Intestinal failure: the scale of the problem

Intestinal failure is defined as a reduction in intestinal absorption, so that macronutrient and/or water and electrolyte supplements are needed to maintain health and/or growth. This review aims to clarify the nature and epidemiology of this condition.

While intestinal failure (IF) can take acute and chronic forms, patients may move from one form to another and back again during their illness and in relation to phases of their treatment. Acute IF varies from a condition characterized by sudden onset, followed generally by rapid and spontaneous resolution (type 1 acute IF), to a more complex clinical state (type 2 acute IF). Type 1 acute IF is usually associated with failure of intestinal motility caused by critical illness, injury and otherwise uncomplicated major abdominal surgery, while type 2 acute IF is usually associated with intestinal disease and complications following abdominal surgery, including development of intestinal fistula and abdominal sepsis.

The chief clinical features which distinguish the two subtypes of acute IF are the fact that type 1 IF is exceedingly common and invariably resolves spontaneously within days, with only simple supportive treatment as the underlying cause resolves, while type 2 IF generally requires complex medical and frequently surgical treatment, and often weeks or even months of hospital admission.

The prevalence of acute IF is not known. The majority of cases of type 1 IF are managed with short courses of parenteral nutrition and frequently fail even to be documented as distinct clinical incidents. In the case of type 2 IF a proportion of cases, generally those associated with intestinal fistulas and sepsis, are sufficiently complex to warrant referral to one of the two specialist centres established by the UK Department of Health. Approximately 120 patients are referred in this manner each year, of which approximately 60% have type 2 IF (Scott et al, 1991). The remainder have type 3, or chronic IF, which is usually synonymous with short bowel syndrome (see below).

Table 1. Criteria for referral to specialized intestinal failure units

Persistent intestinal failure beyond 6 weeks without any evidence of resolution and complicated by venous access problems
Multiple intestinal fistulae in a total dehisced abdominal wound
An intestinal fistula outside the expertise of the referring unit
Total or near-total small bowel enterectomy (less than 30 cm of residual small bowel)
Recurrent venous access problems as a result of sepsis or thrombosis
Persistent and severe intra-abdominal sepsis
Persistent nutritional or metabolic complications associated with a high output stoma or fistula
Chronic intestinal failure in a hospital without adequate experience or expertise to manage the medical, surgical or nutritional requirements of such patients

From Irving (2001)

Mr Duncan Mathew *is Clinical Fellow and* **Professor Gordon L Carlson** *is Consultant Surgeon in the Intestinal Failure Unit, at the University of Manchester, Hope Hospital, Salford M6 8HD*

Correspondence to: Professor GL Carlson

Criteria for referral to specialist units

The spectrum of IF requiring specialist treatment is determined by referral criteria which were laid down in the working specifications of the national IF service (Irving, 2001) (*Table 1*). These mainly relate to the management of acute, rather than chronic IF; the administration and funding of home parenteral nutrition (HPN) for patients with type 3 IF is complex and poorly organized. This has significant implications for the treatment for patients with acute IF in specialist centres, as simultaneous provision of HPN in these centres inevitably leads to bed occupancy by patients with complications of HPN, who might be better looked after in regional, rather than national centres. Approximately 40% of patients referred have short bowel syndrome at referral (Scott et al, 1991), with the majority of the remaining patients referred either because of the complexity of the fistula or the associated metabolic complications.

Spectrum of IF

Acute IF

Acute IF frequently develops as a consequence of secondary impairment of intestinal function in conditions such as paralytic ileus (*Table 2*). Although it may be possible to provide enteral nutrition and fluid via nasoenteric tubes, in many cases feeding is poorly tolerated and target provision of calories, nitrogen and fluid are not met (Woodock et al, 2001). Many patients are thus fed intravenously and the mainstay of treatment is supportive, with expectation of recovery within days.

In contrast, while the causes of type 2 acute IF, such as intestinal fistula and postoperative abdominal sepsis, are also usually potentially reversible (*Figure 1*), this is usually the case only in patients with postoperative intestinal fistula, where spontaneous closure may occur in up to 60% of cases. Such patients are rarely referred to specialized IF units. Patients who are referred to specialist units

for management of an intestinal fistula usually have high output, complex fistulas with associated abscess cavities and internal components, or fistulas within open abdominal wounds. Management in these cases may require radiological procedures and surgery to treat sepsis and nutritional and metabolic support for weeks or even months in order maintain health and nutritional status to permit recovery, or at least to improve the patient's underlying condition until surgical treatment to restore gastrointestinal function can be safely undertaken.

