

<b>Subject: Small Bowel Transplantation, Small Bowel and Liver Transplantation and Multivisceral Transplantation</b>		<b>Original Effective Date:</b> 8/30/12
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## PREFACE

*This Medical Guidance is intended to facilitate the Utilization Management process. It expresses Molina's determination as to whether certain services or supplies are medically necessary, experimental, investigational, or cosmetic for purposes of determining appropriateness of payment. The conclusion that a particular service or supply is medically necessary does not constitute a representation or warranty that this service or supply is covered (i.e., will be paid for by Molina) for a particular member. The member's benefit plan determines coverage. Each benefit plan defines which services are covered, which are excluded, and which are subject to dollar caps or other limits. Members and their providers will need to consult the member's benefit plan to determine if there are any exclusions or other benefit limitations applicable to this service or supply. If there is a discrepancy between this policy and a member's plan of benefits, the benefits plan will govern. In addition, coverage may be mandated by applicable legal requirements of a State, the Federal government or CMS for Medicare and Medicaid members. CMS's Coverage Database can be found on the following website: <http://www.cms.hhs.gov/center/coverage.asp>.*

## FDA INDICATIONS

Small Bowel and Multi-visceral transplantation are procedures that are not subject to FDA regulation.

## CENTERS FOR MEDICARE AND MEDICAID SERVICES (CMS)

*The coverage directive(s) and criteria from an existing National Coverage Determination (NCD) or Local Coverage Determination (LCD) will supersede the contents of this Molina medical coverage guidance (MCG) document and provide the directive for all Medicare members. The directives from this MCG document may be followed if there are no available NCD or LCD documents available and outlined below.*

CMS<sup>2</sup> has an NCD entitled Intestinal and Multi-Visceral Transplantation (260.5) and covers these transplant procedures for the purpose of restoring intestinal function in patients with irreversible intestinal failure. Intestinal failure is defined as the loss of absorptive capacity of the small bowel secondary to severe primary gastrointestinal disease or surgically induced short bowel syndrome. It may be associated with both mortality and profound morbidity. Multi-visceral transplantation includes organs in the digestive system (stomach, duodenum, pancreas, liver and intestine). Intestinal and multivisceral transplant procedures are covered only when performed for patients who have failed total parenteral nutrition (TPN) defined as any of the following:

- Impending or overt liver failure due to TPN induced liver injury. The clinical manifestations include elevated serum bilirubin and/or liver enzymes, splenomegaly, thrombocytopenia, gastroesophageal varices, coagulopathy, stomal bleeding or hepatic fibrosis/cirrhosis.
- Thrombosis of the major central venous channels; jugular, subclavian, and femoral veins. Thrombosis of two or more of these vessels is considered a life threatening complication and failure of TPN therapy. The sequelae of central venous thrombosis are lack of access for TPN infusion, fatal sepsis due to infected thrombi, pulmonary embolism, Superior Vena Cava syndrome, or chronic venous insufficiency.
- Frequent line infection and sepsis. The development of two or more episodes of systemic sepsis secondary to line infection per year that requires hospitalization indicates failure of TPN therapy. A

single episode of line related fungemia, septic shock and/or Acute Respiratory Distress Syndrome are considered indicators of TPN failure.

- Frequent episodes of severe dehydration despite intravenous fluid supplement in addition to TPN. Under certain medical conditions such as secretory diarrhea and non-constructable gastrointestinal tract, the loss of the gastrointestinal and pancreatobiliary secretions exceeds the maximum intravenous infusion rates that can be tolerated by the cardiopulmonary system. Frequent episodes of dehydration are deleterious to all body organs particularly kidneys and the central nervous system with the development of multiple kidney stones, renal failure, and permanent brain damage.

Intestinal and multivisceral transplant procedures must be performed in an approved transplant facility which is outlined by CMS as based on a volume of 10 intestinal transplants per year with a 1-year actuarial survival of 65% using the Kaplan-Meier technique.

