Small Bowel/Liver and Multivisceral Transplant

Effective: June 1, 2023

Next Review: March 2024
Last Review: April 2023

IMPORTANT REMINDER

Medical Policies are developed to provide guidance for members and providers regarding coverage in accordance with contract terms. Benefit determinations are based in all cases on the applicable contract language. To the extent there may be any conflict between the Medical Policy and contract language, the contract language takes precedence.

PLEASE NOTE: Contracts exclude from coverage, among other things, services or procedures that are considered investigational or cosmetic. Providers may bill members for services or procedures that are considered investigational or cosmetic. Providers are encouraged to inform members before rendering such services that the members are likely to be financially responsible for the cost of these services.

DESCRIPTION

Small bowel/liver transplantation is performed in people that have both intestinal and liver failure and may be combined with the transplantation of other portions of the digestive tract and accessory organs.

MEDICAL POLICY CRITERIA

I. A small bowel/liver transplant or multivisceral transplant may be considered medically necessary for pediatric and adult patients with intestinal failure (characterized by loss of absorption and the inability to maintain protein-energy, fluid, electrolyte, or micronutrient balance), who have been managed with long-term total parenteral nutrition and who have developed evidence of impending end-stage liver failure, when transplant candidates meet both of the following criteria:

   A. Adequate cardiopulmonary status; and
   B. Documentation of patient compliance with medical management.

II. A small bowel/liver transplant or multivisceral transplant may be considered not medically necessary when Criterion I. is not met.
III. A small bowel/liver retransplant or multivisceral retransplant may be considered medically necessary after a failed primary small bowel/liver transplant or multivisceral transplant.

NOTE: A summary of the supporting rationale for the policy criteria is at the end of the policy.

LIST OF INFORMATION NEEDED FOR REVIEW

It is critical that the list of information below is submitted for review to determine if the policy criteria are met. If any of these items are not submitted, it could impact our review and decision outcome.

- History and physical/chart notes
- Diagnosis and indication for transplant

CROSS REFERENCES

1. Liver Transplant, Transplant, Policy No. 5
2. Isolated Small Bowel Transplant, Transplant, Policy No. 9

BACKGROUND

Small bowel/liver transplantation is transplantation of an intestinal allograft in combination with a liver allograft, either alone or in combination with one or more of the following organs: stomach, duodenum, jejunum, ileum, pancreas, or colon. Small bowel transplants are typically performed in patients with intestinal failure (IF) due to functional disorders (e.g., impaired motility) or short bowel syndrome (SBS), defined as an inadequate absorbing surface of the small intestine due to extensive disease or surgical removal of a large portion of small intestine.

In some instances, short bowel syndrome is associated with liver failure, often due to the long-term complications of total parenteral nutrition (TPN). These patients may be candidates for a small bowel/liver transplant or a multivisceral transplant, which includes the small bowel and liver with one or more of the following organs: stomach, duodenum, jejunum, ileum, pancreas, and/or colon. A multivisceral transplant is indicated when anatomic or other medical problems preclude a small bowel/liver transplant, and the patient requires removal of all of the native gastrointestinal tract and replacement with a multivisceral graft.

Note: Isolated small bowel transplants and isolated liver transplants are considered in separate medical policies (see Cross References section above).

EVIDENCE SUMMARY

Much of the published literature consists of case series reported by single centers. Authors of these reports as well as narrative reviews observed that while outcomes continue to improve, recurrent and chronic rejection and complications of immunosuppression continue to be obstacles to long term survival.

People with high morbidity from TPN appear to have better outcomes with transplant, but it is unknown whether ongoing home-based TPN or intestinal transplant is superior. Randomized
controlled trials comparing the two forms of IF management have not been performed, primarily owing to small numbers of people with IF.[1]

REGISTRY DATA

The most recent published report from the international Intestinal Transplant Registry (ITR) reported on 4103 total intestinal transplants between January, 1985 and December, 2018. Of these, 2096 transplants were performed in children. Transplant subtypes are: small bowel only (1842), small bowel and liver (1251), multivisceral (small bowel, liver, stomach: 810), and modified multivisceral (small bowel and stomach: 200).[2] Improvements in the management of IF, both with and without intestinal transplant have led to a sharp reduction in the annual number of intestinal transplants being performed. Intestinal transplant volume decreased from a peak of 270 in 2008 to fewer than 50 in 2018.[1, 2] Participation in this registry was considered to be nearly 100% of all intestinal transplants performed in the world since April 1985. The following results were reported:[3]:

- Regional practices and outcomes are now similar worldwide.
- Current actuarial patient survival rates at one-, five-, and 10-years post-transplant are 76%, 56%, and 43%, respectively.
- Outcomes of intestinal transplantation improved modestly over the past decade, but rates of graft loss beyond one year have not improved.
- The reasons for late graft loss have been difficult to identify due to the low case volumes at most centers.
- Better function was found in intestinal grafts that included a colon segment and/or a liver component.

Better graft survival was also seen in patients who waited at home for intestinal transplant, used induction immune-suppression therapy, and had rapamycin maintenance therapy.

NON-RANDOMIZED TRIALS

Survival Outcomes

The published literature consists of case series, mainly reported by single centers in the United States and Europe. Tables 1 and 2 summarize the characteristics and results of the case series, respectively. Many case series have included isolated small bowel transplantations.

Reasons for transplantations were mainly short bowel syndrome. Other reasons included congenital enteropathies and motility disorders. Most common outcomes reported were survival rates and weaning off TPN. Several studies have presented survival rates by type of transplantation, while others have combined all types of transplants when reporting survival rates. When rates were reported by type of transplant, isolated transplantations had higher survival rates than multivisceral transplants (see Table 2).

Several investigators have reported higher survival rates in transplants conducted more recently than those conducted earlier.[4-6] Reasons for improved survival rates in more recent years have been attributed to the development of more effective immunosuppressive drugs and the learning curve for the complex procedure.

Authors of these series, as well as related reviews, have observed that while outcomes have improved over time, recurrent and chronic rejection and complications of immunosuppression
continue to be obstacles to long-term survival. A separate discussion of complications follows the evidence tables.

### Table 1. Summary of Key Case Series Characteristics for Transplantations

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Location</th>
<th>N</th>
<th>Median Age (Range), y</th>
<th>Interventions</th>
<th>Follow-Up (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raghu (2019)[7]</td>
<td>International</td>
<td>2,080</td>
<td>2.5 (1.1-6.3)</td>
<td>• Isolated IT • Combined liver IT • Multivisceral graft</td>
<td>725 966 389 5 y</td>
</tr>
<tr>
<td>Elsabbagh (2019)[8]</td>
<td>United States</td>
<td>174</td>
<td>19 (0.42-66)</td>
<td>• Isolated IT • Combined liver IT • Multivisceral graft • Modified multivisceral</td>
<td>98 44 28 4 8.1 (3-13.2) y</td>
</tr>
<tr>
<td>Lacaille (2017)[9]</td>
<td>France</td>
<td>110</td>
<td>5.3 (0.4-19)</td>
<td>• Isolated IT • Combined liver IT • Multivisceral graft</td>
<td>45 60 5</td>
</tr>
<tr>
<td>Garcia Aroz (2017)[10]</td>
<td>United States</td>
<td>10</td>
<td>1.5 (0.7-13)</td>
<td>• Isolated IT • Combined liver IT</td>
<td>Of 55 alive: • 17 at &lt;5 y • 17 at 5-10 y • 21 at ≥10 y 7 3 6/7 alive at follow-up ≥10 y</td>
</tr>
<tr>
<td>Dore (2016)[11]</td>
<td>United States</td>
<td>30</td>
<td>0.2 (0.1-18)</td>
<td>• Isolated IT • Combined liver IT • Multivisceral graft</td>
<td>6 6 18 28 (4-175) mo</td>
</tr>
<tr>
<td>Rutter (2016)[12]</td>
<td>United Kingdom</td>
<td>60</td>
<td>1.8 (0-8)</td>
<td>• Isolated IT • Multivisceral graft • Modified multivisceral</td>
<td>16 35 9 21.3 (0-95) mo</td>
</tr>
<tr>
<td>Lauro (2014)[13]</td>
<td>Italy</td>
<td>46</td>
<td>34 (NR)</td>
<td>• Isolated IT • Combined liver IT • Multivisceral graft</td>
<td>34 6 6 51.3 mo</td>
</tr>
<tr>
<td>Varkey (2013)[14]</td>
<td>Sweden</td>
<td>20</td>
<td>Adults: 44 (20-67) Children: 6 (0.5-13)</td>
<td>• Isolated IT • Combined liver IT • Multivisceral graft</td>
<td>4 1 15 NR</td>
</tr>
<tr>
<td>Mangus (2013)[4]</td>
<td>United States</td>
<td>100</td>
<td>Adults: 48 (NR to 66) Children: 1 (0.6 to NR)</td>
<td>• Multivisceral graft • Modified multivisceral</td>
<td>84 16 25 mo</td>
</tr>
</tbody>
</table>

