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Evidence-Based Colombian Consensus for the Management of Intestinal Failure Secondary to Short Bowel Syndrome in Pediatrics

Ailim Margarita Carias-Domínguez,[1*] Mónica María Contreras,[2] Clara Eugenia Plata,[3] Ana María Rojas,[3] Alejandra Wilches,[4] José Fernando Vera-Chamorro,[1] Verónica Botero,[5] Carlos Augusto Cuadros,[6] Johon Francisco Garcés,[7] Hugo Laignelet,[8] Claudia Liliana Losada,[4] Juan Carlos López,[9] Mayra Alejandra Montes,[3] Diana Mora-Quintero,[10] César Moreno,[11] Adriana Patricia Osorno,[12] Stephania Peña,[13] Diana María Quimbayo,[5] Juan Enrique Seba,[14] Margarita Suárez,[2] Gustavo Adolfo Triana,[15] Geraldine Vargas-Salamanca,[16] Sergio Álvarez-Vallejo,[17] Mónica Rocío Royero,[18] Hernán Darío Vergara-Samur.[19]

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[1] Pediatric Gastroenterologist, Hospital Universitario Fundación Santa Fe. School of Medicine, Universidad de los Andes. Bogotá, Colombia.
[2] Pediatric Gastroenterologist, Hospital Pablo Tobón Uribe. Medellín, Colombia.
[3] Pediatric Gastroenterologist, Hospital Universitario San Ignacio, Pontificia Universidad Javeriana. Bogotá, Colombia.
[4] Pediatric Gastroenterologist and Hepatologist, Hospital San Vicente Fundación. Medellín, Colombia.
[5] Pediatric Gastroenterologist and Hepatologist, Fundación Valle del Lili, Universidad ICESI. Cali, Colombia.
[6] Pediatric Gastroenterologist, Hospital Internacional de Colombia, Fundación Cardiovascular. Bucaramanga, Colombia.
[7] Pediatric Gastroenterologist and Nutrition Specialist, Hospital Internacional de Colombia. Bucaramanga, Colombia.
[8] Pediatric Gastroenterologist, MSc in Health Economics, Hospital Militar Central. Bogotá, Colombia.
[9] Pediatric Infectious Disease Specialist, Fundación Santa Fe. Bogotá, Colombia.
[10] Pediatric Gastroenterologist, Fundación Hospital Pediátrico de la Misericordia. Bogotá, Colombia.
[11] Pediatric Gastroenterologist, Hospital Departamental de Villavicencio. Villavicencio, Colombia.
[12] Registered Dietitian Nutritionist, Specialist in Pediatric Clinical Nutrition, Hospital Universitario San Vicente Fundación. Universidad de Antioquia. Medellín, Colombia.
[13] Pediatric Gastroenterologist, Fundación Cardioinfantil and Fundación Hospital Pediátrico La Misericordia. Bogotá, Colombia.
[14] Pediatric Surgeon, Hospital Universitario San Ignacio. Universidad Nacional de Colombia. Bogotá, Colombia.
[15] Radiologist, Specialist in Pediatrics. Head of the Pediatrics Section, Radiology and Diagnostic Imaging, and Head of the Research Department, Fundación Santa Fe. Bogotá, Colombia.
[16] Registered Dietitian Nutritionist, MSc in Biological Sciences. Hospital Universitario San Ignacio. Bogotá, Colombia.
[17] Radiologist. Radiologist. Head of the Department of Radiology and Interventional Body Radiologist, Hospital Pablo Tobón Uribe. Medellín, Colombia.
[18] Pediatric Radiologist, Hospital Universitario San Vicente Fundación. Medellín, Colombia.
[19] Physician and Surgeon, Master's Degree in Epidemiology, MSc in HIV/AIDS. Professor, Researcher, and Methodological Advisor, Fundación Universitaria Sanitas. Bogotá, Colombia.

***Correspondence:** Ailim Margarita Carias.
ailimcarias@gmail.com

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INTRODUCTION

Short bowel syndrome (SBS) is an anatomical condition characterized by a significant reduction in the length of the small intestine, generally secondary to extensive intestinal resections due to necrotizing enterocolitis, congenital malformations, or ischemic events[1]. When this loss of intestinal surface area results in the inability of the gastrointestinal tract to maintain adequate nutritional and hydration status without prolonged intravenous support, intestinal

Abstract

Introduction: Intestinal failure secondary to short bowel syndrome in pediatric patients leads to malabsorption, metabolic disturbances, and frequent reliance on parenteral nutrition. Clinical variability and therapeutic management require the implementation of a local clinical practice guideline. **Objective:** To provide evidence-based recommendations, with emphasis on early evaluation, appropriate therapeutic selection, and long-term follow-up. **Methods:** A multidisciplinary group of 25 experts formulated 12 questions. Through independent systematic literature review and analysis, recommendations were developed using a modified Delphi methodology to achieve consensus. **Results:** A total of 1,124 references were screened. Thirty-eight were included in the evidence synthesis (20 systematic reviews, 10 guidelines, and 8 primary studies). The expert panel issued 88 recommendations. Management strategies were identified regarding the use of proton pump inhibitors, prokinetics, antibiotics, and the implementation of individualized nutrition. The use of teduglutide is recommended in patients with prolonged dependence on parenteral nutrition, along with the need for multidisciplinary evaluation and follow-up for complication management. **Conclusions:** The management of intestinal failure secondary to short bowel syndrome is complex and requires a multidisciplinary intestinal rehabilitation team. Evaluation strategies, pharmacological and surgical treatment, nutritional support, and complication management should be individualized. This consensus provides evidence-based recommendations and standardized practices to improve clinical outcomes.

Keywords

Intestinal failure; short bowel syndrome; parenteral nutrition; enteral nutrition; teduglutide.

failure develops, a functional condition that in this context is referred to as intestinal failure secondary to short bowel syndrome (IF-SBS)[1,2].

Pediatric IF-SBS represents a major clinical challenge because of its impact on both quality of life and patient prognosis. Its consequences include nutrient malabsorption, electrolyte disturbances, metabolic imbalances, and malnutrition[1].

The management of these patients is particularly complex and requires a multidisciplinary approach integrating specialized nutritional support, pharmacological management, surgical interventions, and close follow-up to prevent complications such as catheter-related infections, metabolic disturbances, and intestinal failure-associated liver disease[3].

Despite advances in pathophysiological knowledge and therapeutic strategies, the available evidence remains limited and heterogeneous, resulting in considerable variability in clinical practice and in the approach to key aspects of the diagnosis, treatment, and follow-up of these patients. In this context, integrating the best available evidence with expert clinical experience is essential to guide decision-making. Therefore, the present evidence-based consensus for the management of intestinal failure secondary to short bowel syndrome in pediatrics was developed, the objective of which is described below.

Objective and Scope of the Consensus

The objective of this consensus is to provide evidence-based recommendations for the optimal management of IF-SBS in pediatric patients, addressing early identification, comprehensive evaluation, appropriate selection of therapeutic options, and long-term follow-up.

Target Population and Scope of Application

This consensus is intended for pediatricians, neonatologists, pediatric gastroenterologists, pediatric surgeons, nurses, nutritionists, and other healthcare professionals involved in the care and management of patients with IF-SBS in hospitals and pediatric and neonatal intensive care units.

Excluded Aspects

This consensus does not address the management of causes of intestinal failure unrelated to SBS.

Context and Limitations

This consensus was developed based on the evidence available up to the date of its preparation. The management of IF-SBS may vary according to local conditions and patient-specific factors, and adaptation of the recommendations to individual circumstances is encouraged.