#### INITIAL COVERAGE CRITERIA

**All transplants require prior authorization from the Corporate Transplant Department. Solid organ transplant requests will be reviewed by the Corporate Senior Medical Director or qualified clinical designee. If the criteria are met using appropriate NCD and/or LCD guidelines, state regulations and/or MCG policies the Corporate Senior Medical Director's designee can approve the requested transplant.**

**Members must meet UNOS guidelines for transplantation and the diagnosis must be made by a Gastroenterologist, Hepatologist and or Transplant Surgeon.**

#### Pre-Transplant Evaluation:

General requirements for transplant evaluation include all of the following: <sup>3 4 6 8 9 19</sup>

- ☐ History and physical examination
- ☐ **Psychosocial evaluation and clearance:** This must be completed and documentation submitted for review before any additional transplant work-up or testing is initiated.
- ☐ Dietary consult
- ☐ Echocardiogram
- ☐ Stress test if >50 years or with cardiac history, risk factors (HTN, DM) and if abnormal:
  - cardiac catheterization
- ☐ Pulmonary function testing
- ☐ Lab studies:
  - Complete blood cell count, liver chemistry, kidney profile, coagulation profile (prothrombin time, partial thromboplastin time)
  - HIV testing.
  - Hepatitis A (HAV), Hepatitis B (HBV), Hepatitis C (HCV), Hepatitis D, Epstein-Barr virus (EBV), cytomegalovirus (CMV) serology, syphilis, toxoplasmosis, herpes simplex virus
  - Hypercoagulability studies in mesenteric vessel thrombosis
  - 24 hour creatinine clearance
  - HLA Antibody
  - Blood type

- ☐ Chest X-ray
- ☐ CT scan abdomen and pelvis
- ☐ Doppler ultrasound of liver, upper and lower extremities
- ☐ EGD and gastric intestinal motility studies
- ☐ EKG
- ☐ Liver biopsy indicated in suspected liver disease

Within the last 12 months the following is required:

- ☐ Colonoscopy (indicated > age 50 with removal of any polyps if applicable)
- ☐ Dental examination (contact plan for coverage criteria)
- ☐ GYN examination with Pap smear (indicated > age 18) with complete workup and treatment of abnormal results as indicated
- ☐ Immunizations up to date when indicated: Hepatitis A and Hepatitis B, pneumococcal vaccine, influenza vaccine, tetanus booster, varicella, meningococcal)
- ☐ Mammogram (indicated > age 40) with complete workup and treatment of abnormal results as indicated
- ☐ Osteoporosis screening with DEXA scan: [ONE]
  - cholestatic disorders
  - prolonged corticosteroid therapy
  - postmenopausal women
  - age > 65
- ☐ Peripheral artery disease (PAD) screening with doppler-recorded ankle-brachial index: [ONE]
  - age > 50
  - history of diabetes or smoking
- ☐ TB test
- ☐ Testicular examination > age 50

### Adult & Pediatric Criteria<sup>3 4 6 8 9 19 20 21</sup>:

1. Cadaver or living donor **small bowel transplantation alone** may be authorized when the following criteria are met:
  - ☐ Documentation that all medical, pharmaceutical and surgical alternatives to transplant have been utilized including but not limited to the following (Refer to UpToDate)
    - nutritional management of dehydration and electrolyte imbalance with oral and enteral feeding
    - parental nutrition when oral and enteral management fails
    - surgical enteroplasty, strictureplasty, or serosal patching to improve intestinal functioning if intestinal obstruction that requires correction is present
  - ☐ Diagnosis of irreversible intestinal failure caused by any of the following conditions:[ONE]
    - Secretory diarrhea
    - Radiation enteritis

- Microvillous involution disease
- Hirschsprung disease (congenital aganglionic megacolon)
- Chronic small bowel pseudo-obstruction
- Massive resection secondary to tumor
- Desmoid tumor requiring extensive resection

**OR**

☐ Diagnosis of short bowel syndrome caused by any of the following conditions:[**ONE**]

- Crohn's disease
- Gastroschisis
- Gardner's syndrome/familial polyposis
- Necrotizing enterocolitis (NEC)
- Autoimmune enteritis
- Small bowel atresia
- Superior mesenteric artery thrombosis
- Superior mesenteric vein thrombosis
- Trauma
- Volvulus

**AND**

☐ Long-term dependency on total parental nutrition (TPN) for a minimum of two years, **and/or**

☐ Severe complications from TPN that include **any** of the following:

- Impending, progressive, but reversible, overt liver dysfunction (increased serum bilirubin and/or liver enzyme levels, splenomegaly, thrombocytopenia, gastroesophageal varices, coagulopathy, stomal bleeding, hepatic fibrosis or cirrhosis)
- Multiple and prolonged hospitalizations to treat TPN-related complications
- Thrombosis of two or more major central venous channels (e.g., subclavian, jugular, or femoral veins) causing difficult venous access for TPN administration
- Repeated central line-related sepsis (defined as two episodes of systemic sepsis secondary to line infection per year, or one episode of line-related fungemia, septic shock, and/or acute respiratory distress syndrome)
- Frequent episodes of severe dehydration despite intravenous fluid supplement in addition to TPN

**AND**

☐ No Absolute contraindications:

- Active alcohol and/or other substance abuse including smoking (to remove as a contraindication there must be 6 months of documented abstinence through participation in a structured alcohol/substance abuse program with regular meeting attendance and negative random drug testing)

- Active Malignancy within 2 years of the evaluation not including skin cancers
- AIDS (CD4 count < 200cells/mm<sup>3</sup>)
  - ◇ If HIV positive **ALL** of the following must be met to remove as a contraindication:
    - ◇ CD4 count >200 cells/mm-3 for >6 months
    - ◇ HIV-1 RNA undetectable
    - ◇ On stable anti-retroviral therapy >3 months
    - ◇ No other complications from AIDS (e.g., opportunistic infection, including aspergillus, tuberculosis, coccidioides mycosis, resistant fungal infections, Kaposi's sarcoma, or other neoplasm)
    - ◇ Meeting all other criteria for transplantation
- Irreversible brain damage or neurological disease
- Systemic or uncontrolled infection
- Multi-organ failure or significant or advanced heart, lung, kidney, or other systemic or multi-system disease that is likely to contribute to a poor outcome after transplantation
- Anatomic abnormality that would preclude the transplant (requires statement from surgeon that such an abnormality is not present)
- No behavioral health disorder by history or psychosocial issues: [One]
  - if history of behavioral health disorder, no severe psychosis or personality disorder
  - mood/anxiety disorder must be excluded or treated
  - member has understanding of surgical risk and post procedure compliance and follow-up required

**Note:** Patient's need to understand the importance of adherence to medication schedules and follow-up appointments/noncompliance is a major cause of graft failure.

- No adequate social/family support

## **SMALL BOWEL AND LIVER SPECIFIC CRITERIA**

2. Molina Healthcare considers cadaver or living donor **small bowel and liver** transplantation ME in adults and children who have met criteria in # 1 above and have irreversible end-stage liver disease evidenced by either of the following <sup>19 21</sup>:

- ☐ Prolonged prothrombin time (PT) > 2 times the laboratory value (normal range is 11 to 13.5 seconds; **or**
- ☐ Albumin decreasing to < 3.0 (normal range is 3.4 to 5.4 g/dL)

## **CADAVER MULTIVISCERAL SPECIFIC CRITERIA**

3. Cadaver **Multivisceral** transplantation may be authorized in adults and children who have met the criteria in #1 **and** 2 above and have any of the following: **[ONE]**
  - ☐ Thromboses of the celiac axis, and the superior mesenteric artery
  - ☐ Pseudo-obstruction, localized tumors or other causes of vascular occlusion affecting the arterial blood supply to stomach, liver, small bowel, and pancreas
  - ☐ Massive gastrointestinal polyposis
  - ☐ Generalized hollow visceral myopathy or neuropathy
4. Retransplantation: When retransplantation is being considered, a number of factors need to be considered that include the timing and indication for retransplant, the presence of other comorbidities, immunosuppressive management, infection prophylaxis, and the likelihood of success.
  - The member must meet all of the other requirements for transplantation outlined above AND have one of these indications:
    - graft failure of an initial small bowel, small bowel/liver, or multi-visceral transplant, due to either technical reasons or acute rejection
    - chronic rejection or recurrent disease
  - Requests for a third or subsequent intestinal transplant are not covered

#### CONTINUATION OF THERAPY

A review for any small bowel, small bowel and liver and multivisceral transplantation procedure is valid for one year from the time the request was approved. Due to potential lengthy organ donor waiting time, an annual review of clinical information should be conducted to evaluate any changes in the member's clinical status.