IT: intestinal transplantation; NR: not reported.

* Living donors.

### Table 2. Summary of Key Case Series Results for Transplantations

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Interventions</th>
<th>Survival</th>
<th>Off TPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raghu (2019)[7]</td>
<td>• Isolated IT • Combined liver IT • Multivisceral graft</td>
<td>725 966 389 All transplantations combined: • Patient survival: 72.7% at 1 y, 57.2 at 5 y</td>
<td>NR</td>
</tr>
<tr>
<td>Author (Year)</td>
<td>Interventions</td>
<td>Survival</td>
<td>Off TPN</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Treatment n</td>
<td>Graft survival: 66.1% at 1 y, 47.8% at 5y</td>
<td>NR</td>
</tr>
<tr>
<td>Elsabbagh (2019)</td>
<td>Isolated IT, Combined liver IT, Multivisceral graft, Modified multivisceral</td>
<td>98 44 28 4</td>
<td>All transplantations combined: 69.5% at 3 y, 66% at 5 y, 63% at 10 y</td>
</tr>
<tr>
<td>Lacaille (2017)</td>
<td>Isolated IT, Combined liver IT, Multivisceral graft</td>
<td>60 45 5</td>
<td>59% at 10 y; 54% at 18 y, 48% at 10 y, NR</td>
</tr>
<tr>
<td>Garcia Aroz (2017)</td>
<td>Isolated IT, Combined liver IT</td>
<td>7 3</td>
<td>All transplantations combined: 70%</td>
</tr>
<tr>
<td>Dore (2016)</td>
<td>Isolated IT, Combined liver IT, Multivisceral graft</td>
<td>6 6 18</td>
<td>83% at 9 y, 33% at 10 y, 67% at 2.5 y</td>
</tr>
<tr>
<td>Rutter (2016)</td>
<td>Isolated IT, Multivisceral graft, Modified multivisceral</td>
<td>16 35 9</td>
<td>92% at 1 y; 37% at 5 y, 71% at 1 y; 33% at 5 y, 85% at 1 y; 65% at 5 y</td>
</tr>
<tr>
<td>Lauro (2014)</td>
<td>Isolated IT, Combined liver IT, Multivisceral graft</td>
<td>34 6 6</td>
<td>All transplantations combined: 77% at 1 y, 58% at 3 y, 53% at 5 y, 37% at 10 y</td>
</tr>
<tr>
<td>Varkey (2013)</td>
<td>Isolated IT, Combined liver IT, Multivisceral graft</td>
<td>4 1 15</td>
<td>All transplantations combined: 78% at 1 y, 50% at 5 y</td>
</tr>
<tr>
<td>Mangus (2013)</td>
<td>Multivisceral graft, Modified multivisceral</td>
<td>84 16</td>
<td>All transplantations combined: 72% at 1 y, 57% at 5 y</td>
</tr>
</tbody>
</table>

IT: intestinal transplantation; NR: not reported; TPN: total parenteral nutrition.
a Living donors.

Complications

Post-transplant lymphoproliferative disorders (PTLD) are a potentially life-threatening complication of the immunosuppression required for solid organ transplant. PTLD is associated with exposure to Epstein-Barr virus (EBV). Chang (2022) performed a retrospective single-institution study of pediatric solid organ transplant recipients to determine risk factors associated with post-transplant EBV DNAemia and PTLD. The study included 275 patients, of whom 20 had multivisceral transplant and 10 had intestinal transplant. Other transplant types were liver, lung, kidney, and heart. Intestinal and multivisceral transplants patients were over-represented in PTLD cases. Intestinal transplants comprised 2% of the total study population but 21% of PTLD cases. Multivisceral transplant recipients represented 3% of the
study population but 14% of PTLD cases. While high post-transplant EBV DNAemia levels were a strong risk factor for PTLD (p<0.0001), the study found that PTLD incidence in intestinal and multivisceral transplant recipients was not explained by EBV DNAemia levels. Transplant type did not correlate with EBV DNAemia (p=0.14).