Review Date and Validity

The need to review and update the consensus five years after its publication is established.

IF-SBS in Pediatrics

SBS is a malabsorptive state resulting from surgical resection or congenital disease affecting a significant portion of the small intestine[1,2]. It is characterized by a residual intestinal length of less than 25% of the expected length

for age[1,2]. SBS is the leading cause of intestinal failure in children and the underlying condition in 50% of patients receiving home parenteral nutrition (PN)[2,3].

The severity of SBS has been classified according to residual intestinal length, measured from the ligament of Treitz. Ultrashort bowel syndrome (USBS) is defined as an intestinal length of less than 10 cm or less than 10% of the expected length for age. Another classification anatomically categorizes SBS into three forms according to the surgical reconstruction performed after intestinal resection: patients with terminal jejunostomy (J-SBS or type I); those with jejunocolic anastomosis (JC-SBS or type II); and patients with jejunoileal anastomosis preserving both the colon and the ileocecal valve (JIC-SBS or type III). This categorization is not limited to an anatomical description, but also has important clinical and prognostic implications, as the type of intestinal configuration determines absorptive capacity, the degree of dependence on parenteral nutrition, and the likelihood of achieving intestinal autonomy over the course of the disease[1,4].

Intestinal failure is defined as a reduction in intestinal function below the minimum necessary for the absorption of macronutrients, water, and electrolytes, requiring intravenous supplementation to maintain health or growth. It is associated with the need for PN for more than 60 days after loss of intestinal function or surgical resection[2,5,6]. Intestinal adaptation is the process by which the remaining gastrointestinal tract adjusts to meet the patient's physiological needs[1,6].

Data regarding the prevalence and incidence of pediatric IF-SBS vary depending on the population and geographic setting. The estimated incidence in neonates is 24.5 per 100,000 live births[7–9]. Its disease burden is substantial and negatively affects the quality of life of both patients and caregivers. Treatments are associated with high costs for both patients and healthcare systems[8,9].

The treatment of IF-SBS focuses on promoting intestinal adaptation through the use of enteral nutrition (EN) and PN. PN should be initiated early within a multidisciplinary approach. EN, including breast milk and specialized formulas, is essential to stimulate intestinal growth and reduce dependence on PN. Pharmacological treatment includes proton pump inhibitors (PPIs), antibiotics for small intestinal bacterial overgrowth, and gastrointestinal hormones such as glucagon-like peptide-2 (GLP-2) analogs to induce intestinal adaptation. Surgical management focuses on preserving the greatest possible amount of functional intestine, restoring intestinal continuity, and, in some cases, intestinal transplantation in patients with severe complications[6,10–13].

Intestinal Failure-Associated Liver Disease

Intestinal failure-associated liver disease (IFALD) is a hepatic disorder resulting from factors intrinsic to IF-SBS and its medical-surgical management, which may progress to end-stage liver failure. Up to 50% of children with IF-SBS may develop IFALD, with a higher prevalence in neonates. Risk factors such as prematurity, prolonged PN, intestinal surgery, and comorbidities including infections and intestinal dysmotility increase the likelihood of its development. Signs and symptoms include cholestatic jaundice, steatosis, hepatomegaly, and growth retardation. Diagnosis is based on biochemical analyses and exclusion of other causes of liver disease. Prevention is essential, and cycling PN, optimizing EN, and implementing pharmacological strategies are recommended. In severe cases, liver transplantation may be required[14–17].

METHODOLOGY

Clinical Questions

The development group, composed of pediatric gastroenterologists and epidemiologists, formulated 12 clinical questions that guided the evidence search used to develop the recommendations discussed by the expert panel. These questions addressed key aspects of the diagnosis, treatment, and follow-up of IF-SBS. The clinical questions were formulated using the PICO structure (population, intervention, comparator, and outcomes).

Evidence Search and Synthesis

A systematic literature search was conducted in electronic databases (Medline, Embase, Lilacs, Cochrane Library, Google Scholar, and Epistemonikos), as well as repositories of organizations involved in the development and compilation of consensus statements and clinical practice guidelines (CPGs). Search strategies were developed from the clinical questions formulated in PICO format, combining controlled vocabulary (MeSH and Emtree terms) and free-text language through the use of Boolean operators (AND, OR), truncation symbols, and proximity operators. Clinical practice guidelines, systematic literature reviews (SLRs), meta-analyses, and network meta-analyses published within the last five years in English and Spanish were included. The methodological quality of the included evidence sources was assessed using validated tools according to the type of document. CPGs were evaluated using the Appraisal of Guidelines for Research and Evaluation (AGREE II) instrument[18], and SLRs were assessed using the Risk of Bias in Systematic Reviews (ROBIS) tool[19]. The process is summarized in the flow diagram presented in **Figure 1**. Evidence synthesis was performed narratively, highlighting the main quantitative findings supporting each recommendation, which are presented in the supplementary material.

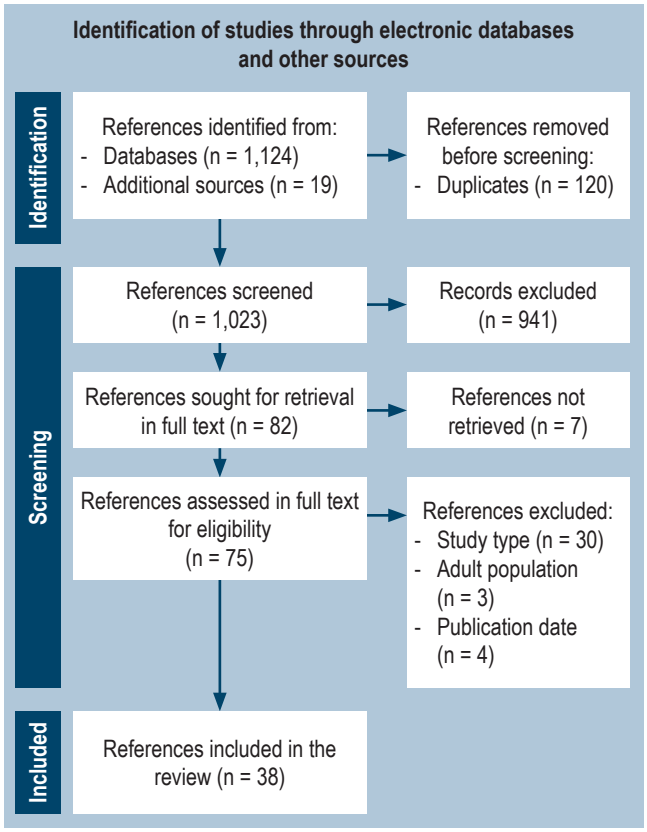


Figure 1. PRISMA flow diagram of the study search and selection process. Author's file. Adapted from: Page MJ and colleagues. BMJ. 2021;372:n71[20].

Composition of the Expert Panel

The preliminary recommendations derived from the evidence synthesis were discussed and subjected to a consensus process using a modified Delphi methodology[21]. The expert panel was composed of specialists with recognized clinical and academic expertise in the management of pediatric intestinal failure from different regions of the country (Barranquilla, Medellín, Cali, and Bogotá), with the aim of ensuring diversity of clinical perspectives and representativeness in the development of the consensus. A panel of 25 experts was convened, including pediatric gastroenterologists, pediatric surgeons, radiologists, nutritionists, and epidemiologists. A first round of anonymous voting was conducted through electronic forms with the following response options: "agree," "agree with modifications," or "disagree." Recommendations that did not reach the 75% agreement threshold were revised according to the modifications proposed by the experts and submitted to a second round of voting. In this second round, the response options were "agree" or "disagree," and the strength of the recommendation was classified according to the percentage of agreement achieved using a quartile-based scale, as shown in **Table 1**.