#### COVERAGE EXCLUSIONS<sup>3468919</sup>

1. Intestinal transplantation in members who can tolerate TPN is not covered.
2. The following absolute contraindications to intestinal and multivisceral transplantation are not covered:
  - Active alcohol and/or other substance abuse including smoking (to remove as a contraindication there must be 6 months of documented abstinence through participation in a structured alcohol/substance abuse program with regular meeting attendance and negative random drug testing)
  - Active Malignancy within 2 years of the evaluation not including skin cancers
  - AIDS (CD4 count < 200cells/mm<sup>3</sup>)
    - If HIV positive all of the following must be met to remove as a contraindication:
      - ◇ CD4 count >200 cells/mm<sup>3</sup> for >6 months
      - ◇ HIV-1 RNA undetectable
      - ◇ On stable anti-retroviral therapy >3 months
      - ◇ No other complications from AIDS (e.g., opportunistic infection, including aspergillus, tuberculosis, coccidioides mycosis, resistant fungal infections, Kaposi's sarcoma, or other neoplasm)
      - ◇ Meeting all other criteria for transplantation
  - Documented history of non-compliance or inability to follow through with medication adherence or office follow-up
  - Irreversible brain damage or neurological disease

- Systemic or uncontrolled infection
- Multi-organ failure or significant or advanced heart, lung, kidney, or other systemic or multi-system disease that is likely to contribute to a poor outcome after transplantation
- Anatomic abnormality that would preclude the transplant (requires statement from surgeon that such an abnormality is not present)

#### **DESCRIPTION OF PROCEDURE/SERVICE/PHARMACEUTICAL**

Small bowel and multivisceral transplantation procedures are the surgical replacement of the small bowel alone or with other diseased organs with donor organs and can be a lifesaving procedure for patients with irreversible intestinal and/or multivisceral organ failure who can no longer be sustained on total parental nutrition (TPN). Patients can survive total intestinal failure with TPN therapy but frequently lose the ability to tolerate long term TPN therapy secondary to liver failure, thrombosis of central veins, infections from central lines and dehydration. The goals of the transplantation are the restoration of intestinal function and elimination or reduction in the need for TPN in patients with irreversible intestinal failure. Intestinal failure is defined as the loss of absorptive capacity of the small bowel so that macronutrient, water, electrolyte supplements, or a combination thereof are needed to maintain health or growth. Severe intestinal failure is when parenteral nutrition, fluid, or both are needed. Mild intestinal failure is when oral supplements or dietary modification suffice. Short bowel syndrome (SBS) is present when failure results from intestinal loss and failure to adapt by one month.

Small bowel transplantation (SBT) involves either the whole small bowel or a bowel segment, and there are three different types: SBT alone, where the recipient receives part of or the entire small bowel; small bowel and liver transplant (SBLT) combined, which may be required if the patient with intestinal failure has irreversible end-stage liver disease; and multivisceral transplant (MVT), which may be required for patients with intestinal failure and disease or injury involving other gastrointestinal organs that may include the small bowel and liver with one or more of the following organs from the digestive system: stomach, pancreas, and/or colon. The majority of intestinal transplants are performed for short gut syndrome, a condition where the absorbing surface of the small intestine is inadequate due to extensive disease or surgical removal of a large portion of small intestine. Causes of short bowel syndrome include volvulus, atresias, necrotizing enterocolitis, Crohn's disease, gastroschisis, thrombosis of the superior mesenteric artery, desmoid tumors, and trauma. Patients with short gut syndrome are typically unable to obtain adequate nutrition from enteral feeding and become dependent upon total parenteral nutrition (TPN). Small bowel and concurrent liver transplants are performed for patients with short bowel syndrome and impending liver failure. Multivisceral transplantation is considered when patients have irreversible failure of three or more abdominal organs including the small bowel. The most common indications for multivisceral transplantation are total occlusion of the splanchnic circulation, extensive GI polyposis, hollow visceral myopathy or neuropathy, and some abdominal malignancies.

The majority of SBT, SBLT and MVT procedures use cadaveric donors; however, a relatively small number of transplants have been performed in which the small bowel allograft is obtained from a healthy, living donor. At the current time, experience with living-donor segmental intestinal transplantation is limited. The potential advantages of living donor intestinal transplant include elimination of waiting time, better matching, the opportunity for preoperative donor and recipient optimization, elective surgery, minimal cold ischemia and



expansion of the donor pool. However, this procedure will remain limited due to the risks associated for the donor.