Patients develop acute IF as a result of a variety of disease processes but Crohn's disease and complications of abdominal surgery predominate (*Figure 2*). It has been suggested that the development of IF in many cases can be predicted (and thereby avoided); the risk factors for abdominal sepsis in patients undergoing surgery for Crohn's disease or repeated laparotomy have been well documented and include hypoalbuminaemia, abscess and fistula formation, immunosuppressive therapy (Yamamoto et al, 2000), and unplanned enterotomy after adhesiolysis (Van Der Krabben et al, 2000).

Despite this, many patients undergo a series of laparotomies to deal with the consequences of severe abdominal sepsis resulting from anastomotic leakage with intestinal fistulation. Unfortunately, injudicious attempts to gain access to a hostile peritoneal cavity in recurrent abdominal sepsis, tertiary peritonitis or manoeuvres (including attempts to construct intestinal anastomoses in sick hypoalbuminaemic and malnourished patients) within abscess cavities, and even attempts to repair leaking anastomoses, continue to deliver patients with persistent sepsis and intestinal fistulation (Carlson and Irving, 1997). The development and management of complications of surgery for Crohn's disease may have consequences which extend beyond the development of acute IF. While Crohn's disease is the most common cause of chronic (type 3) IF, patients with Crohn's disease develop chronic IF not as a result of uncomplicated, repeated resection of recrudescent disease, but because of multiple laparotomies to deal with complications from anastomotic leakage and fistulation, and intestinal reconstructive surgery required for the management of acute IF (Agwunobi et al, 2001).

The principal clinical reason for referral (*Figure 3*) in patients without short bowel syndrome is management of abdominal and line sepsis and intestinal fistulation. However, difficulty in managing the open abdominal wound (laparostomy) also results in clinical problems leading to referral because, although laparostomy may simplify management of abdominal sepsis (Mughal et al, 1986), nursing the patient with an open abdomen is complex and laborious. Avoiding development of secondary fistulation from exposed bowel loops is a priority in these patients.

Table 2. Causes of acute intestinal failure

When the gastrointestinal tract is 'blocked'	Mechanical obstruction
	Paralytic ileus
	Intestinal pseudo-obstruction
When the gastrointestinal tract is too short	Massive resection
	Internal or external fistula
When the gastrointestinal tract is inflamed	Inflammatory bowel disease
	Severe infective enteritis
	Radiotherapy
	Chemotherapy
When the gastrointestinal tract fails to function adequately for other reasons	Intra-abdominal sepsis
	Abdominal compartment syndrome
	Multiple organ failure
	Severe acute pancreatitis

From Carlson (2001)

Figure 1. Acute intestinal failure – multiple small intestinal fistulas within a healing laparostomy wound.

Figure 2. Distribution of underlying diseases leading to intestinal failure. From Scott et al (1991).

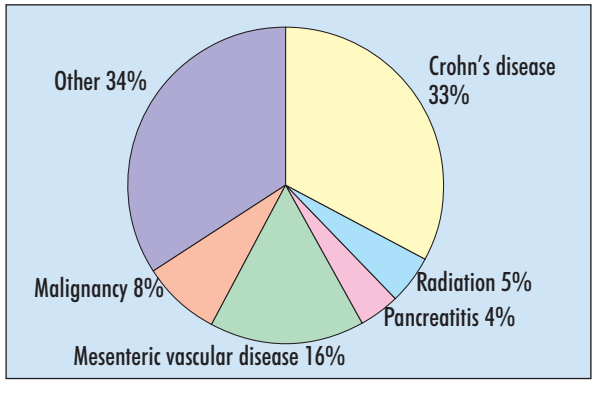
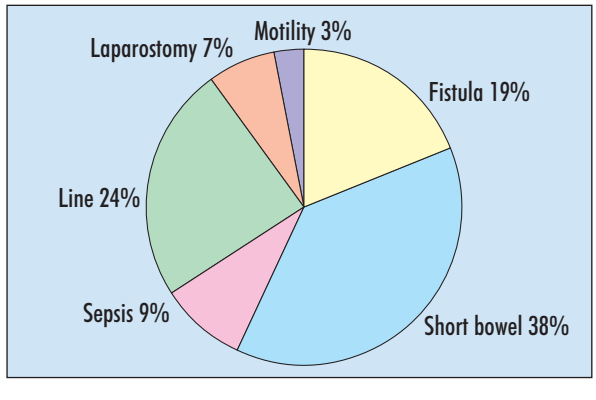