Table 1. Levels of Consensus

Percentage of Agreement Achieved	Interpretation
75-100	Strong consensus
50-74	Moderate consensus
25-49	Low level of consensus
Less than 25	Lack of consensus

Author's own research.

RESULTS

Search, Reference Screening, and Study Selection

A total of 1,124 records were identified through electronic databases, and 19 additional records were identified through manual searches and other sources. After duplicate removal, the titles and abstracts of the identified studies were screened. Subsequently, potentially relevant articles were reviewed in full text to determine eligibility. Finally, 38 studies that met the inclusion criteria were included and used for the evidence synthesis. The complete selection process is presented in **Figure 1** using a PRISMA flow diagram[22–60].

Risk of Bias Assessment of the Studies

Assessment of the quality of various CPGs using the AGREE II instrument[18] revealed variability. The risk of bias analysis is presented in the supplementary material.

Clinical Questions and Consensus Recommendations

Two rounds of voting were conducted. Overall, 76% (n = 77) achieved strong consensus, with more than 75% agreement. In the second round, 17 recommendations were voted on, and consensus was achieved for all of them. Differences in the denominator across recommendations are explained by minor variations in expert participation during the voting rounds. To ensure methodological accuracy, agreement percentages were always calculated based on the total number of valid responses received for each recommendation.

The recommendations derived from the consensus are presented below.

QUESTION 1. WHAT IS THE MOST EFFECTIVE AND SAFE PHARMACOLOGICAL MANAGEMENT FOR INTESTINAL FAILURE IN PEDIATRIC PATIENTS REGARDING THE USE OF PPIS, PROKINETICS, BILE ACID SEQUESTRANTS, PROBIOTICS, ANTIBIOTICS, AND ANTIDIARRHEAL AGENTS?

R-1: Use of Proton Pump Inhibitors

The use of PPIs, preferably esomeprazole, is recommended to reduce gastric acid secretion in patients with IF-SBS (**Table 2**)[25,26,29].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence

Table 2. Doses of Proton Pump Inhibitors

Name	Route of Administration	Dose
Esomeprazole[a]	Oral or intravenous	1–2 mg/kg/day, administered every 12 or 24 hours (maximum: 40 mg/day)
Omeprazole[b]	Oral or intravenous	1–4 mg/kg/day, administered every 12 or 24 hours (maximum: 80 mg/day)

a. Preferred option according to availability.
b. Second-line option. It may be used as a compounded formulation if necessary. Author's own research.

Good Clinical Practice Points

The use of PPIs is important during the first three months after surgical resection, with a recommended duration of up to six months, at which point the need for continuation should be reassessed. Patients should be monitored for adverse effects such as recurrent gastrointestinal infections and vitamin B12 and magnesium deficiency.

R-2: Use of Domperidone

The individualized use of domperidone is recommended because of its prokinetic effect. The recommended dose is 0.2–0.4 mg/kg/dose, administered orally every 6–8 hours, with a maximum dose of 30 mg/day. Dose adjustment according to individual needs is essential[26,29].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-3: Use of Erythromycin

The individualized use of erythromycin is recommended. As a prokinetic agent, erythromycin is administered at doses of 3–5 mg/kg/dose every six hours. It is used in gastroparesis to improve gastric emptying. Prolonged use may lead to tachyphylaxis. Its use should be avoided in neonates because of the risk of hypertrophic pyloric stenosis[26,29].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-4: Use of Ondansetron

The individualized use of ondansetron is recommended. The standard dose is 0.15 mg/kg/dose, administered orally or intravenously every 8–12 hours, with a maximum dose of 16 mg/day. Indication: control of nausea and vomiting in conditions such as SBS[26,29].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

Good Clinical Practice Point

These prokinetic agents may prolong the QT interval. It is recommended to perform an electrocardiogram before and after treatment initiation in at-risk patients and to review potential drug interactions. Their use warrants careful assessment of risks and benefits, avoiding routine administration.

R-5: Use of Cyproheptadine

The individualized use of cyproheptadine is recommended. It is administered at a dose of 0.25 mg/kg/day, divided into 2–3 doses. It is used to stimulate appetite in pediatric patients, particularly those with malnutrition or increased caloric requirements. Precautions: although generally well tolerated, it may cause drowsiness and weight gain[29].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-6: Use of Ursodeoxycholic Acid

The use of ursodeoxycholic acid (UDCA) is recommended in pediatric patients with IF-SBS and IFALD. Evidence suggests that UDCA contributes to reducing serum bilirubin levels and improving liver function parameters, which may mitigate progression to advanced liver disease and improve long-term quality of life. Potential drug interactions with other medications, including prokinetics, aluminum-containing compounds, statins, and antibiotics, should be considered[29,32]. Dose: 20–30 mg/kg/day, administered orally and divided into two to three daily doses.

UDCA is generally well tolerated, although potential adverse effects include diarrhea, abdominal pain, and, in exceptional cases, gallbladder calcification. Continuous monitoring of liver function and bilirubin levels is essen-

tial in order to adjust the dose and minimize associated risks[29,32].

Strong consensus (final agreement 100% [21/21]), high quality of evidence.

R-7: Avoidance of Probiotic Administration

The use of probiotics is contraindicated in patients with central venous access, immunosuppression, or critical illness because of the risk of severe complications such as bacteremia or fungemia. In patients with IF-SBS without central venous access, evidence regarding probiotic administration is insufficient and inconclusive; therefore, their use is not recommended[25,27].

Strong consensus (final agreement 85.7% [18/21]), moderate quality of evidence.

R-8: Use of Antibiotics

The use of systemic antibiotics in combination with local antibiotic therapies, such as antibiotic lock therapy, is recommended in pediatric patients with catheter-related infections (CRIs). Antibiotic selection should be guided by antimicrobial susceptibility testing to ensure effectiveness against the specific pathogens involved[26,29].

Strong consensus (final agreement 100% [21/21]), high quality of evidence.

Good Clinical Practice Point

Initial antibiotic management should include coverage for gram-positive and gram-negative organisms, based on local epidemiology and antibiotic availability. Appropriate empiric treatment should be initiated while awaiting antimicrobial susceptibility results in order to adjust therapy accordingly.

R-9: Use of Loperamide and Cholestyramine

The use of loperamide or cholestyramine is recommended for the management of IF-SBS in pediatric patients with high fecal output (greater than 40–50 mL/kg/day). Selection should be based on a comprehensive evaluation, considering both efficacy in reducing fecal output and the safety profile of each medication[27,29].

- Loperamide:
  - Dose: 0.4–0.8 mg/kg/day, administered orally every six hours (maximum dose: 16 mg/day).
- Cholestyramine:
  - Its use is recommended in patients with preserved colon and intestinal continuity when increased fecal output due to bile acid malabsorption or choleretic diarrhea is suspected. It should ideally be administered one hour before other medications or food intake[27,29].
  - Dose: 240 mg/kg/day administered orally every 8 or 12 hours.

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

QUESTION 2. WHAT ARE THE EFFECTIVENESS AND SAFETY OF ENTEROHORMONES IN PEDIATRIC PATIENTS WITH INTESTINAL FAILURE SECONDARY TO SHORT BOWEL SYNDROME?