The goal of the pretransplant evaluation is to assess the ability of a patient to tolerate the surgery, post-operative immunosuppression, and transplant care. An extensive cardiopulmonary evaluation, screening for occult infection or cancer, and psychosocial evaluation is standard. Specific testing varies depending upon the patient's age, medical history, and transplant center practice. In addition, while a certain battery of tests may initiate the work up, more testing may be indicated depending upon the condition of the patient or the initial test results. The cardiopulmonary evaluation is intended to evaluate for any significant coronary artery or valvular disease, cardiomyopathy, obstructive or restrictive lung disease, and pulmonary hypertension. In addition to a standard medical evaluation the initial assessment should include a psychological and social support evaluation to identify issues that may impair a successful outcome after transplantation. These include a lack of information about the nature of the transplant procedure and post-transplant care, drug or alcohol dependence, compliance with complex medical and behavior regimens. The assessment includes education of the family and the support network of the patient because compliance with complex medical and behavior treatment is critical after any organ transplant procedure. Recipients must be able to incorporate complicated medications, follow-up appointments, and frequent laboratory visits into their schedules. Having an adequate support network aware of these requirements will encourage patient compliance and long-term success.

## GENERAL INFORMATION

### Summary of Medical Evidence

The medical evidence for small bowel transplantation consists of individual case series obtained from transplant centers that perform adult and pediatric transplantation and is summarized below.

A retrospective review of the United Network for Organ Sharing intestinal transplant database (January 1, 1991, to May 16, 2008), including all pediatric transplant centers participating in the United Network for Organ Sharing, was conducted. The main outcome measures were survival and mortality. Eight hundred fifty-two children received an intestinal transplant (54% male). Median age and weight at the time of transplant were 1 year (interquartile range: 1–5) and 10.7 kg (interquartile range: 7.8–21.7). Sixty-nine percent of patients also received a simultaneous liver transplant. The most common diagnoses among patients who received a transplant were gastroschisis (24%), necrotizing enterocolitis (15%), volvulus (14%), other causes of short-gut syndrome (19%), functional bowel syndrome (16%), and Hirschsprung disease (7%). The Kaplan-Meier curves demonstrated variation in patient survival according to diagnosis. Cox regression analysis confirmed a survival difference according to diagnosis ( $P < .001$ ) and demonstrated a survival advantage for those patients listed with a diagnosis of volvulus ( $P < .01$ ) compared with the reference gastroschisis. After adjusting for gender, recipient weight, and concomitant liver transplant, children with volvulus had a lower hazard ratio for survival and a lower risk of mortality. The authors concluded that survival after intestinal transplant was associated with the underlying disease state. The explanation for these findings requires additional investigation into the differences in characteristics of the population of children with intestinal failure.<sup>10</sup>



In a report by Benedetti about a single centers experience from April 1998 to October 2004, 11 patients with living donor small bowel transplants. 4 of the patients were under 5 years of age. All donors did well and did not experience any complications. The overall survival for 1 and 3 years was 82% with graft survival of 72%. The median hospital stay was 36 days. The authors concluded that living donor bowel transplant is a valuable option for individuals with irreversible intestinal failure, however further study in a larger number of recipients is necessary to confirm this centers findings.<sup>12</sup>

Gangemi and Benedetti published a literature review of living donor small bowel transplantation reports from 2003 to 2006. The authors indicate that registry data suggests that the outcomes of living donor small bowel transplants are comparable to those obtained with intestinal transplants from deceased donors despite that there is limited published experience with this procedure.<sup>14</sup>

A retrospective study by Florescu showed data on the incidence of fungal infection after pediatric small bowel transplantation among patients treated between 2003 and 2007 at a single center. The average length of follow-up was not reported. A total of 25 of 98 cases reviewed (26%) developed at least one episode of fungal infection; Candida infection was most common. During the study period, the mortality rate did not differ significantly between patients who did and did not develop a fungal infection (32.3% vs. 29.8%, respectively), but the authors stressed the importance of better screening tools to identify and prevent fungal infections.<sup>15</sup>

