

# Serial transverse enteroplasty procedure (STEP) for bowel lengthening in parenteral nutrition-dependent children

Interventional procedures guidance

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[nice.org.uk/guidance/ipg232](https://www.nice.org.uk/guidance/ipg232)

## Your responsibility

This guidance represents the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take this guidance fully into account. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Commissioners and/or providers have a responsibility to implement the guidance, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should [assess and reduce the environmental impact of implementing NICE recommendations](#) wherever possible.

## 1 Guidance

- 1.1 The evidence on the safety of the serial transverse enteroplasty procedure (STEP) for bowel lengthening in parenteral nutrition-dependent children is adequate; however, there is limited evidence of its efficacy. Therefore, this

procedure should not be used without special arrangements for consent and for audit or research.

- 1.2 Clinicians wishing to undertake STEP for bowel lengthening in parenteral nutrition-dependent children should take the following actions.
- Inform the clinical governance leads in their Trusts.
  - Ensure that parents or carers understand the uncertainty about the procedure's efficacy, in addition to its risks. Provide parents or carers with clear written information. In addition, use of the Institute's [information for patients](#) (Understanding NICE guidance') is recommended.
- 1.3 Patient selection should be carried out in the context of a multidisciplinary team experienced in the management of short bowel syndrome (SBS). These teams should consider case selection carefully so that the procedure is only performed on children who are likely to remain dependent on parenteral nutrition.
- 1.4 Clinicians undertaking STEP for bowel lengthening in parenteral nutrition-dependent children should submit data on all patients to the [International STEP Data Registry](#) at Children's Hospital Boston, USA.

## 2 The procedure

### 2.1 *Indications and current treatments*

- 2.1.1 SBS is a rare but serious condition which may either be associated with congenital conditions or follow bowel resection. Patients with SBS have a rapid intestinal transit time resulting in malabsorption of enteral nutrition and subsequent malnutrition. Most patients with SBS require partial or total parenteral nutrition (TPN), although some will develop adequate intestinal function and no longer require TPN. Intestinal failure combined with TPN can cause liver failure and recurrent sepsis leading to death.
- 2.1.2 SBS can be caused by structural or functional abnormalities.
- 2.1.3 Surgical procedures which prolong bowel transit time and aim to increase the absorption of nutrients include resection of dilated segments of the small intestine, tapering enteroplasty, intestinal plication, or the Bianchi intestinal

loop lengthening procedure. Some patients require small bowel and liver transplants.

## 2.2 *Outline of the procedure*

2.2.1 STEP is a surgical technique that aims to lengthen the small intestine of patients with SBS so that they can benefit from enteral nutrition.

2.2.2 The procedure is done under general anaesthesia. The procedure relies on the principle that the blood supply to the small bowel originates from the mesentery and traverses the bowel perpendicular to its long axis. An endoscopic stapler is passed through the mesentery and the bowel is simultaneously stapled and dissected on alternating sides in a direction perpendicular to its long axis. The small bowel is left with a zigzag appearance.

## 2.3 *Efficacy*

2.3.1 In a case series of 38 patients (29 with SBS) at 13-month follow-up, the mortality rate following STEP was 8% (3/38) and 3 patients (8%) went on to require a bowel or liver and bowel transplant. One patient in a case series of 8 developed cholestasis which caused sepsis, liver failure, and subsequently death at 3-month follow-up.

2.3.2 The same case series of 38 patients reported an increase in mean bowel length from  $68 \pm 44$  cm at baseline to  $115 \pm 87$  cm in 27 patients where this outcome was measured. A second case series of 5 patients showed an increase in bowel length from 61 cm at baseline to 98 cm immediately following the procedure. A third case series of 8 patients, with 5 patients treated with STEP, reported an increase in mean bowel length of 17 cm, from an average of 62 cm to 79 cm.

2.3.3 A case report of a patient treated with STEP for SBS and D-lactic acidosis reported that a normal bowel transit time (2.5 hours) was achieved at 7-day follow-up.

2.3.4 In the case series of 38 patients, 21 of whom were on TPN at baseline, there was a mean improvement in the total percentage of calories tolerated enterally from 31% at baseline to 67% ( $p < 0.01$ ) at 13-month follow-up. Of these 21 patients, 10 were completely weaned off TPN (follow-up not stated). In the case series of

5 patients, it was reported that the mean percentage of nutrition received enterally improved from 49% at baseline to 80% in 3 patients at 17-month follow-up ( $p < 0.05$ ). The case series of 8 patients reported that, of the 5 treated with STEP alone, 'more than 50%' were completely weaned off TPN and 1 patient had significantly decreased dependency (not otherwise defined). In two case reports, STEP allowed for 75% and 100% of calorific intake to be achieved enterally at 11 and 7 months, respectively. For more details, refer to the 'Sources of evidence' section.

- 2.3.5 One Specialist Adviser commented that STEP is one of a range of surgical options, none of which has been shown convincingly to provide benefit. Most of the Specialist Advisers stated that the prognosis of SBS is uncertain and that some patients improve spontaneously without treatment.

## 2.4 *Safety*

- 2.4.1 A case series of 5 patients and a case report of 1 patient reported no long-term complications at 15- and 7-month follow-up, respectively.
- 2.4.2 A patient in one case report required nasogastric fluid aspiration postoperatively. This was bilious at first, becoming clear over time. For more details, refer to the 'Sources of evidence' section.
- 2.4.3 The Specialist Advisers considered this procedure to have low morbidity. They considered the potential risks associated with this procedure to include staple-line leak, bowel obstruction, pleural effusion, haematoma, abscess formation, progression to transplant and mortality.

## 2.5 *Other comments*

- 2.5.1 It was noted that safety data are based on small case series but they compare favourably with other surgical treatments for this high-risk group of patients. In view of this, the Committee considered the data adequate in the context of these severely ill children.

Andrew Dillon  
Chief Executive  
September 2007

### 3 Further information

#### *Sources of evidence*

The evidence considered by the Interventional Procedures Advisory Committee is described in the following document.

['Interventional procedure overview of serial transverse enteroplasty procedure \(STEP\) for bowel lengthening in parenteral nutrition-dependent children'](#), March 2007.

#### *Information for patients*

NICE has produced [information describing its guidance on this procedure for patients and their carers](#) ('Understanding NICE guidance'). It explains the nature of the procedure and the decision made, and has been written with patient consent in mind.

### 4 About this guidance

NICE interventional procedure guidance makes recommendations on the safety and efficacy of the procedure. It does not cover whether or not the NHS should fund a procedure. Funding decisions are taken by local NHS bodies after considering the clinical effectiveness of the procedure and whether it represents value for money for the NHS. It is for healthcare professionals and people using the NHS in England, Wales, Scotland and Northern Ireland, and is endorsed by Healthcare Improvement Scotland for implementation by NHSScotland.

This guidance was developed using the NICE [interventional procedure guidance](#) process.

We have produced a [summary of this guidance for patients and carers](#). Information about the evidence it is based on is also [available](#).

#### Changes since publication

14 January 2012: minor maintenance.

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exercising their clinical judgement. This guidance does not, however, override the individual responsibility of healthcare professionals to make appropriate decisions in the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way which would be inconsistent with compliance with those duties.

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## *Endorsing organisation*

This guidance has been endorsed by [Healthcare Improvement Scotland](#).