R-10: Use of Teduglutide

Teduglutide is a glucagon-like peptide-2 (GLP-2) analog. This hormone promotes epithelial proliferation through crypt cell growth and inhibits enterocyte apoptosis in the small intestine. Teduglutide is currently indicated for pediatric patients aged one year and older with IF-SBS who are dependent on PN or intravenous fluid support. It is not considered a first-line treatment for patients with IF-SBS. Its use should only be considered when the patient has received optimal treatment at a specialized center and, despite this, remains dependent on PN without achieving intestinal adaptation. The recommended dose is 0.05 mg/kg once daily, administered subcutaneously under the supervision of a specialized intestinal failure team (**Table 3**)[22,25–28,33,34,53].

Mild adverse effects include abdominal pain, nausea, distension, and vomiting. Cases of cholecystitis, pancreatitis, and intestinal obstruction at anastomoses or stoma sites have been reported. Elevation of aminotransferases, as well as increased lipase, phosphorus, and blood urea nitrogen levels, has been observed in approximately 5% of treated patients[22,25–28,33,34,53].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-11: Monitoring and Duration of Teduglutide Treatment

During the first four weeks, weekly assessment of weight, height, heart rate, blood pressure, volume of orally ingested fluids, urinary output, and fecal output is recommended. Serum electrolytes, blood glucose, renal function, and liver transaminases should be monitored every two weeks during the initial phase of treatment and subsequently on a monthly basis. Before treatment initiation, endoscopic studies (esophagogastroduodenoscopy and colonoscopy) should be performed to rule out polyps. Endoscopic follow-up with colonoscopy is recommended one year after initiation of teduglutide treatment and subsequently

every three to five years, or earlier if clinically indicated. Appropriate patient selection and follow-up are essential to maximize benefits and mitigate risks.

Treatment duration: a responder is defined as a patient who achieves a 20% reduction in PN requirements. Most patients respond during the first year of treatment; however, some are considered late responders, in whom the multidisciplinary team should evaluate the appropriateness of continuing or discontinuing treatment. Patients who respond to teduglutide treatment should continue therapy even after achieving intestinal adaptation, as no discontinuation protocol currently exists[22,25–28,33,34,53].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

Table 3. Considerations for the Use of Teduglutide

Candidates for Treatment
The patient must meet ALL of the following criteria:
- Patients aged one year and older with SBS.
- Requirement for PN for more than six months.
- Stable parenteral/enteral nutrition without the possibility of reduction >10% during the previous three months.
- PN providing >20% of caloric or fluid/electrolyte requirements.
- Patient without additional medical-surgical treatment options to improve intestinal adaptation.
- Interval >3 months since the last surgical intervention.
- History of complications associated with IF-SBS: hydroelectrolytic imbalance, liver disease, catheter-related infections, or thromboembolic events.
Patients Without Indication for Teduglutide
- Intestinal failure due to an etiology other than SBS.
- Patients showing satisfactory progression with conventional intestinal rehabilitation treatment.
- Patients who have received growth hormone (somatropin) within the previous six months.
- Patients who do not require PN.
- Patients with a history of gastrointestinal neoplasia within the previous five years.
Contraindications
- Allergic reactions to the active substance or excipients.
- Hypersensitivity to tetracyclines.
- Suspected or confirmed active malignant neoplasia.

Author's own research.

QUESTION 3. WHAT ARE THE APPROPRIATE PARENTERAL NUTRITION STRATEGIES IN A PATIENT WITH IF-SBS?

R-12: Fluid Intake

Individualization of PN fluid volume according to the patient's age, weight, clinical status, and insensible losses is recommended, using the Holliday-Segar formula as the basis. Monitoring fluid balance and adjusting doses are essential to avoid complications such as fluid overload or dehydration[23,27,29,30].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-13: Macronutrient Requirements

A protein intake according to patient age of 1.5–3.5 g/kg/day is recommended to ensure a positive nitrogen balance. Carbohydrates are recommended to account for 50%–60% of total caloric intake and fats for 30%–40%, preferably using mixed lipid emulsions to minimize the risk of IFALD[23,27,29,30].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-14: Micronutrient Requirements

Appropriate supplementation and monitoring of vitamins and minerals are essential and should be adjusted periodically according to laboratory results to prevent deficiencies that may negatively affect growth and development[6,15,23,30].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-15: Lipid Intake

Administration of lipid emulsions composed of a mixture of oils (soybean, coconut, olive, and fish oils) is recommended to reduce the risk of hepatic complications in pediatric patients requiring PN. The suggested dose ranges from 1 to 4 g/kg/day, adjusted according to the patient's age, tolerance, and clinical status.

Specific approach: priority should be given to lipid emulsions enriched with omega-3 fatty acids (eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]) because of their anti-inflammatory properties and lower negative impact on liver function compared with emulsions based exclusively on soybean oil. However, the exclusive use of omega-3 emulsions should be temporary and reserved for situations of established liver injury because of the risk of

inducing essential fatty acid deficiency. Systematic monitoring of liver function parameters and lipid profile is imperative, as it allows adjustment of PN therapy and prevention of complications such as IFALD[23,27,29,30].

Strong consensus (final agreement 95.2% [20/21]), moderate quality of evidence.

R-16: Electrolyte Balance

Regular monitoring of serum sodium, potassium, calcium, magnesium, and phosphate levels is recommended, with adjustment of PN solutions to maintain optimal balance and prevent severe complications. Gastrointestinal losses should be considered when adjusting sodium and other electrolyte requirements[23,27,29,30].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-17: Parenteral Nutrition in the Acute Phase

It is recommended that parenteral nutrition be managed according to phases as outlined in the European Society for Paediatric Gastroenterology, Hepatology and Nutrition guidelines (ESPGHAN 2023): during the early acute phase (0–48 hours), the focus is on restoring normal physiological status through fluid and electrolyte management, including glucose administration (3.5–7 mg/kg/min) to prevent catabolism[23,25,26,29,38].

Strong consensus (final agreement 100% [22/22]), high quality of evidence.

R-18: Parenteral Nutrition in the Subacute Phase

During the intermediate postoperative phase (48 hours–7 days), priority is given to meeting basic metabolic requirements with PN when EN is not feasible, ensuring protein intake (1.3–01.5 g/kg/day) and balanced lipid emulsions, preferably including fish oil during prolonged periods or in the presence of cholestasis. In the subacute phase (from day 7 onward), optimization of nutritional support with a focus on gradual transition to EN is recommended in order to reduce dependence on PN and stimulate intestinal function. Monitoring nutritional parameters (albumin, prealbumin, fat- and water-soluble vitamins, urinary sodium >20 mmol/L) at intervals adapted to patient stability (weekly, biweekly, or monthly) is essential, and the strategy should be adjusted to prevent complications such as cholestasis. Appropriate implementation of PN improves long-term clinical outcomes[23,25,26,29,38].

Strong consensus (final agreement 85.7% [18/21]), high quality of evidence.

R-19: Parenteral Nutrition in the Chronic Phase

During the chronic phase (>30 days), continuous optimization of PN is recommended, adjusting its composition according to biochemical parameters and always under the supervision of a nutritional support team; gradually reducing dependence on PN while promoting intestinal absorption and the progressive introduction of EN[23,25,26,29,38].

Strong consensus (final agreement 100% [22/22]), high quality of evidence.

Good Clinical Practice Point

Cycling of PN should be considered in clinically and metabolically stable patients who have achieved their nutritional goals and who receive some proportion of EN or oral intake.

QUESTION 4. WHAT ARE THE STRATEGIES FOR FLUID AND ELECTROLYTE MANAGEMENT AND MONITORING IN A PATIENT WITH SBS?

