Intestinal transplantation –
An overview
(What you should know as a non-intestinal transplant surgeon)

Wendy J. Grant, MD
Associate Professor of Surgery
Assistant Dean for Student Affairs
University of Nebraska College of Medicine
Disclosures

• No financial disclosures
• I am an intestinal transplant surgeon and believe that is indicated for those that need it
• I take care of intestinal rehabilitation patients
Does your institution perform intestinal transplants?

1. Yes
2. No
How many intestinal transplant recipient operations have you participated in?

1. 0
2. 1-5
3. 5-10
4. >10
5. Too many to count
What will we talk about

• Intestine transplant volumes
• Indications for transplant
• Isolated intestine
• Intestine with liver (and other bits)
• Allocation
• Patient survival
• Cases
IN 1.1 Patients waiting for an intestinal transplant

SRTR & OPTN Annual Data Report, 2011
Transplant wait time

IN 1.7 Median months to intestinal transplant for wait-listed patients, by age
Patients waiting for a transplant, with observations censored at December 31, 2011; Kaplan-Meier method used to estimate time to transplant. If an estimate is not plotted for a certain year, 50% of the cohort listed in that year had not been transplanted at the censoring date. Only the first transplant is counted.
IN 3.2 Intestinal transplants

Age

Sex

Race

Primary cause of disease

SRTR & OPTN Annual Data Report, 2011
### IN 3.1 Total intestinal transplants

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of IT in US</th>
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<tr>
<td>1998</td>
<td>116</td>
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<tr>
<td>2000</td>
<td>178</td>
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<td>2002</td>
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<td>2004</td>
<td>180</td>
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<tr>
<td>2006</td>
<td>129</td>
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<td>2012 through Oct</td>
<td>89</td>
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#### Intestine, with liver

#### Intestine only, no liver

#### Live donor

SRTR & OPTN Annual Data Report, 2011
Why not transplant?????
Prospective, Case Controlled Trial of 24 weeks of Intravenous Fish Oil in Children with Intestinal Failure Associated Liver Disease

Kara Calkins\textsuperscript{1}, Stephen Shew\textsuperscript{2}, James Dunn\textsuperscript{2}, Douglas Farmer\textsuperscript{2}, and Robert Venick\textsuperscript{1,2}

\textsuperscript{1}Department of Pediatrics, \textsuperscript{2}Department of Surgery
University of California, Los Angeles

*Supported by NIH grant T32GM75776-6

PROSPECTIVE FO COHORT

Satisfies Inclusion Criteria

- FO
- Omegaven\textsuperscript{TM} 1 gm/kg/d IV
- X 24 weeks or until death/transplant

RETROSPECTIVE SO COHORT

Satisfies Inclusion Criteria

- SO
- Intralipid\textsuperscript{TM} 0.5 – 4 gm/kg/d
- X 24 weeks or until death/transplant

BILIRUBIN

\begin{figure}
\centering
\includegraphics[width=\textwidth]{bilirubin_graph.png}
\caption{Graph showing geometric mean total bilirubin levels over weeks.}
\end{figure}

\textsuperscript{*}p-value<0.05

\textsuperscript{**}p-value<0.01

\textsuperscript{***}p-value<0.001
Hepatic Fibrosis Persists and Progresses Despite Biochemical Improvement in Children Treated With Intravenous Fish Oil Emulsion

Mercer, David F.; Hobson, Brandy D.; Fischer, Ryan T.; Talmon, Geoffrey A.; Perry, Deborah A.; Gerhardt, Brandi K.; Grant, Wendy J.; Botha, Jean F.; Langnas, Alan N.; Quiros-Tejeira, Ruben E.