Santarsieri (2022) published data describing PTLD incidence and outcomes from 5365 solid-organ and hematopoietic stem cell transplants over a 20-year period in the United Kingdom. Multivisceral transplants were defined as intestinal transplant, with or without simultaneous transplant of other abdominal organs. The study included both adult and pediatric cases with the median age at transplant of 52 years (range 0.8 to 79.5 years). In addition to multivisceral transplant, other transplant types were kidney, pancreas, liver, hematopoietic stem cell, heart, lung (single, bilateral, and heart-lung), and simultaneous kidney and pancreas (SPK). A total of 225 cases of PTLD were documented. It was noted that multivisceral transplant follow-up time was the shortest because the procedure was initiated after other transplant types. Despite shorter follow-up, the incidence of PTLD was highest in multivisceral transplant cases. Out of a total of 113 multivisceral transplant cases, 21 (18.6%) were diagnosed with PTLD, which was notably higher than the overall PTLD incidence of 5.9% in all transplant types.

Clouse (2019) reported on the incidence of graft-versus-host disease (GVHD) following intestine transplant at a single center. Of the 236 transplants performed between 2003 and 2015, 37 patients (16%) developed GVHD. Mortality was 54% within one year of diagnosis for these patients. An increased risk of GVDH was seen with liver inclusion and increasing graft volume.

Spence (2020) published on the development of intra-abdominal infections within two years following intestinal and multivisceral transplants in adults at a single center. There were 103 patients that were included, who underwent transplantations between 2003 and 2015, and 46 of these (43%) had intra-abdominal infections with the two-year follow-up. The median time to infection was 23 days post-transplant. Six patients also had concurrent blood stream infections. While patients with intra-abdominal infections had longer hospital stays than those without (median 35 days vs. 23 days, p=0.0012), there was no difference in all-cause mortality.

A report of thrombotic and hemorrhagic complications associated with visceral transplantation was published by Raveh (2018). Data from 48 adult transplantations (32 multivisceral, 10 isolated intestinal, and six modified multivisceral) between 2010 and 2017 were reviewed retrospectively. There were eight patients who experience intraoperative intracardiac thrombosis (ICT)/pulmonary embolism (PE), all of whom were undergoing multivisceral transplants. Postoperative bleeding complications at one month were found in 11% of multivisceral transplants, 20% of isolated intestinal transplants, and 17% of modified multivisceral transplants.

Danziger-Isakov (2018) evaluated the epidemiology and outcomes of inpatient respiratory virus infection in pediatric patients following solid organ transplant at nine U.S. transplant centers. Among the 42 patients who underwent intestine/multivisceral transplantation, respiratory virus infection occurred in 38%, the highest rate by transplant type. Respiratory virus infection was associated with younger age at transplant.

Vo (2018) reported on the risk of invasive pneumococcal infections among pediatric patients receiving liver-small bowel-pancreas transplants at a single center. Of the 122 patients who underwent this procedure between 2008 and 2016, nine patients experienced 12 invasive pneumococcal infections. The median time to first infection following transplant was three
years (range 0.8 to 5.8 years), and the mortality rate was 22%. The authors noted that all patients were on prophylactic oral penicillin and the majority had received at least one dose of pneumococcal conjugate vaccine.

Nagai (2016) reported on cytomegalovirus (CMV) infection after intestinal or multivisceral transplantation at a single center in the US. A total of 210 patients had in intestinal transplant, multivisceral transplant or modified multivisceral transplant between January 2003 and June 2014. The median length of follow-up was 2.1 years. A total of 34 patients (16%) developed CMV infection a median of 347 days after transplantation. Nineteen patients had tissue invasive CMV disease. CMV infection was significantly associated with rejection (odds ratio 2.6, p<0.01) and adversely affected patient survival (hazard ratio 2.7, p<0.001). A report from another center in the US, 16 of 85 (19%) patients undergoing intestinal or multivisceral transplantation developed CMV infection a mean of 139 days (range 14 to 243 days) postoperatively.