R-20: Quantification of Losses

Daily monitoring and quantification of fecal losses, stool consistency, and urine output are recommended. In patients with ostomies, detailed measurement of output volume and consistency should be performed. Fecal losses should be maintained below 50 mL/kg/day to prevent dehydration and electrolyte imbalances[23,26,29,30].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-21: Intravenous Replacement

Initiation of intravenous fluid and electrolyte replacement is recommended during the initial phases of treatment or during acute decompensations. Prolonged PN should be adjusted according to the patient's specific needs in order to maintain hydroelectrolytic and nutritional balance. Serum electrolyte levels should also be monitored regularly, initially every two weeks and subsequently monthly according to patient stability[23,26,29,30].

Sodium should be administered to maintain urinary sodium levels between 20 and 60 mmol/L and to ensure a urinary sodium-to-potassium ratio of at least 2:1[23,26,29,30].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-22: Monitoring of Clinical Parameters and Adjustments

Weekly body weight measurements are recommended during the first month, every two weeks during the second

month, and subsequently monthly or at alternate intervals depending on clinical evolution. Signs of fluid overload and variations in fecal or ostomy output should be monitored weekly during the first months and then monthly thereafter[23,26,29,30].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

QUESTION 5. WHAT ARE THE APPROPRIATE FEEDING AND ENTERAL NUTRITION STRATEGIES IN PATIENTS WITH INTESTINAL FAILURE?

R-23: Timing of Enteral Nutrition Initiation

Enteral feeding should be initiated as soon as the patient's condition permits, generally once postoperative ileus has resolved and bowel sounds and stool passage are present. This approach takes advantage of the benefits of oral feeding, which is more physiological and promotes intestinal adaptation[36,37,40,41].

Strong consensus (final agreement 77.3% [17/22]), high quality of evidence.

R-24: Use of Breast Milk

Breast milk should be the first option for EN in infants with intestinal failure. It contains immunological and growth factors that support intestinal adaptation and strengthen the immune system.

Dose: initiate with volumes of 10–20 mL/kg/day, administered as assisted feeding or continuous infusion, with progressive increases according to tolerance in order to maintain fecal losses below 50 mL/kg/day[36,37,40,41].

Strong consensus (final agreement 86.4% [19/22]), high quality of evidence.

R-25: Use of Infant Formulas

In the absence of available breast milk, the use of semi-elemental infant formulas is recommended. These formulas contain extensively hydrolyzed protein and medium-chain triglycerides (MCTs) and are lactose-free. In cases of suspected severe food allergy or intolerance to semi-elemental formula, the use of elemental formulas (free amino acids) should be considered. MCTs are useful in patients with intestinal dysfunction because they are more easily absorbed than long-chain triglycerides, as their absorption occurs directly through the portal circulation[36,37,40,41].

Recommended dose: initiate with volumes of 10–20 mL/kg/day, progressively increasing according to patient tolerance until established nutritional requirements are achieved[36,37,40,41].

Strong consensus (final agreement 100% [22/22]), high quality of evidence.

R-26: Key Points for Evaluating Tolerance

Assessment of feeding tolerance through monitoring of fecal output or stool frequency is recommended. These indicators are crucial for adjusting the volume and composition of enteral feeding[36,37,40,41].

Strong consensus (final agreement 81.8% [18/22]), high quality of evidence.

R-27: Transition to Full Enteral Feeding

The transition should be performed carefully, beginning with breast milk or specialized formulas and gradually advancing the volume and diversity of foods according to tolerance and clinical response[36,37,40,41].

Moderate consensus (final agreement 72.7% [16/22]), high quality of evidence.

R-28: Complementary Feeding

Initiation of complementary feeding is recommended between four and six months of chronological age or corrected age in preterm infants, according to the residual anatomy and neurocognitive development of the patient. New foods should be introduced gradually, testing one new food every two to four days in order to evaluate tolerance and minimize potential adverse effects. Administration of complete proteins and restriction of simple carbohydrates are recommended[36,37,40,41].

Specifications according to the type of resection:

- Type I SBS: diet containing 40%–50% complex carbohydrates, high in fat (40%), without the need for oxalate restriction.
- Type II SBS: caution with excessive fat intake, as fats may bind to calcium, increasing the risk of oxalate formation.
- Type III SBS: priority should be given to the use of soluble fiber to promote the production of short-chain fatty acids, which are essential for maintaining the integrity of the colonic mucosa.

Moderate consensus (final agreement 100% [22/22]), high quality of evidence.

R-29: Routes of Enteral Nutrition Administration

Selection of the route of EN administration should be based on the type of intestinal resection and the clinical condition of each patient[36,37,40,41].

Orogastric and Nasogastric Tubes

The orogastric tube is used primarily in neonates. Both tubes are employed for temporary feeding and during the transition to full EN. The use of silicone tubes is recommended because of their greater durability and lower risk of complications.

Nasojejunal and Gastrojejunal Tubes

These are indicated for patients with gastroparesis, motility disorders, and risk of aspiration, allowing direct access to the jejunum. These tubes require continuous monitoring to prevent mucosal erosion, especially during prolonged use. Tube migration, as well as nasal or esophageal complications associated with insertion and prolonged placement, should be monitored and prevented.

Gastrostomy

Recommended for long-term feeding in patients requiring more than 4–8 weeks of nasogastric tube feeding. Careful supervision is essential to prevent insertion-site infections and tube displacement, as well as to ensure appropriate stoma maintenance.

Additional Considerations

Depending on tolerance and the patient's specific needs, both bolus administration and continuous infusion may be used. Selection of the method should be individualized and should consider factors such as the absorptive capacity of the remaining intestine and the comfort of the patient and family.

Moderate consensus (final agreement 100% [22/22]), high quality of evidence.

QUESTION 6. WHAT ARE THE SURGICAL MANAGEMENT STRATEGIES FOR INTESTINAL FAILURE SECONDARY TO SHORT BOWEL SYNDROME AND THEIR INDICATIONS?

R-30: Intestinal Remodeling

Restoration of gastrointestinal tract continuity through intestinal remodeling techniques is recommended, including enteroplasty, ostomy closure, stricturoplasty, or the Bianchi technique, in order to increase the absorptive surface area of the small intestine. The risk of postoperative complications, such as intestinal obstruction and anastomotic leaks, should be considered[25–27].

Strong consensus (final agreement 95% [19/20]), moderate quality of evidence.

R-31: Intestinal Lengthening

Consideration of intestinal lengthening surgery, specifically using the Serial Transverse Enteroplasty Procedure (STEP) technique, is recommended in pediatric patients with IF-SBS. This technique has been shown to be effective in increasing functional intestinal length, improving nutrient absorption, and reducing dependence on PN. The STEP technique may be associated with complications such as sepsis and intestinal obstruction[25–27].

Strong consensus (final agreement 95% [19/20]), moderate quality of evidence.

R-32: Comparison and Selection of Technique

Selection of the surgical technique should be based on a comprehensive evaluation of patient characteristics, the length and functionality of the remaining intestine, and the presence of preexisting complications.

When enteroplasty or the Bianchi technique is used, appropriate monitoring should be implemented, including hemodynamic, nutritional, and radiological surveillance according to each clinical scenario.

STEP procedures should be performed exclusively in specialized centers, with rigorous postoperative follow-up to ensure treatment success and patient safety[25,27,35,42,43].

Strong consensus (final agreement 100% [21/21]), high quality of evidence.

R-33: Gastrostomy and Insertion Technique

Insertion of a percutaneous endoscopic gastrostomy is recommended in pediatric patients with IF-SBS. This technique represents a minimally invasive approach that, in cases of complex anatomy, may be complemented with laparoscopic assistance or, ultimately, by surgical gastrostomy placement. Selection of the insertion technique should be individualized and should take into account the expertise of the treating team[29–31,36,37,40,44].