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<td>43 52 99 131</td>
<td>14 41</td>
<td>8 34 40 67</td>
<td>8 38 11 19 47</td>
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<tr>
<td>length (cm)</td>
<td>67.5 73 80.5 84.5</td>
<td>50.5 65</td>
<td>54.8 69 71 77.5</td>
<td>46 63 58.5 62 73.5</td>
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<td>weight (kg)</td>
<td>8 2.9 5 12</td>
<td>4.1 8.3</td>
<td>4.1 7.2 8.3 9.7</td>
<td>2.4 7.2 4.6 6.6 9</td>
<td>6.6 9.4</td>
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<td>%enteral</td>
<td>15 0 0 16</td>
<td>0 70</td>
<td>0 0 15 47</td>
<td>0 25 30 35 35</td>
<td>94 86</td>
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<tr>
<td>%parenteral</td>
<td>85 100 100 84</td>
<td>100 30</td>
<td>100 100 85 53</td>
<td>100 75 70 65 65</td>
<td>6 14</td>
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<tr>
<td>Total bili (mg/dl)</td>
<td>0.4 1.7 0.4 0.4</td>
<td>3.4 0.4</td>
<td>6.5 0.4 0.3 0.3</td>
<td>17.4 0.6 4.4 0.3 0.4</td>
<td>0.4 0.7</td>
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<tr>
<td>Dir bili (mg/dl)</td>
<td>0.2 0.2 0.1 ND</td>
<td>ND 0.1</td>
<td>3.6 ND ND ND</td>
<td>10.4 ND 3.6 ND ND</td>
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<tr>
<td>AST (U/L)</td>
<td>75 107 95 39</td>
<td>56 56</td>
<td>142 28 53 27</td>
<td>52 83 105 94 129</td>
<td>36 70</td>
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<tr>
<td>ALT (U/L)</td>
<td>125 127 201 121</td>
<td>77 42</td>
<td>109 21 75 22</td>
<td>26 141 129 231 229</td>
<td>44 116</td>
<td></td>
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<tr>
<td>GGT (U/L)</td>
<td>198 96 31 35</td>
<td>107 23</td>
<td>ND 22 18 32</td>
<td>223 ND 139 159 122</td>
<td>20 44</td>
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<tr>
<td>alk phos (U/L)</td>
<td>185 231 280 164</td>
<td>548 271</td>
<td>475 251 257 310</td>
<td>673 348 510 385 557</td>
<td>401 251</td>
<td></td>
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<tr>
<td>Trig (mg/dl)</td>
<td>60 40 ND 17</td>
<td>59 53</td>
<td>96 41 28 50</td>
<td>90 37 87 34 ND</td>
<td>29 26</td>
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<td>platelets</td>
<td>275 247 225 212</td>
<td>397 325</td>
<td>241 204 194 272</td>
<td>101 118 422 247 241</td>
<td>273 454</td>
<td></td>
</tr>
<tr>
<td>PT-INR</td>
<td>1.6 1.2 1.2 1.1</td>
<td>1.2 1.2</td>
<td>ND 1.2 1.1 1.1</td>
<td>102 1.1 1 1.2 0.9</td>
<td>1.4 1.2</td>
<td></td>
</tr>
<tr>
<td>albumin</td>
<td>2.3 2.9 3.2 3.2</td>
<td>3.6 2.1</td>
<td>2.3 1.8 3.5 2.3</td>
<td>2.6 3.1 3 2.5 3.3</td>
<td>3.1 3.1</td>
<td></td>
</tr>
<tr>
<td>time on FOE at biopsy (w)</td>
<td>11 20 off off</td>
<td>6 off</td>
<td>1 27 33 off</td>
<td>1 31 0 9 36</td>
<td>20 75</td>
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<td>steatosis</td>
<td>1 0 1 1</td>
<td>0 0</td>
<td>0 1 0 0</td>
<td>0 1 0 0 0 0</td>
<td>0 1</td>
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<td>cholestasis</td>
<td>1 1 0 0</td>
<td>2 0</td>
<td>3 1 1 0</td>
<td>4 1 3 2 0 1 0</td>
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<td>inflammation</td>
<td>0-1 1-2 0 0</td>
<td>0-1 0-1 0</td>
<td>2 1 1 1 1 1</td>
<td>1 2 1 0 2 0</td>
<td>2 0</td>
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<td>fibrosis</td>
<td>3 3 3 3</td>
<td>2 2</td>
<td>0 2 3 3</td>
<td>1 2 1 2 2 1</td>
<td>2 1</td>
<td></td>
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<td>ductal proliferation</td>
<td>no yes no no</td>
<td>no no</td>
<td>no yes no no</td>
<td>yes yes no yes no</td>
<td>yes no</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Summary of clinical, laboratory and pathological data for six study subjects. AST – aspartate aminotransferase; ALT – alanine aminotransferase; Alk phos – alkaline phosphatase; Trig – triglyceride; FOE – fish oil emulsion; ND – not done. Percent enteral and parenteral calories are calculated based on an estimated need of 85 kCal/kg/d.
Retrospective Study of Central Venous Catheter Infections in Intestinal Rehabilitation Patients Using Ethanol Therapy or Alternative Therapy.