Wu (2016) investigated the incidence and risk factors of acute antibody-mediated rejection (ABMR) among patients undergoing intestinal transplantation (n=175). Acute ABMR was diagnosed by: clinical evidence; histologic evidence of tissue damage; focal or diffuse linear C4d deposition; and circulating anti-human leukocyte antigen antibodies. Of the 175 intestinal transplants, 58% were liver-free grafts, 36% included a liver graft, and 6.3% were retransplantations. Eighteen cases of acute ABMR were identified: 14 (14%) among the patients undergoing first liver-free transplantation, two (3%) among patients undergoing liver/small bowel transplantations, and two (18%) among the patients undergoing retransplantation. Graft failure occurred in 67% of patients with acute ABMR. The presence of a donor-specific antibody and a liver-free graft were associated with the development of acute ABMR.

In a case series by Cromvik (2016), five of 26 patients (19%) were diagnosed with GVHD after intestinal or multivisceral transplantation at a center in Sweden. Risk factors for GVHD were malignancy as a cause of transplantation and neoadjuvant chemotherapy or brachytherapy before transplantation.

A 2015 retrospective review reported a number of parameters for intestinal and multivisceral transplants performed on Nordic patients between 1998 and 2013. Twenty out of the 29 patients (69%) received liver-containing allografts. Nineteen of them were multivisceral grafts, including the stomach, the pancreaticoduodenal complex, the liver and the small intestine. The remaining liver-containing allograft was a combined liver and intestinal graft with a segmental pancreas. Three of eight patients with a spleen included in their multivisceral graft developed GVHD. One patient with GVHD and manifestations with skin rash later developed post-transplant lymphoproliferative disorder (PTLD).

A 2012 retrospective review focused on the rate of kidney dysfunction, a recognized complication after non-renal solid organ transplantation, in 33 multivisceral and 15 isolated small bowel transplant patients. A significant decline in kidney function was reported in 46% of patients at one year following transplantation. A significant correlation was found for patient age, pretransplant serum creatinine, estimated GFR (eGFR) at post-transplant day 30, 90, 180, and 270, and tacrolimus level at post-transplant day seven. Lesser decline was found in pediatric patients and patients with multivisceral transplantation compared with adults or isolated small bowel transplantation.
A 2012 retrospective review reported on bloodstream infections among 98 children younger than age 18 years with small bowel/combined organ transplants.\(^{[28]}\) Seventy-seven (79\%) patients underwent small bowel transplant in combination with a liver, kidney, or kidney-pancreas, and 21 had an isolated small bowel transplant. After a median follow-up of 52 months, 58 (59\%) patients remained alive. The one-year survival rate was similar in patients with combined small bowel transplant (75\%) and those with isolated small bowel transplant (81\%). In the first year after transplantation, 68 patients (69.4\%) experienced at least one episode of bloodstream infection. The one-year survival rate for patients with bloodstream infections was 72\% compared to 87\% in patients without bloodstream infections (\(p=0.056\) for difference in survival in patients with and without bloodstream infections).

Wu (2011) reported on complications after small bowel and multivisceral transplantation in 241 patients who underwent intestinal transplantation.\(^{[29]}\) Of these, 147 (61\%) had multivisceral transplants, 65 (27\%) had small bowel transplants and 12\% had small bowel/liver transplants. There were 151 children (63\%) and 90 adults. A total of 22 patients (9\%) developed graft-versus-host disease (GVHD). Children younger than five years old were more likely to develop GVHD; the incidence in this age group was 16 of 121 (13.2\%) compared to 2 of 30 (6.7\%) in children between 5 and 18 years and 9 of 90 (4.4\%) in adults over 18 years. Among diseases, patients with intestinal atresia were more likely to develop GVHD than those with other conditions (22.2\% vs. 2.6\%, respectively, \(p=0.03\)).