Strong consensus (final agreement 75% [15/20]), high quality of evidence.

R-34: Effectiveness of Intestinal Transplantation

Intestinal transplantation provides significant improvement in long-term survival and quality of life in patients with severe intestinal failure. Studies report survival rates of approximately 50% at 5 years after transplantation[23,25,27,29].

Strong consensus (final agreement 100% [17/17]), high quality of evidence.

R-35: Indications for Referral to a Transplant Center

Irreversible intestinal failure: patients who are unable to achieve enteral autonomy despite intensive medical and surgical management and whose quality of life under intestinal rehabilitation treatment is poor[23,25,27,29]:

- Progressive IFALD or irreversible liver disease or progression to cirrhosis.
- Multiple vascular thromboses.
- Recurrent episodes of catheter-related sepsis (≥2 per year).
- Severe hydroelectrolytic disorders that cannot be corrected or managed.

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-36: Referral to a Specialized Transplant Center

In pediatric patients with severe IF-SBS, referral to a specialized intestinal transplant center should be considered as a viable therapeutic option when conventional interventions have failed to restore adequate intestinal function. Candidate selection should be performed under strict criteria, including irreversibility of intestinal failure and the presence of severe complications related to prolonged PN, such as IFALD or recurrent infections[23,25,27,29].

Decision-making process: the multidisciplinary intestinal failure management team should evaluate each case and determine whether the patient meets the criteria for referral to a transplant center.

Social considerations: evaluation of the social context is essential, as limitations affecting implementation of the recommendation, such as access to a specialized center or family support, may influence the success of post-transplant treatment. Available resources and support systems for the patient and family should be specified and documented before proceeding with referral[23,25,27,29].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

QUESTION 7. WHAT ARE THE MOST RECOMMENDED TYPES OF VASCULAR ACCESS AND DEVICES, CARE MEASURES, AND PREVENTION AND TREATMENT STRATEGIES FOR COMPLICATIONS IN PEDIATRIC PATIENTS WITH INTESTINAL FAILURE SECONDARY TO SHORT BOWEL SYNDROME?

R-37: Use of Tunneled Catheters

The use of tunneled catheters, preferably silicone rather than polyurethane, single-lumen, and cuffed catheters, is recommended for children with IF-SBS[15,23,53].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-38: Catheter Location

Vascular access in the upper part of the trunk is preferably recommended when these vessels remain patent[23,27,53].

Strong consensus (final agreement 100% [20/20]), high quality of evidence.

R-39: Endovascular Procedures

In patients with difficult vascular access who require alternative access or endovascular procedures, these should be performed by experienced pediatric surgeons or interventional radiologists, preferably in a specialized intestinal rehabilitation or transplant center[23,27,53].

Strong consensus (final agreement 100% [20/20]), high quality of evidence.

R-40: Importance of Technique and Hygiene in Central Venous Catheter Care

Use of appropriate and hygienic techniques in central venous catheter care is recommended to prevent associated complications. It is essential that caregivers receive specific education before patient discharge, with reinforcement sessions as needed to ensure proper understanding and practice[23].

Strong consensus (final agreement 100% [19/19]), high quality of evidence.

R-41: Use of Chlorhexidine-Impregnated Supplies

For coverage of the central catheter insertion site in pediatric patients with IF-SBS, consideration should be given to the use of 2% chlorhexidine-impregnated supplies, such as discs, sponges, or dressings. These products may help reduce the risk of catheter-related infections[23].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-42: Routine Surveillance of Central Venous Access

Routine surveillance of central venous access should be based on clinical assessment, and in cases of suspected abnormalities, ultrasound should be performed to monitor for potential complications. When more detailed delineation of venous access is required, the interventional radiologist from the intestinal rehabilitation team should be consulted regarding the diagnostic approach[23].

Strong consensus (final agreement 100% [17/17]), high quality of evidence.

R-43: Emergency Letter

All children with IF-SBS should have a letter detailing their specific needs in emergency situations[23].

Strong consensus (final agreement 100% [16/16]), high quality of evidence.

R-44: Discussion Regarding Physical Activities

It is important to discuss with families the risks associated with swimming and participation in sports, as well as strategies to protect the catheter insertion site dressing and the central line during these activities[23].

Strong consensus (final agreement 100% [17/17]), high quality of evidence.

R-45: Travel Planning

It is recommended that travel plans be discussed with the intestinal rehabilitation team sufficiently in advance to develop an emergency care plan[23].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-46: Management of Fever in Children with IF-SBS and a Central Venous Catheter

All children with IF-SBS and a central venous catheter who develop fever should be hospitalized and evaluated to rule out bacteremia through central and peripheral blood cultures. They should receive empiric broad-spectrum antibiotics through the central venous catheter for at least 48 hours while awaiting culture results, regardless of the presence of other possible sources of infection[23,27,53].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-47: Consultation Before Catheter Removal in Central Line-Associated Bloodstream Infection (CLABSI)

In a patient with CLABSI who is clinically stable, the intestinal rehabilitation team should be consulted before proceeding with catheter removal[23,27,53].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-48: Prophylactic Lock Therapy

Prophylactic lock therapy with ethanol or other non-antibiotic lock solutions should be strongly considered in all children with IF-SBS from the time of tunneled catheter insertion[23,27,53].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-49: Management of Mechanical Complications

In children with IF-SBS, the central venous catheter should be repaired whenever possible in order to preserve venous access, according to the availability of repair kits in the country[23,27,53].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

R-50: Treatment of Catheter-Related Thrombosis (CRT)

Children with IF-SBS and newly identified catheter-related thrombosis should be treated with low-molecular-weight heparin for at least six weeks. Those with persistence of at least one chronic thrombus should remain on prophylactic anticoagulation under the supervision of a hematologist[23,27,53].

Strong consensus (final agreement 100% [16/16]), high quality of evidence.

R-51: Evaluation for Intestinal Transplantation

Children who have lost multiple central venous access sites should be considered for referral to an intestinal transplant center for evaluation and management[23,27,53].

Strong consensus (final agreement 100% [19/19]), high quality of evidence.

R-52: Recommendation for the Management of Central Venous Access Programs

All centers caring for children with IF-SBS should record the number of CLABSIs in hospitalized or outpatient patients per 1,000 catheter-days[23,27,53].

Strong consensus (final agreement 100% [18/18]), high quality of evidence.

QUESTION 8. WHAT ARE THE RECOMMENDATIONS FOR THE DIAGNOSIS, PREVENTION, AND TREATMENT OF INTESTINAL FAILURE-ASSOCIATED LIVER DISEASE SECONDARY TO SHORT BOWEL SYNDROME IN PEDIATRICS?

R-53: Monitoring of Liver Biochemistry

Monitoring of hepatic biochemical parameters, such as bilirubin, transaminases, γ-glutamyltransferase, and alkaline phosphatase, is recommended in order to adjust nutritional treatment and detect early signs of hepatic deterioration[27].

Strong consensus (final agreement 100% [18/18]), moderate quality of evidence.

Good Clinical Practice Points

To date, there is no universally accepted diagnostic definition for intestinal failure-associated liver disease; however, in clinical practice, biochemical criteria based on persistent abnormalities in liver profile tests are used. In the pediatric population, elevations of cholestatic enzymes (mainly alkaline phosphatase and γ-glutamyltransferase) above 1.5 times the upper limit of normal persisting for more than six weeks are considered suggestive. Additionally, alanine aminotransferase (ALT) elevations greater than 2–3 times the normal value may be observed, as well as increases in total bilirubin within a similar range.