Heidi O’Connell¹, David Mercer¹, Teresa Barry³, Fedja Rochling¹, Laura Beerman², Brandy Hobson², Brandi Gerhardt¹, Jaime Carney¹

¹Department of Surgery- Intestinal Rehabilitation- University of Nebraska Medical Center, Omaha. ²The Nebraska Medical Center, Omaha. ³College of Nursing-Families and Health Systems, University of Nebraska Medical Center, Omaha.

OBJECTIVE

Central venous catheter related infections (CVCI) are a significant cause of morbidity and mortality in patients with long term parental nutrition (PN) needs. Each CVCI generally results in a hospital stay and antibiotic therapy use, both of which have detrimental effects on the patient/family and increase costs of health care. The purpose of this study was to determine if ethanol lock therapy (compared to alternative therapy) decreased the incidence of CVC total infections per 1000 line days and total line insertions in Intestinal Rehabilitation patients who have long term PN needs. In addition, number and types of cultured organisms are examined.

METHODS

• Retrospective analysis of 25 patients
• Subjects used as their own controls, equal time period prior and post 70% ethanol therapy initiation
• Alternative therapies prior to ethanol therapy included saline, antibiotic, or heparin locks
• Inclusion criteria: a) receiving parental nutrition via long term CVC, b) enrolled in the University of Nebraska Medical Center IRP program, c) using ethanol locks, d) the patients were served by home health agencies using standardized ethanol therapy protocol.
• Study variables include patient age, days with CVC, days with ethanol therapy, number of infections, the microbes cultured, new line insertions and patient anatomy.
• Statistical analysis was done in SPSS using paired t-tests.

RESULTS

• Median age: 23 months old, (range 6 months to 82 years).
• Most common cause of IF(44%) gastrochisis.
• 48% of patients had less than 50cm of SB remaining
• Mean number of days on ethanol therapy was 406 days (13.5 months) (SD= 371).
• Most common organisms cultured during alternative and ethanol therapy: gram positive and gram negative organisms (15 and 6 respectively).

Table 1: Comparison of CVC Infections for pre-ethanol therapy and post ethanol therapy

<table>
<thead>
<tr>
<th>Description</th>
<th>Pre-ethanol therapy Mean (SD)</th>
<th>Post-ethanol therapy Mean (SD)</th>
<th>p-value</th>
</tr>
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<tbody>
<tr>
<td>CVC Infections</td>
<td>2.20 (2.57)</td>
<td>0.68 (1.41)</td>
<td>.012*</td>
</tr>
<tr>
<td>CVC Infections/1000 line days</td>
<td>7.29 (8.74)</td>
<td>1.16 (2.07)</td>
<td>.002*</td>
</tr>
<tr>
<td>New Line insertions</td>
<td>4.88 (4.06)</td>
<td>3.56 (4.20)</td>
<td>.262</td>
</tr>
</tbody>
</table>

p < .05.