In a report by Sudan, a review of current literature on long-term outcomes after intestinal transplantation was published in 2010. The author indicated that intestinal transplantation has become standard therapy for patients with life-threatening complications from parenteral nutrition therapy. Data was gathered from a current single-center series showing a 1-year patient survival rate of 78-85% and a 5+ year survival rate of 56-61. For pediatric intestinal transplant patients, the majority achieve normal growth velocity at 2 years post-transplant. However, oral aversion is a common side effect and tube feedings are necessary in 45% of children. The author indicated that parental surveys of quality of life in pediatric transplant patients have shown that intestinal transplant patients appear to have a modest improvement of quality of life in comparison to patients on TPN and are somewhat worse than matched school-age controls without intestinal disease.<sup>16</sup>

Desai compared the outcomes of adult intestinal transplants (ITx); isolated ITx vs. liver-intestinal transplants (L-ITx) using the UNOS database (1987-2009). Of 759 ITx transplants in 687 patients, 463 (61%) were isolated and 296 (39%) were L-ITx. Patient survival for primary isolated ITx at one, three, and five yr was 84%, 66.7%, and 54.2%; and primary L-ITx was, 67%, 53.3%, and 46%. Primary isolated ITx graft survival at one, three, and five yr was 80.7%, 57.6%, 42.8%; primary L-ITx was 64.1%, 51%, 44.1%. For retransplants (n=72), patient and graft survival for isolated ITx (n=41) at five yr was 40% from 1987-2000 and 16% from 2001-2009. For retransplanted L-ITx (n=31), it improved from 14% to 64% from 2001-2009. Cox regression: creatinine >1.3 mg/dL and pre-transplant hospitalization were negative predictors for outcome of both; bilirubin >1.3 mg/dL was a negative predictor for isolated ITx and donor age >40 yr for L-ITx. The authors concluded that isolated ITx should be considered prior to liver disease for adults with intestinal failure; L-ITx is preferable for retransplantation.<sup>17</sup>

Desai evaluated the outcomes of intestinal retransplantation in children and adults in the United States by evaluating the United Network for Organ Sharing data from October 1987 to August 2009. In adult isolated intestinal transplant (ITx) retransplants (n=41), patient survival was 80.1%, 47.4%, and 28.5% at 1, 3, and 5 years, which was worse than primary isolated ITx. For liver ITx (L-ITx) retransplants (n=31), patient survival was 63.1%, 56.1%, and 46.8% and was not significantly different than primary L-ITx. In pediatric isolated ITx retransplants (n=28), patient survival at 1, 3, and 5 years was 80.7%, 74%, and 57.5%; graft survival was 76.4%, 56.6%, and 44%. In L-ITx retransplants (n=49), patient survival was 42%, 42%, and 42%; graft survival was 39%, 39%, and 39%. Patient and graft survival in adult L-ITx retransplants were better in era 2 (January 2001-August 2009) than era 1 (October 1987-December 2000). Among pediatric L-ITx retransplants, outcomes were worst in children younger than 2 years (n=12). In regression analysis, prior hospitalization was a negative predictor for all the groups of patients (relative risk, 5.4). The authors concluded that patient and graft survival in adult isolated ITx are less favorable after a retransplant compared with a primary transplant. Patient and graft survival are also poor in pediatric L-ITx after a retransplant, especially for children younger than 2 years of age. L-ITx retransplant results improved significantly in era 2 in adult recipients.<sup>18</sup>

According to the Organ Procurement and Transplantation Network Scientific Registry of Transplant Recipients (OPTN/SRTR)<sup>7</sup> only 2,191 intestinal transplants were performed from 1990 to 2012. The adjusted graft survival of intestinal transplants (351) for the year 2011 was 88.5% at 3 months, 74.6% at one year, 48.5% at 5 years and 34.8% at 10 years.

Hayes, Cochrane, UpToDate, MD Consult etc.