R-54: Adjustment of Lipid Emulsion Dose and Infusion Rate

Adjustment of the dose or infusion rate of lipid emulsions is recommended while respecting the oxidation rate of fatty acids[27].

Strong consensus (final agreement 100% [19/19]), moderate quality of evidence.

R-55: High Soybean Content Lipid Emulsions

Avoidance of lipid emulsions with a high soybean oil content (first-generation emulsions) is recommended[27].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-56: Composite Lipid Emulsions

Use of composite lipid emulsions (soybean oil, olive oil, MCTs, and fish oil) is recommended[27].

Strong consensus (final agreement 100% [20/20]), moderate quality of evidence.

R-57: Prevention and Treatment of CLABSI

Implementation of strict prevention and treatment measures for CLABSI and small intestinal bacterial overgrowth (SIBO) is recommended, as infections may aggravate hepatic involvement[27].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-58: Cyclic Administration of Parenteral Nutrition

Cyclic administration of PN is recommended as soon as possible[27].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-59: Intestinal Reconstruction

Surgical interventions should be evaluated and considered when necessary, including reconstruction of intestinal continuity and treatment of dilated bowel loops, in order to improve intestinal adaptation and reduce hepatic burden[26,27,29].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-60: Clinical Evaluation of IFALD

When IFALD is suspected, clinical evaluation is recommended to identify signs of persistent jaundice, hepatomegaly with an irregular liver edge, and splenomegaly. In advanced stages, the presence of collateral circulation, variceal bleeding secondary to portal hypertension, and ascites should be monitored[26,27,29].

Strong consensus (final agreement 100% [20/20]), high quality of evidence.

R-61: Biochemical Evaluation of IFALD

When IFALD is suspected, monitoring of biochemical parameters (bilirubin, transaminases, γ-glutamyltransferase, and alkaline phosphatase) every one to four weeks is recommended, depending on the degree of hepatic involvement[26,27,29].

Strong consensus (final agreement 100% [17/17]), high quality of evidence.

R-62: Imaging Studies and Pathological Anatomy

Upon diagnosis of IFALD, total abdominal ultrasound and splenoportal Doppler ultrasound are recommended to characterize parenchymal involvement and portal hypertension. Other studies, such as abdominal computed tomography, magnetic resonance imaging, elastography, and endoscopic studies, should be evaluated according to the clinical presentation. Liver biopsy is the reference standard for the diagnosis and classification of fibrosis; however, its indication should be determined by the intestinal failure team[26,27,29].

Strong consensus (final agreement 100% [21/21]), high quality of evidence.

R-63: Temporary Reduction of Lipid Emulsions

Temporary reduction of the dose or suspension for several days of lipid emulsions in PN is recommended according

to the severity of hepatic involvement, while ensuring the provision of essential fatty acids[26,27,29].

When available, the use of lipid emulsions containing 100% fish oil at a dose of 1 g/kg/day should be considered while hepatic involvement persists[26,27,29].

Strong consensus (final agreement 94.4% [17/18]), high quality of evidence.

R-64: Use of Hepatoprotective Medications

Use of UDCA is suggested to improve bile flow and reduce cholestasis in patients with early signs of IFALD[26,27,29].

Strong consensus (final agreement 100% [21/21]), high quality of evidence.

R-65: Liver Transplantation

Early identification and evaluation of patients with advanced liver disease who do not respond to conventional therapies are recommended in order to consider liver transplantation or multivisceral transplantation.

A transplant team should also be involved in patient follow-up and preparation, ensuring that all medical and nutritional needs are addressed[26,27,29].

Strong consensus (final agreement 100% [22/22]), high quality of evidence.

QUESTION 9. WHAT ARE THE RECOMMENDATIONS FOR DIAGNOSIS AND TREATMENT, IN TERMS OF EFFECTIVENESS AND SAFETY, FOR THE MANAGEMENT OF OTHER MEDICAL COMPLICATIONS INHERENT TO INTESTINAL FAILURE?

R-66: Lactulose or Glucose Breath Test for the Diagnosis of SIBO

Use of the lactulose or glucose breath test is recommended as a noninvasive diagnostic method for SIBO, based on its availability and diagnostic accuracy. Jejunal aspirate with culture is recommended only in complex or refractory cases because of its greater diagnostic accuracy[45].

Strong consensus (final agreement 95.2% [20/21]), moderate quality of evidence.

R-67: Use of Rotating Cycles of Antibiotics for the Treatment of SIBO

Use of rotating cycles of antibiotics such as rifaximin and metronidazole is suggested for the treatment of SIBO, as this strategy has demonstrated effectiveness in reducing symptoms of malabsorption and abdominal distension, with a favorable safety profile[48].

Strong consensus (final agreement 100% [20/20]), moderate quality of evidence.

Good Clinical Practice Point

In patients with neurological involvement and high anion gap metabolic acidosis with normal lactate levels, the presence of D-lactic acidosis should be considered. This can be confirmed through D-lactate measurements according to their availability.

R-68: Dietary Modification

Dietary modification, including restriction of simple carbohydrates and increased fat intake, is recommended in patients with recurrent D-lactic acidosis, as this approach has been shown to reduce bacterial fermentation and D-lactate production[27].

Strong consensus (final agreement 100% [20/20]), moderate quality of evidence.

R-69: Use of Preventive Antibiotics

Use of antibiotics (metronidazole or vancomycin) is suggested in severe cases of D-lactic acidosis associated with bacterial overgrowth[27].

Strong consensus (final agreement 95% [19/20]), moderate quality of evidence.

R-70: Bone Metabolism

Monitoring of biochemical markers of bone metabolism is recommended, including serum levels of 25-OH-vitamin D3, alkaline phosphatase, phosphate, and calcium every three months, as well as urinary calcium and parathyroid hormone once yearly[27].

Strong consensus (final agreement 85% [17/20]), moderate quality of evidence.

R-71: Vitamin D Supplementation

Supplementation with vitamin D (800-1,000 IU/day) and calcium (1-1.5 grams/day) is recommended in patients with IF-SBS, as deficiency is associated with an increased risk of metabolic bone disease. Supplementation should be individualized and determined by the intestinal failure team[27].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

Good Clinical Practice Point

Recommendation or indication for the use of therapies such as bisphosphonates in patients with diagnosed osteoporosis should be discussed with a pediatric endocrinologist.

R-72: Endoscopic Studies in Recurrent Gastrointestinal Bleeding

In patients with recurrent gastrointestinal bleeding without a clear etiology, endoscopic studies with biopsy sampling are recommended to differentiate eosinophilic gastrointestinal disorders from other etiologies[27].

Strong consensus (final agreement 100% [21/21]), moderate quality of evidence.

R-73: Diet in Eosinophilic Intestinal Disorders

In patients with confirmed eosinophilic intestinal disorders, an individualized allergen elimination diet is recommended, aiming to be as minimally restrictive as possible: milk, egg, wheat, soy, peanuts, fish, shellfish, tree nuts, and sesame[27].

Strong consensus (final agreement 78.9% [15/19]), moderate quality of evidence.

QUESTION 10. WHAT ADDITIONAL DIAGNOSTIC STUDIES SHOULD BE REQUESTED FOR THE DIAGNOSIS AND FOLLOW-UP OF PEDIATRIC PATIENTS WITH INTESTINAL FAILURE?