Conclusion and Future Directions

This is amongst the first known studies including both pediatric and adult patients using a standardized ethanol lock protocol. Compared with various alternative therapies, the use of 70% ethanol lock therapy significantly reduces the rate of CVCI per 1000 line days in IRP patients. Differences between groups for new line placements was not significant.
What is a STEP procedure?

1. Building stairs
2. Lengthening bowel
3. A dance
4. An app
International STEP Registry Data

HB Kim, MD
Boston Children’s Hospital
Pediatric Intestinal Failure and Rehabilitation Symposium (PIFRS)
Chicago, IL 2010

STEP Registry

- 111 patients
- 9/2004 – 1/2010
- 50 worldwide centers

111 Patients
\[\rightarrow\]
97 STEP
\[\rightarrow\]
9 Death 4 SBT 8 TPN 14 TPN+EN
\[\rightarrow\]
14 Repeat STEP (3rd STEP=2)
\[\rightarrow\]
2 Death 1 SBT 4 TPN+EN
\[\rightarrow\]
14 Lost 3 Poor data
\[\rightarrow\]
45 100% EN
\[\rightarrow\]
3 100% EN
## UNMC IRP STEPs 01/06 to 08/11

<table>
<thead>
<tr>
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<th>Median (range)</th>
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<tr>
<td>Total STEPs</td>
<td>68 (50 patients)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>26 (52%)</td>
</tr>
<tr>
<td>Female</td>
<td>24 (48%)</td>
</tr>
<tr>
<td>Gestational age (w)</td>
<td>33.5 +/- 2.9</td>
</tr>
<tr>
<td>Birth weight (g)</td>
<td>2308 +/- 802</td>
</tr>
<tr>
<td>Birth height (cm)</td>
<td>40.6 +/- 3.9</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
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<tr>
<td>NEC</td>
<td>8 (16%)</td>
</tr>
<tr>
<td>Gastrochisis</td>
<td>28 (56%)</td>
</tr>
<tr>
<td>Intestinal atresia</td>
<td>10 (20%)</td>
</tr>
<tr>
<td>Volvulus</td>
<td>4 (8%)</td>
</tr>
<tr>
<td>Median length post initial surgeries (cm)</td>
<td>30 (10-175)</td>
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</table>

|                           |                      |
| Age (y)                   | 1.0 (0.1–12.7)       |
| Height (cm)               | 71 (46-140)          |
| Weight (kg)               | 8.5 (3.1-32)         |
| Length pre-STEP (cm)      | 51 (15-175)          |
| Length post-STEP (cm)     | 87 (31-270)          |
| Length gain               | 54% (5-130%)         |
| OR Time (min)             | 115 (65-257)         |
| Blood loss (ml)           | 0 (0-50)             |
| Days to feeding           | 8 (5-44)             |
| Days to discharge         | 14 (7-61)            |
So .. Who do we actually transplant?

- Dependence on TPN (intestinal failure) with
  - Advancing TPN-associated liver disease despite appropriate management
  - Thrombosis of $\geq 2$ central veins
  - $\geq 2$ episodes/yr severe sepsis especially fungemia despite appropriate management
  - Nonreconstrucatable GI tract
Loss of vascular access
Indications for intestinal transplant

• Loss of vascular access
• Advancing or advanced liver disease
• Repeated life threatening line infections despite optimal line management
• Non-reconstructable GI tract
• Uncontrollable fluid and electrolyte balance
Intestinal transplant diagnosis

- Hirschprung's Disease: 6%
- Microvillus Inclusion Disease: 7%
- Myopathic Pseudo-Obstruction: 4%
- Neuropathic Pseudo-Obstruction: 2%
- Meconium Obstruction: 1%
- Gastrochisis: 26%
- NEC: 19%
- Intestinal Volvulus (Malrotation): 13%
- Intestinal Volvulus (Adhesions): 1%
- Intestinal Atresia: 13%
- Tumor: 2%
- Trauma: 1%
Patient Evaluation

