invasive means, thus providing the individual with the best possible quality of life (Forbes, 1997).

**Maximising gastrointestinal function** There are a number of sites in the gastrointestinal tract that affect the rate of gastric emptying and thus influence gastrointestinal motility. These sites (or brakes) occur in the stomach, the proximal small bowel, the distal small bowel, and the colon and rectum (Nightingale and Spiller, 2001).

Absence of any or all of these sites will lead to decreased intestinal transit time, high intestinal fluid loss and reduced absorption of fluid and nutrients. Intestinal transit time refers to the time that food and fluids remain in the gastrointestinal tract. Increasing intestinal transit time is therefore an important consideration in optimising gastrointestinal function as it will increase fluid and nutrient absorption and decrease intestinal losses.

**Medication** Anti-diarrhoeal medications such as loperamide and codeine phosphate are commonly used to reduce motility and enhance absorption. To maximise their effectiveness they should be taken half an hour before food (Nightingale, 2001). An additional dose before bedtime can be of enormous psychological benefit by reducing the fear of incontinence or leakage from a stoma.

Anti-secretory medications such as histamine 2 (H2)-receptor antagonists or proton pump inhibitors can lead to a reduction in output from the gastrointestinal tract by reducing the secretion of gastric acid. Large doses of both anti-diarrhoeal and anti-secretory medications may be necessary to compensate for the decreased intestinal transit time and impaired absorption (Forbes, 1997).

**Reducing the intake of hypotonic fluids** Arguably, the most important intervention in maximising gastrointestinal function is to reduce the amount of hypotonic fluid (such as water, tea, coffee and squash) entering the intestine, as this will significantly reduce the amount of fluid the intestine has to assimilate. Without an appreciation of the mechanisms affecting absorption in the jejunum, this intervention may appear to be illogical.

The sodium concentration in the jejunum is maintained at 90mmol/litre. Drinking hypotonic fluid dilutes the sodium concentration causing a net efflux of sodium from the plasma in order to restore the concentration to 90mmol/litre.

In someone with a proximal stoma this will result in high sodium losses and sodium depletion. Therefore reducing the amount of hypotonic fluid to no more than one litre per day, and adding an oral rehydration...
solution, will promote sodium absorption (Nightingale, 2001). A modified version of The World Health Organization cholera solution is commonly used (3.5g sodium chloride, 20g glucose and 2.5g sodium bicarbonate dissolved in one litre of tap water). As the sodium content of this fluid closely matches that of the sodium concentration within the jejenum, there will be no net efflux of sodium from the plasma, and the result is sodium conservation and increased absorption of fluid by the jejenum (Forbes, 1997).

**Balancing fluid and food intake** Given that intestinal output increases after food (Nightingale, 2001), there may be some benefit in avoiding the consumption of fluids with food in order to promote absorption and reduce output. However, the reported benefit of this intervention is largely anecdotal.

**Facilitating small bowel adaptation** A final consideration in maximising intestinal function is facilitating small bowel adaptation. Following intestinal resection the remaining bowel undergoes structural and functional changes. The small bowel dilates and lengths and there is a reduction in motility. These changes result in increased intestinal function. The controlling mechanisms behind adaptation are not yet fully understood, but it is believed that the presence of nutrients within the intestine is an important factor (Scolapio and Fleming, 1998).

Patients with intestinal failure are encouraged to eat for a number of reasons. Although the oral intake will inevitably be associated with an increase in intestinal output, eating is an important social activity and linked to psychological well-being (Forbes, 1997). In addition to being important in small bowel adaptation, the presence of nutrients within the intestine is also important in maintaining normal gastrointestinal flora and the gut barrier function, for example, preventing infection – factors that can impact on intestinal function (Hollworth, 1999).

**Supplementing fluid/nutrient intake** The small intestine transports between 7–9 litres of fluid a day, absorbing about 80 per cent of this so that only about 1–2 litres enters the colon. The colon absorbs fluid, so that only 100–200ml is actually excreted each day (Scolapio and Fleming, 1998). Although there will be alteration in fluid and nutrient absorption in all patients with intestinal failure, the most significant will occur in those in whom there has been a significant loss of intestine. A reduction in absorptive area, such as in someone with a proximal small bowel stoma or enterocutaneous fistula, will result in a greater volume of fluid excreted and subsequent fluid and electrolyte imbalance and a degree of malabsorption (Nightingale, 2001).

The need for fluid and nutrient replacement is determined by a number of factors, namely, the amount of available intestine, the volume of daily intestinal losses, and the ability to maintain a satisfactory weight. Individuals with less than 75cm of jejunum, an intestinal output of greater than 2500ml/day, and absorption below about one-third of all energy taken orally will usually be dependent on long-term parenteral nutrition. Those with 75–100cm of jejunum, and average daily outputs of about 1200–2500ml/day, may require parenteral supplementation of fluid while being able to maintain their nutritional status with an enteral regime including food and/or supplemental enteral nutrition (Forbes, 1997).

While long-term parenteral supplementation of fluids and nutrients will help prevent dehydration and malnutrition, it imposes restrictions on an individual’s daily life. Large fluid volumes usually mean infusion times of at least 12 hours, and while cyclical infusion overnight permits freedom from the infusion pump during the day, the patient may suffer disrupted sleep due to the need to pass urine frequently during the night.

Depending on their specific fluid and nutrient requirements it may not be possible for some patients to have an ‘all-in-one’ regimen in which the lipid emulsion is included (Allwood, 2001). In these circumstances a separate infusion of lipid is required and is administered either before or after the main infusion. While this additional infusion is usually required two to three times a week, it increases the infusion period on those days by four hours.

It is important to note that even though a patient may be dependent on parenteral nutrition or fluid, this does not mean that other aspects of their treatment regimen can be relaxed. Fluid and nutrient needs are determined by a patient’s average daily fluid balance and if there is a significant shift in this – for example, by drinking excessive amounts of hypotonic fluid or not taking medication – they will still become dehydrated.

**Conclusion** Advances in the management of patients with intestinal failure and the development of home parenteral nutrition have allowed patients with even the most profound fluid and electrolyte disturbances to be discharged home. However, it must be remembered that they will need to comply with an intricate treatment plan that impinges upon their daily routine and inevitably affects their quality of life.

It is important, therefore, that the physical consequences of intestinal failure are not viewed in isolation from the potential social consequences, as these are inevitably and inexorably linked. Without consideration of how to incorporate the individual aspects of a proposed treatment regimen into a patient’s daily schedule, the physical and social isolation often felt can be compounded once they are discharged from hospital and coping with the constraints of their condition on a daily basis.