R-74: Frequency of Biochemical Monitoring

The frequency of biochemical monitoring should be individualized and determined by the multidisciplinary intestinal rehabilitation team[27,29,56,57].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-75: Recommendation Regarding Densitometry

Dual-energy X-ray absorptiometry (DXA) is considered the gold standard for the diagnosis and monitoring of bone health in pediatric patients with IF-SBS from five years of age onward. DXA is recommended every 1–3 years, adjusting the frequency according to previous Z-score results, clinical presentation, and occurrence of fractures[27,29,56,57].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-76: Use of Diagnostic Imaging

The role of imaging is to:

- Assess preoperative and postoperative intestinal anatomy.
- Identify stenoses, fistulas, collections, or other complications.
- Exclude congenital malformations.

Close communication between clinicians and radiologists is recommended in order to select the most appropriate diagnostic modality and avoid unnecessary exposure to ionizing radiation[25,27,38,58,59].

Strong consensus (final agreement 100% [22/22]), high quality of evidence.

R-77: Gastrointestinal Fluoroscopy Studies

Fluoroscopy studies are recommended to evaluate preoperative and postoperative intestinal anatomy. These studies allow measurement of intestinal length and assessment of anatomical integrity[25,27,38,58,59].

Strong consensus (final agreement 100% [22/22]), high quality of evidence.

Good Clinical Practice Point

Iso-osmolar water-soluble contrast should be used, avoiding barium because of the risk of chemical peritonitis in cases of leakage, especially during the immediate postoperative period. Other studies, such as CT enterography or magnetic resonance enterography, should be considered according to each patient's needs.

R-78: Abdominal Ultrasound and Hepatic Doppler

Use of ultrasonography is suggested for follow-up of the hepatic parenchyma and biliary tract, hepatic steatosis in patients dependent on parenteral nutrition, associated malformations, and complications (latest-generation ultrasound equipment can quantitatively measure fat infiltration and fibrosis by elastography). The frequency of use should be individualized for each case according to the indications of the intestinal rehabilitation team[27,35,39,51,60].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

Good Clinical Practice Point

Complementary hepatic Doppler evaluation is advised to assess portal blood flow, especially in patients with suspected IFALD-related portal hypertension.

R-79: Liver Elastography and Magnetic Resonance Imaging

Liver elastography and magnetic resonance imaging may be considered according to availability, on an individualized basis and according to the indications of the intestinal rehabilitation team. If these technologies are used, the patient should be considered his or her own control[27,35,39,51,60].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

R-80: Gastrointestinal Endoscopy

Endoscopic studies, including esophagogastroduodenoscopy (EGD) and colonoscopy, are suggested in patients with anemia refractory to treatment, suspected or documented gastrointestinal bleeding, suspected enteropathies and eosinophilic gastrointestinal disorders, as a baseline study before initiation and follow-up of enterohormone treatment to rule out polyps, and as a route for nasojejunal tube placement[25–27].

Strong consensus (final agreement 100% [22/22]), moderate quality of evidence.

QUESTION 11. WHAT ARE THE INDICATIONS FOR REFERRAL AND THE REQUIREMENTS THAT A MULTIDISCIPLINARY INTESTINAL REHABILITATION CENTER SHOULD FULFILL?

R-81: Indications for Referral to an Intestinal Rehabilitation Center

Referral to an intestinal rehabilitation program is recommended for all pediatric patients with the following indications[25–27]:

- Progressive associated liver disease.
- Recurrent catheter-associated sepsis: two or more catheter-related sepsis episodes within one year.
- Recurrent loss of vascular access.
- Central venous access thrombosis.
- Epithelial enteropathies complicating management.
- Ultrashort bowel.
- Lack of a trained team or infrastructure.
- Lack of diagnostic certainty to guide management.
- Prolonged parenteral nutrition for more than three months.
- Severe hydroelectrolytic disorders.

Strong consensus (final agreement 100% [22/22]), low quality of evidence.

R-82: Requirements That an Intestinal Rehabilitation Center Should Fulfill[25–27]

Multidisciplinary Team

- Pediatric gastroenterologist with experience in intestinal failure and nutrition.
- Pediatric surgeon with experience in complex procedures and vascular access management.
- Specialists in pediatric nutrition (dietitian or pediatric nutrition specialist): pediatric metabolic and nutritional support team.
- Pediatric infectious disease specialist: management of recurrent sepsis and infection prevention.
- Pediatric psychologist or psychiatrist.
- Clinical pharmacist: optimization of nutritional therapy and medications.
- Specialized nursing staff: management of central venous access and administration of parenteral nutrition.
- Comprehensive physical therapy services: speech therapy, occupational therapy, and physiotherapy.

Infrastructure and Services

- Pediatric intensive care unit (PICU).
- Specialized clinical laboratory.
- Advanced imaging services.
- Operating rooms equipped for highly complex procedures.
- Gastroenterology unit with availability of endoscopic equipment for diagnostic studies, follow-up, and interventions such as gastrostomy.
- Advanced nutritional therapies: home parenteral and enteral nutrition and transition to home care.
- Continuing education program for healthcare staff and families focused on home management of parenteral nutrition and catheter care.

Strong consensus (final agreement 100% [22/22]), low quality of evidence.

QUESTION 12. WHAT ARE THE INDICATIONS AND REQUIREMENTS FOR HOME PARENTERAL NUTRITION?

R-83: Indications for Home Parenteral Nutrition[25–27]

- Family members/caregivers of legal age who accept and assume responsibility for treatment and are trained in PN replacement, PN cycling, and emergency situations.
- Home with adequate socioenvironmental conditions for PN administration: hygiene, potable water, electricity, and refrigeration.
- Clinical stability of the patient: underlying disease stability, control of losses, metabolic and hemodynamic stability.
- Expected weight gain.
- Patient requiring prolonged PN and beyond the neonatal period.
- Multidisciplinary team with experience in nutritional support.
- Long-term venous catheter (free of infection and in good condition).
- Contact and accessibility to a nearby healthcare center.
- Payer ensuring coverage.

- Availability of home supplies.
- Appropriate legal framework.

Strong consensus (final agreement 100% [22/22]), low quality of evidence.

R-84: Multidisciplinary Follow-Up

Children discharged with home PN should be monitored by a multidisciplinary intestinal rehabilitation team[25–27].

Strong consensus (final agreement 100% [22/22]), low quality of evidence.

R-85: Family Training and Support

Before discharge, it should be ensured that parents are adequately trained in the administration of PN and EN, as well as in the recognition of warning signs[25–27].

Strong consensus (final agreement 100% [22/22]), low quality of evidence.

R-86: Central Venous Access Team

To prevent loss of vascular access, a specialized team for central venous access management is recommended(25–27).

Strong consensus (final agreement 100% [22/22]), low quality of evidence.

R-87: Psychological Care and Social Workers

Mental health professionals and social workers should address the impact on quality of life and the emotional well-being of patients and families[25–27].

Strong consensus (final agreement 100% [22/22]), low quality of evidence.

R-88: Telemedicine

Telemedicine is a valuable option for reducing the frequency of visits and monitoring patients in remote areas[25,26].

Strong consensus (final agreement 90.9% [20/22]), low quality of evidence.

CONCLUSION

Intestinal failure secondary to short bowel syndrome in pediatrics represents one of the most complex challenges in contemporary pediatric medicine, requiring a comprehensive, multidisciplinary, and highly specialized approach. This consensus, developed through a rigorous Delphi method with participation of 25 multidisciplinary experts, provides 88 recommendations based on the best available evidence, adapted to the context and resources of the Colombian healthcare system.

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Conflict of Interest

The development of this analysis, as well as its conclusions, was conducted independently, transparently, and impartially by the authors.

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