**Transplant Recipients with Malignancies**

Duchateau (2022) published a systematic review of reported experiences of combined liver-intestinal and multivisceral transplantation (MvTx) for neuroendocrine tumors (NET) extending beyond the liver.\(^{[30]}\) Fourteen single-center and three multi-center retrospective studies reported on one combined liver-intestinal and 38 MvTx for NET and nine previously unreported MvTx were added to the analysis by the authors. Overall patient survival up to 51.2\% was found with recurrence of 35\%, which is similar to recurrence after liver transplantation for NET. In addition, the authors reported that patients with NET with diffuse abdominal presentation, normally considered a contraindication, may benefit from radical resection and MvTx. Additional studies to optimize post-transplant management are needed.

Cruz (2011) published results from a small case series (\(n=10\)) of patients with intra-abdominal desmoid tumors secondary to familial adenomatous polyposis who underwent multivisceral transplant.\(^{[31]}\) All patients were able to discontinue home parenteral nutrition by an average 30 days after transplant. Estimated survival was 80\% at five years, and desmoid tumors reoccurred in one patient 15 months after transplantation. However, conclusions from this study are limited by the small sample size and the lack of a comparison group, factors which do not allow for the isolation of transplant as a causative factor in patient health outcomes.

**HIV Positive Transplant Recipients**

Solid organ transplant for patients who are HIV-positive was historically controversial, due to the long-term prognosis for HIV positivity and the impact of immunosuppression on HIV disease. Currently, OPTN policy permits HIV-positive transplant candidates.\(^{[32]}\)

**Retransplantation**

Evidence for the use of retransplantation to treat individuals who have failed intestinal transplants includes several case series, mostly from single institutions. One case series analyzed records from the United Network for Organ Sharing database.\(^{[6]}\) Among the case
series described in Table 3, reasons for retransplantation include: acute rejection, chronic rejection, CMV, liver failure, lymphoproliferative disorder, and graft dysfunction. Survival rates for retransplantation are listed in Table 4.

Table 3. Summary of Key Case Series Characteristics for Retransplantation

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Location</th>
<th>N</th>
<th>Median Age (Range), y</th>
<th>Interventions</th>
<th>Follow-Up, (Range), mo</th>
</tr>
</thead>
</table>
| Ekser (2018)[33] | United States | 18 | 27 (0.9-57) | • Isolated IT  
• Modified MVT  
• Multivisceral graft | 1  
16 |
| Kubal (2018)[34] | United States | 23 | 27 (1-58) | • Isolated IT  
• Multivisceral graft | 1  
22 |
| Lacaille (2017)[9] | France | 10 | 13 (5-16) | • Isolated IT  
• Combined liver IT | 3  
7  
4 |
| Desai (2012)[6] | United States | • 72 (adults)  
• 77 (children) | NR | Adults:  
• Isolated IT  
• Combined liver IT  
Children:  
• Isolated IT  
• Combined liver IT | 41  
31  
28  
49 |
| Abu-Elmagd (2009)[5] | United States | 47 | NR | • Isolated IT  
• Combined liver IT  
• Multivisceral graft | 31  
7  
9 |
| Mazariegos (2008)[35] | United States | 14 | 9.4 (3.2-22.7) | • Isolated IT  
• Combined liver IT  
• Multivisceral graft | 1  
3  
55.9 |

IT: intestinal transplantation; NR: not reported.

Table 4. Summary of Key Case Series Results for Retransplantation

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Interventions</th>
<th>Survival</th>
<th>Off TPN</th>
</tr>
</thead>
</table>
| Ekser (2018)  | • Isolated IT  
• Multivisceral graft  
• Modified multivisceral graft | Graft survival:  
• 71% at 1 y, 56% at 3 y, 44% at 5 y  
Patient survival:  
• 71% at 1 y, 47% at 3 y, 37% at 5 y | NR |
| Kubal (2018)[34] | • Isolated IT  
• Multivisceral graft | All transplantations combined:  
• 34% at 1 y | NR |
| Lacaille (2017)[9] | • Isolated IT  
• Combined liver IT | All transplantations combined:  
• 30% at last follow-up | NR |
| Desai (2012)[6] | Adults:  
• Isolated IT  
• Combined liver IT  
Children:  
• Isolated IT  
• Combined liver IT | Adults:  
• 80% at 1 y; 47% at 3 y; 29% at 5 y  
Children:  
• 81% at 1 y; 74% at 3 y; 57% at 5 y  
• 42% at 1 y; 42% at 3 y; 42% at 5 y | NR |
| Abu-Elmagd (2009)[5] | • Isolated IT  
• Combined liver IT | All transplantations combined:  
• 69% at 1 y | NR |
<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Interventions</th>
<th>Survival</th>
<th>Off TPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mazariegos (2008)</td>
<td>Multivisceral graft 9</td>
<td>47% at 5 y</td>
<td>100%</td>
</tr>
<tr>
<td>Mazariegos (2008)</td>
<td>Isolated IT 1</td>
<td>71% at last follow-up</td>
<td></td>
</tr>
<tr>
<td>Mazariegos (2008)</td>
<td>Combined liver IT 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mazariegos (2008)</td>
<td>Multivisceral graft 10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IT: intestinal transplantation; NR: not reported; TPN: total parenteral nutrition.