Hayes Medical Technology Directory Report for Small Bowel, Small Bowel-Liver, and Multivisceral Transplantation<sup>1</sup> (archived in 2010) indicates that evidence from peer-reviewed published studies suggests that cadaveric SBT, SBLT, and MVT are reasonable and appropriate treatments for TPN-dependent patients with irreversible intestinal failure who have SBS due to disease or injury or who have functional disorders of the small bowel, liver, and/or other visceral organs, but for whom TPN has failed or is causing serious, life-threatening complications. These complications include progressive liver disease, recurrent central-line infections, sepsis, and loss of venous access. The evidence suggests that isolated SBT should be considered first, with SBLT considered for patients who also have life-threatening, progressive liver disease, and MVT reserved for patients with intestinal failure who also have extensive disease or injury of other gastrointestinal organs. However, while SBT, SBLT, and MVT prolong survival in selected patients and survivors generally have good outcomes, these procedures are associated with relatively high morbidity and mortality. Patient and graft survival following living donor SBT is similar to that reported for cadaveric SBT, but there are too few numbers to make definitive conclusions about the safety and efficacy of living donor transplantation.

SBT, SBLT, and MVT are indicated when transplantation is performed in patients with small bowel failure that is irreversible and associated with serious or life-threatening complications from TPN and when the patient's condition is refractory to all other medical or surgical therapies. SBT, SBLT, and MVT is not indicated in patients with irreversible intestinal failure who are benefiting from TPN, who have good venous access and who are not experiencing serious or life-threatening complications related to this therapy. For living donor isolated

SBT, there is insufficient evidence about safety and efficacy for the recipients or donors at the current time due to limited experience and published data.

#### UpToDate:

In a report on the management of short bowel syndrome (SBS) in children, the authors indicate that a transplantation procedure is appropriate for some children with SBS. Isolated intestinal transplantation is indicated for those with intractable symptoms necessitating recurrent hospitalization, or those with recurrent catheter sepsis who no longer have adequate central venous access to support long-term parenteral nutrition. Combined liver/small intestine transplantation is indicated for patients with SBS and irreversible parenteral nutrition-associated liver disease if they are considered likely to die in the subsequent two years without transplantation.<sup>9</sup>

In a report called Overview of Intestinal and Multivisceral Transplantation<sup>8</sup> the authors summarize the following:

- Intestinal transplantation (ITx) has established itself as a therapeutic modality in patients with intestinal failure.
- ITx is performed mainly in patients with short-bowel syndrome who have developed serious complications from total parenteral nutrition.
- Potential candidates should be referred to transplant centers accredited for ITx.
- Long-term outcomes have improved, but remain worse than for other forms of solid-organ transplantation. Three-year recipient survival is approximately 62 percent for ITx and 68 percent for combined liver and intestinal transplantation and for multivisceral transplantation.
- Quality of life after ITx appears to be better than or equal to quality of life on long-term TPN

#### Professional Organizations

American Society of Transplantation (AST) published guidelines for pediatric intestinal transplantation that include the following indications: progressive parenteral nutrition-associated liver disease, recurring sepsis, impending loss of central venous access, extreme short-bowel syndrome and congenital intractable epithelial (mucosal) disorders. The Society designates that intestinal transplantation is a lifesaving therapy for the child with intestinal failure and that transplantation should be considered when intestinal failure is or will be refractory to conventional management which is total parenteral nutrition therapy.<sup>4</sup>

The American Gastroenterological Association (AGA) medical position statement for Short Bowel Syndrome and Intestinal Transplantation<sup>3</sup> proposes that the following are indications for intestinal transplantation:

- Intestinal failure with impending life threatening complications:
  - Progressive parenteral nutrition associated liver disease

- impending or overt liver failure
- impending loss of or thrombosis of major central venous channels
- frequent recurring central line-related sepsis
- Intestinal failure due to short bowel syndrome and mucosal disorders

The Clinical Practice Committee of the American Society of Transplantation<sup>6</sup> proposed that the presence of AIDS could be considered a contraindication to kidney transplant unless the following criteria were present.