• Radiographic studies to define anatomy
  – Upper GI/ Small bowel series; barium enema
  – Ultrasound
  – Fistulogram, if present
• Lab work – Nutritional deficiency, liver disease
• Gastroenterologist
  – liver biopsy
  – endoscopy
• Surgeon
• Nurse coordinator
• Psychology
• Psychiatry
• Dietician
• Financial counselor
What will we talk about

- Intestine transplant volumes
- Indications for transplant
- Isolated intestine
- Intestine with liver (and other bits)
- Allocation
- Patient survival
- Cases
Isolated intestine

• Donor size
  – If all or most of native intestine in place can size match or go smaller
  – If most of native intestine gone and therefore loss of peritoneal domain need donor about 50% of size

• Donor characteristics
  – Hemodynamically stable
  – Nutrition
  – Bowel movements in recent days
    • Number
    • Character (not bloody)
  – CMV/EBV status
    • If patient not in dire straights can wait for CMV negative, but prophylaxis better and CMV not as big a problem as 10 years ago

• Procurement
  – No data showing better outcomes with HTK or SPS
  – Donor pretreatment with anti-lymphocyte preparation (Nebraska)
  – Pancreas
    • Technically feasible to procure pancreas and isolated intestine graft but abberant anatomy and size must dictate this decision
    • Billing for pancreas if procured and discarded on backtable is controversial
Isolated intestine

• Recipient operation
  – Arterial anastomosis to infrarenal aorta
  – Venous drainage into vena cava or portal system
  – Jejunojejunostomy
  – Ileocolostomy
  – Loop ileostomy (or end ileostomy if no colon)

• Ileostomy
  – Still no reliable serologic marker for rejection and infection so histology remains gold standard
  – Usually reversed after 6 months of clinical stability
Isolated intestine
What will we talk about

• Intestine transplant volumes
• Indications for transplant
• Isolated intestine
• Intestine with liver (and other bits)
• Allocation
• Patient survival
• Cases
Intestine with liver and other bits

• Donor size
  – Liver and spleen usually enlarged so gives extra room
  – Regardless usually need donor smaller than recipient

• Donor characteristics
  • Same as isolated intestine

• Procurement
  – All organs en-bloc from stomach to colon, depending on what organs are being transplanted
  – Thoracic aortic conduit with preservation of celiac and superior mesenteric arteries
  – En-bloc kidneys can be procured depending on size of donor
  – Patch of aorta can be used to oversew aorta below SMA
Intestine with liver and other bits

• Recipient operation variations
  – Removal or preservation of foregut (duodenum, pancreas, spleen)
  – Partial gastrectomy
  – Caval replacement or piggy back

• GI reconstruction
  – Roux-en-y gastrojejunostomy when foregut removed
  – Jejunoojejunostomy when foregut preserved
Liver and other bits
Technical complications

- Isolated small bowel
  - Venous thrombosis
    - Hypovolemia, kinking, hypercoaguable states
  - Arterial thrombosis
    - Technical

- Liver small bowel
  - Vascular complications relatively uncommon

- Bowel perforation
  - Anastomotic
  - Trauma
  - Ischemia
Post operative management

• Aggressive use of take back/wash outs looking for perforations and peritonitis
• Diligent surveillance for blood stream infections and low threshold for line removal and changes
• Alprostodil for 7 days
• Initiation of enteral feedings when ileus resolves – usually within first 7-10 days
• Vivonex or similar formula to start to decrease risk of chylous ascites and effusions
What will we talk about

- Intestine transplant volumes
- Indications for transplant
- Isolated intestine
- Intestine with liver (and other bits)
- Allocation
- Patient survival
- Cases
3.11 INTESTINAL ORGAN ALLOCATION. The following policies apply to intestinal organ allocation which may include the stomach, small and/or large intestine or any portion of the gastro-intestinal tract as determined by the medical needs of individual candidates.