PRACTICE GUIDELINE SUMMARY

AMERICAN GASTROENTEROLOGICAL ASSOCIATION

In 2022, The American Gastroenterological Association published a clinical practice update on the management of short bowel syndrome (SBS) that includes best practice advice on referral for intestinal transplantation. The update is focused on adult patients. In general, early referral for transplant is recommended to avoid the need for simultaneous liver transplant, which leads to increased mortality risk while on the waiting list. Referral for intestinal transplant is recommended for:

- People with SBS-IF and onset of TPN failure. Patients with SBS-IF who have high morbidity or low acceptance of TPN should be considered for referral to transplant individually.

Transplant referral is also suggested for certain patients who do not meet criteria for TPN failure:

- Post-operative referral for patients with large abdominal desmoid tumors.

- Patients with severe dysmotility syndromes who have no prospect of weaning from TPN.


Evidence of advanced or progressive intestinal failure-associated liver disease

- Hyperbilirubinemia >75 µmol/L \(^b\) (4.5 mg/dL) despite intravenous lipid modification strategies that persists for >2 months.

- Any combination of elevated serum bilirubin, reduced synthetic function (subnormal albumin or elevated international normalized ratio), and laboratory indications of portal hypertension and hypersplenism, especially low platelet count, persisting for >1 month in the absence of a confounding infectious event(s).

Thrombosis of 3 out of 4 discrete upper body central veins (left subclavian and internal jugular, right subclavian and internal jugular) or occlusion of a brachiocephalic vein in children (in adults, this criterion should be evaluated in a case-by-case basis).

Live-threatening morbidity in the setting of indefinite parenteral nutrition dependence of either anatomical or functional cause, as suggested by:
• In children, 2 admissions to an intensive care unit (after initial recovery from the event resulting in intestinal failure) because of cardiorespiratory failure (mechanical ventilation or inotrope infusion) due to sepsis or other complication of intestinal failure

• In adults, on a case-by-case basis.

• Invasive intra-abdominal desmoids in adolescents and adults.

• Acute diffuse intestinal infarction with hepatic failure.

• Failure of first intestinal transplant.

**SUMMARY**

There is enough research to show that small bowel/liver and multivisceral transplant and retransplant can improve survival in certain patients. Therefore, these procedures may be considered medically necessary for patients with intestinal failure who have been managed with long-term total parenteral nutrition and who have developed evidence of impending end-stage liver failure. Transplants or retransplants are considered not medically necessary when the policy criteria are not met.