These criteria may be extrapolated to other solid organs:

- CD4 count >200 cells/mm<sup>3</sup> for >6 months
- HIV-1 RNA undetectable
- On stable anti-retroviral therapy >3 months
- No other complications from AIDS (e.g., opportunistic infection, including aspergillus, tuberculosis, coccidioides mycosis, resistant fungal infections, Kaposi's sarcoma, or other neoplasm)
- Meeting all other criteria for transplantation

#### CODING INFORMATION

CPT	Description
44132	Donor enterectomy (including cold preservation), open; from cadaver donor
44133	Donor enterectomy (including cold preservation), open; partial, from living donor
44135	Intestinal allotransplantation; from cadaver donor
44136	Intestinal allotransplantation; from living donor
47133	Donor hepatectomy (including cold preservation), from cadaver donor
47135	Liver allotransplantation; orthotopic, partial or whole, from cadaver or living donor, any age
47136	Liver allotransplantation; heterotopic, partial or whole, from cadaver or living donor, any age
48550	Donor pancreatectomy (including cold preservation), with or without duodenal segment for transplantation
48554	Transplantation of pancreatic allograft

HCPCS	Description
S2053	Transplantation of small intestine and liver allografts
S2054	Transplantation of multivisceral organs

S2055	Harvesting of donor multivisceral organs, with preparation and maintenance of allografts; from cadaver donor
S2152	Solid organs(s), complete or segmental, single organ or combination of organs; deceased or living donor(s), procurement, transplantation, and related complications; including: drugs; supplies; hospitalization with outpatient follow-up; medical/surgical, diagnostic, emergency, and rehabilitative services; and the number of days of pre- and post-transplant care in the global definition

ICD-9	Description
014.8	Necrotizing enterocolitis, other tuberculosis of intestines, peritoneum, and mesenteric
211.2	Benign neoplasm of other parts of digestive system; Duodenum, jejunum, and ileum
211.3	Benign neoplasm of other parts of digestive system; colon
235.2	Neoplasm of uncertain behavior of stomach, intestines and rectum
238.1	Neoplasm of uncertain behavior of connective and other soft tissue (Desmoid Tumor)
555.0	Regional enteritis; Small intestine
555.1	Regional enteritis; Large intestine
555.2	Regional enteritis of small intestine with large intestine
557.0	Acute vascular insufficiency of intestine
557.1	Chronic vascular insufficiency of intestine
558.1	Gastroenteritis and colitis due to radiation
560.2	Volvulus
560.81	Intestinal or peritoneal adhesions with obstruction (postoperative) (postinfection)
560.89	Other specified intestinal obstruction (Hollow viscous myopathy)
564.1	Irritable bowel syndrome
572.8	Other sequelae of chronic liver disease
579.3	Other and unspecified postsurgical nonabsorption
579.9	Unspecified intestinal malabsorption
751.1	Atresia and stenosis of small intestine
751.3	Hirschsprung's disease and other congenital functional disorders of colon
751.5	Other anomalies of intestine
756.73	Gastroschisis
759.89	Other specified multiple congenital anomalies, so described
777.50- 777.53	Necrotizing enterocolitis in newborn
787.91	Diarrhea
863.20- 863.59	Injury to gastrointestinal tract
996.8	Complications of a transplanted organ
V42	Organ or tissue replaced by transplant

ICD-10	Description
D12.6	Polyposis, familial
D237.1- D237.9	Neoplasm of uncertain behavior of stomach, intestines, colon and rectum
D48.1	Desmoid abdominal tumor
K50.00	Crohn's disease of small intestine without complications
K50.10	Crohn's disease
K50.80	Crohn's disease of both small and large intestine without complications
K55.0	Acute vascular disorders of intestine
K55.1	Chronic vascular disorders of intestine
K52.0	Gastroenteritis and colitis due to radiation
K56.2	Volvulus
K56.5	Intestinal adhesions [bands] with obstruction (postprocedural) (postinfection)
K56.69	Other intestinal obstruction
K58.9	Irritable bowel syndrome without diarrhea
K70- K77	Diseases of the liver
K91.92	Postsurgical malabsorption, not elsewhere classified
K90.9	Intestinal malabsorption, unspecified
Q41- Q41.9	Congenital absence, atresia and stenosis of small intestine
Q43.1	Hirschsprung's disease or megacolon
Q43.8	Other specified congenital malformations of intestine
Q79.3	Gastroschisis
Q87.89	Other specified congenital malformation syndromes, not elsewhere classified
P77.9	Necrotizing enterocolitis in newborn, unspecified
R19.7	Diarrhea, unspecified
S36.4- S36.59	Injury of small intestine and colon
D12.6	Polyposis, familial
D237.1- D237.9	Neoplasm of uncertain behavior of stomach, intestines, colon and rectum

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