3.11.1 Degree of Medical Urgency. Each candidate shall be assigned one of the following status codes which correspond to the medical condition of the candidate.

**Status 7**
A candidate listed as a Status 7 is temporarily inactive; however, the candidate continues accruing waiting time up to a maximum of 30 days. Candidates who are considered to be temporarily unsuitable transplant candidates are listed as Status 7.

**Status 1**
A candidate listed as a Status 1 has liver function test abnormalities and/or no longer has vascular access through the subclavian, jugular or femoral veins for intravenous feeding, or has other medical indications that warrant intestinal organ transplantation on an urgent basis.

**Status 2**
All candidates awaiting intestinal organ transplantation who do not meet the criteria for Status 1 will be classified as Status 2.
3.11.4 Combined Intestine-Liver Allocation. For combined intestine-liver allocation, the liver must first be offered:

- according to the liver match run
- sequentially to each potential liver recipient (including all MELD/PELD potential recipients) through national Status 1A and 1B offers.

The liver may then be offered to combined liver-intestine potential recipients sequentially according to the intestine match run.
3.6 ALLOCATION OF LIVERS.

Adult Donor Liver Allocation Algorithm

Combined Local and Regional
1. Status 1A candidates in descending point order
2. Status 1B candidates in descending order

Local and Regional
3. Candidates with MELD/PELD Scores >=35 in descending order of mortality risk (MELD) scores, with Local candidates ranked above Regional candidates at each level of MELD score

Local
4. Candidates with MELD/PELD Scores 29-34 in descending order of mortality risk scores (probability of candidate death)

National
5. Liver-Intestine Candidates in descending order of Status and mortality risk scores (probability of candidate death)

Local
6. Candidates with MELD/PELD Scores 15-28 in descending order of mortality risk scores (probability of candidate death)

Regional
7. Candidates with MELD/PELD Scores 15-34 in descending order of mortality risk scores (probability of candidate death)
3.11.4.2 Combined Liver-Intestinal Organs from Donors 0-10 Years of Age.
For donors 0-10 years of age, offers will be made using the liver match run with candidates prioritized as follows:

**Combined Local and Regional**
1. Pediatric Status 1A Liver and Liver-Intestine Candidates (age 0-17) in descending point order

**National**
2. Pediatric Status 1A Liver and Liver-Intestine candidates (age 0-11) in descending point order
3. Pediatric Status 1A Liver-Intestine candidates (age 12-17) in descending point order

**Local**
4. Adult Status 1A Liver and Liver-Intestine candidates in descending point order

**Regional**
5. Adult Status 1A Liver and Liver-Intestine candidates in descending point order

**Combined Local and Regional**
6. Pediatric Status 1B Liver and Liver-Intestine candidates (age 0-17) in descending point order
7. Pediatric Liver and Liver-Intestine candidates (age 0-11) by PELD greater than 20
Median months to intestinal transplant for wait-listed patients, by age

Patients waiting for a transplant, with observations censored at December 31, 2011; Kaplan-Meier method used to estimate time to transplant. If an estimate is not plotted for a certain year, 50% of the cohort listed in that year had not been transplanted at the censoring date. Only the first transplant is counted.
IN 3.2 Intestinal transplants

**Age**
- 0-17: Peaks in 2006 and 2008
- 18+: Steady increase until 2010

**Sex**
- Male: Peaks in 2006 and 2008
- Female: Peaks in 2006 and 2008

**Race**
- White: Peaks in 2006 and 2008
- Black: Steady increase until 2010
- Other/unk.: Steady increase until 2010

**Primary cause of disease**
- Necrotizing enterocolitis: Steady increase until 2010
- Congenital SGS: Steady increase until 2010
- Pseudo-obstruction: Steady increase until 2010
- Enteropathies: Steady increase until 2010
- Other SGS: Steady increase until 2010

SRTR & OPTN Annual Data Report, 2011
What will we talk about

- Intestine transplant volumes
- Indications for transplant
- Isolated intestine
- Intestine with liver (and other bits)
- Allocation
- Patient survival
- Cases

SRTR & OPTN Annual Data Report, 2011
IN 4.3 Graft survival among intestinal transplant recipients transplanted in 2006, by age: deceased donors
Graft survival estimated using unadjusted Kaplan-Meier methods.