**REFERENCES**


**CODES**

<table>
<thead>
<tr>
<th>Codes</th>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPT</td>
<td>43999</td>
<td>Unlisted procedure, stomach</td>
</tr>
<tr>
<td></td>
<td>44132</td>
<td>Donor enterectomy, (including cold preservation) open; from cadaver donor</td>
</tr>
<tr>
<td></td>
<td>44133</td>
<td>Donor enterectomy, (including cold preservation) open; partial, from living donor</td>
</tr>
<tr>
<td></td>
<td>44135</td>
<td>Intestinal allotransplantation; from cadaver donor</td>
</tr>
<tr>
<td></td>
<td>44136</td>
<td>Intestinal allotransplantation; from living donor</td>
</tr>
<tr>
<td>Codes</td>
<td>Number</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
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<tr>
<td></td>
<td>44715</td>
<td>Backbench standard preparation of cadaver or living donor intestine allograft prior to transplantation, including mobilization and fashioning of the superior mesenteric artery and vein</td>
</tr>
<tr>
<td></td>
<td>44720</td>
<td>Backbench reconstruction of cadaver or living donor intestine allograft prior to transplantation; venous anastomosis, each</td>
</tr>
<tr>
<td></td>
<td>44721</td>
<td>Backbench reconstruction of cadaver or living donor intestine allograft prior to transplantation; arterial anastomosis, each</td>
</tr>
<tr>
<td></td>
<td>44799</td>
<td>Unlisted procedure, small intestine</td>
</tr>
<tr>
<td></td>
<td>47133</td>
<td>Donor hepatectomy, (including cold preservation) from cadaver donor</td>
</tr>
<tr>
<td></td>
<td>47135</td>
<td>Liver allotransplantation; orthotopic, partial or whole, from cadaver or living donor, any age</td>
</tr>
<tr>
<td></td>
<td>47140</td>
<td>Donor hepatectomy (including cold preservation), from living donor; left lateral segment only (segments II and III)</td>
</tr>
<tr>
<td></td>
<td>47141</td>
<td>;total left lobectomy (segments II, III and IV)</td>
</tr>
<tr>
<td></td>
<td>47142</td>
<td>;total right lobectomy (segments V, VI, VII and VIII)</td>
</tr>
<tr>
<td></td>
<td>47143</td>
<td>Backbench standard preparation of cadaver donor whole liver graft prior to allotransplantation, including cholecystectomy, if necessary, and dissection and removal of surrounding soft tissues to prepare the vena cava, portal vein, hepatic artery, and common bile duct for implantation; without trisegment or lobe split</td>
</tr>
<tr>
<td></td>
<td>47144</td>
<td>;with trisegment split of whole liver graft into 2 partial liver grafts (ie, left lateral segment [segments II and III] and right trisegment [segments I and IV through VIII])</td>
</tr>
<tr>
<td></td>
<td>47145</td>
<td>;with lobe split of whole liver graft into 2 partial liver grafts (ie, left lobe [segments II, III, and IV] and right lobe [segments I and V through VIII])</td>
</tr>
<tr>
<td></td>
<td>47146</td>
<td>Backbench reconstruction of cadaver or living donor liver graft prior to allotransplantation; venous anastomosis, each</td>
</tr>
<tr>
<td></td>
<td>47147</td>
<td>Backbench reconstruction of cadaver or living donor liver graft prior to allotransplantation; arterial anastomosis, each</td>
</tr>
<tr>
<td></td>
<td>47399</td>
<td>Unlisted procedure, liver</td>
</tr>
<tr>
<td></td>
<td>48550</td>
<td>Donor pancreatectomy (including cold preservation), with or without duodenal segment for transplantation</td>
</tr>
<tr>
<td></td>
<td>48551</td>
<td>Backbench standard preparation of cadaver donor pancreas allograft prior to transplantation, including dissection of allograft from surrounding soft tissues, splenectomy, duodenotomy, ligation of bile duct, ligation of mesenteric vessels, and Y-graft arterial anastomoses from iliac artery to superior mesenteric artery and to splenic artery</td>
</tr>
<tr>
<td></td>
<td>48552</td>
<td>Backbench reconstruction of cadaver donor pancreas allograft prior to transplantation, venous anastomosis, each</td>
</tr>
<tr>
<td></td>
<td>48554</td>
<td>Transplantation of pancreatic allograft</td>
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<tr>
<td></td>
<td>48999</td>
<td>Unlisted procedure, pancreas</td>
</tr>
<tr>
<td>HCPCS</td>
<td>S2053</td>
<td>Transplantation of small intestine, and liver allografts</td>
</tr>
<tr>
<td></td>
<td>S2054</td>
<td>Transplantation of multivisceral organs</td>
</tr>
<tr>
<td></td>
<td>S2055</td>
<td>Harvesting of donor multivisceral organs, with preparation and maintenance of allografts; from cadaver donor</td>
</tr>
<tr>
<td></td>
<td>S2152</td>
<td>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 posttransplant care in the global definition</td>
</tr>
</tbody>
</table>

*Date of Origin: January 1996*