Figure 3. Principal clinical problems at the time of referral for the treatment of intestinal failure. From Scott et al (1991).



Chronic IF

Type 3 IF generally occurs as a result of Crohn's disease or mesenteric vascular insufficiency (*Table 3*). Patients are usually managed with long-term parenteral nutrition, usually on a domiciliary basis. The UK prevalence of HPN has increased steadily over the last two decades and at a rate of 10–14 individuals per million population, is slightly lower than the prevalence in Europe (Van Gossum et al, 1997) and considerably below the 120 per million in the USA (Howard et al, 1995).

There are considerable differences in the indications for HPN in the UK compared with Europe, US and Japan. While Crohn's disease is overwhelmingly the most common indication for HPN in the UK, approximately 40% of patients in the US, Europe and Japan receive HPN for the treatment of cancer. Less than 5% of all HPN is provided for cancer patients in the UK.

There are a variety of potential reasons for this difference in the use of HPN. The use of HPN in palliative care in cancer patients is controversial and does not affect life expectancy. Decisions regarding HPN use in patients with end-stage malignant disease relate to social and religious differences, as well as differences in financial arrangements for health-care delivery and public expectations.

As well as variations in HPN use and indications for HPN prescribing, differences in the use of HPN in various parts of the UK remain a source of concern. They are likely to reflect differences in the use of HPN rather than distribution of diseases which require HPN for long-term management, so it is difficult not to conclude that patients in some parts of the UK have greater access to HPN than others, and that patients with conditions whose survival requires HPN may be denied life-saving treatment. It is almost impossible to determine this, as withholding of treatment goes unmeasured and unreported. HPN is the mainstay of treatment adults with chronic IF, and provided patients are trained and supported adequately, HPN is compatible with an excellent prognosis and reasonable quality of life. Mortality rates in patients receiving HPN tend to be determined by underlying disease, rather than HPN per se (Scolapio et al, 1999). Good quality of life on HPN and anxiety about long-term prognosis following intestinal transplantation has resulted in limited enthusiasm among patients for small intestinal transplantation in the UK (Carlson et al, 1995).

Table 3. Causes of chronic intestinal failure

		UK	Europe	USA	Japan
Years		1996–2002	1997	1989–1992	1990
Underlying disease (%)	Cancer	3	39	41	40
	Crohn's disease	34	19	11	20
	Vascular disease	21	15	6	19
	Radiation enteritis	5	7	3	2
	HIV	0	2	5	0
	Other	55	18	34	19

* from Van Gossum et al (1997); † = from Howard et al (1995); ‡ = from Takagi et al (1995)

KEY POINTS

- Acute intestinal failure is extremely common but the prevalence is unknown. Most cases are short lived and self-limiting or are dealt with locally in non-specialist units.
- In many cases, acute intestinal failure can be avoided by improved case selection and/or surgical technique.
- More complex and longer-term cases of intestinal failure require referral to a specialist intestinal failure unit.
- Acute intestinal failure in a specialist unit frequently involves an enterocutaneous fistula together with intra-abdominal sepsis secondary to postoperative complications.
- Chronic intestinal failure most commonly occurs as a result of Crohn's disease, mesenteric vascular occlusion and radiation enteritis.
- Home parenteral nutrition is the main treatment for chronic intestinal failure, but there are considerable differences in its use between countries and even regions in the UK.

Conclusions

Both acute and chronic IF contribute significantly to the burden of illness in the UK. While acute IF is often a relatively trivial complication of severe illness, a small number of patients spend many weeks or months in hospital as result of intestinal fistulas and abdominal sepsis. Much of this may be preventable by better case selection, operative strategy and operative technique. **BJHM**

Conflict of interest: none.

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