Percent patient survival using unadjusted Kaplan-Meier methods. For patients with more than one transplant during the period, only their first transplant is considered.
IN 4.5 Recipients alive & with a functioning intestinal transplant on June 30 of the year

SRTR & OPTN Annual Data Report, 2011
CASES
26 year old woman with Gardner’s syndrome. Total abdominal colectomy then enterocutaneous fistulas associated with desmoid tumors.

- Underwent total enterectomy leaving duodenal stump as a blind end
- Gastrojejunostomy tube for drainage of the foregut
- Aspiration pneumonia at time of last operation requiring ECMO for 14 days and prolonged course in ICU with MSOF
- TPN dependent
- Lives independently, only pain meds are for GT exit site
- 2 line infections in 8 months
- No loss of vascular access
- Liver synthetic function intact
What would you offer her ....

1. Hospice
2. Isolated small bowel transplant
3. Ongoing TPN
4. Combined liver and small bowel transplant
What we did ....

• Listed for isolated small bowel transplant
• Transplanted 2 months later
• Post-transplant course unremarkable
  – Off TPN in 2 weeks
  – No rejection or infection
  – Maintenance immunosuppression of tacrolimus, mycofenolate and steroids
  – Allowed to leave Nebraska 6 weeks post-operatively
5 Ileostomy

4 Small Bowel
So we thought we were really smart (or lucky) ..... 

- 6 weeks later she has labs and tacrolimus was undetectable ...
- She denied missing any medications so dose was increased 
- Presented 2 weeks later with diarrhea ....
Rejection

- Presented to local emergency room
- Local physician was willing to communicate with us and plan was made
- Steroids were given and biopsy arranged for the following morning
- Phone communication - the distal graft looked “terrible”, more steroids were given and patient was transferred to Nebraska
- Repeat endoscopy confirmed findings of denudation and sloughing, consistent with severe rejection
- Thymoglobulin therapy started
53 year old woman with hepatitis C, small bowel resections due to Crohn’s disease leaving 180cm small bowel, renal failure on dialysis for past 2 weeks, JAK-2 mutation

- Cirrhosis confirmed on biopsy and imaging
- Required TPN for the past month, but up until that point was enterally independent
- Living functional life until 10 weeks ago
- Has been on and off anti-coagulation over the past 5 years
- Renal failure thought to be due to hepatorenal
- MELD 39+
T2 weighted images – dark is fluid – notice NO DARK in mesentery
What would you offer this patient?

1. Hospice
2. Isolated liver transplant
3. Liver and small bowel transplant
4. Combined liver and kidney transplant
5. Combined liver, small bowel and kidney transplant
6. Isolated small bowel transplant
What we did ....

• Listed for liver/small bowel transplant
• Supportive care
• After 10 days on the list developed multisystem organ failure and died while awaiting organs
Summary

- Intestinal transplant volume transiently decreasing
- Survival satisfactory in the short term, steady for the long term
- Multi-disciplinary management of intestinal failure is essential and can help some patients avoid intestinal transplantation
- Cannot ignore concrete indications and we should try and prevent these from happening
So, what should you know ....

- Patients with intestinal transplants are susceptible to rejection
- Rejection should be diagnosis of exclusion, especially in first few months following transplant
- Early endoscopy with biopsy and communication with intestinal transplant center is highly recommended
So, what should you know ....

• If rejection is not the problem, viral infections are a serious problem
• Aggressive hydration and even TPN are necessary during recovery
• Viral infections make intestinal transplant recipients susceptible to rejection