

## The Changing Face of Intestine Transplantation

Simon Horslen MB ChB FRCPCH  
Director Hepatobiliary Program  
Medical Director Liver & Intestine Transplantation  
Seattle Children's Hospital

Professor Department of Pediatrics  
University of Washington School of Medicine



---

---

---

---

---

---

---

---

### Disclosure

In the past 12 months, I have had no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or providers(s) of commercial services discussed in this CME activity

I do not intend to discuss an unapproved or investigative use of a commercial product or device in my presentation



---

---

---

---

---

---

---

---

### Indications for intestine transplantation

- Irreversible intestinal failure  
And
- Life threatening complications
  - Progressive liver disease
  - Recurrent sepsis
  - Loss of central venous access sites



---

---

---

---

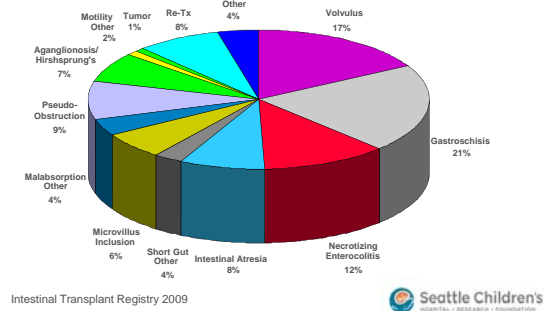
---

---

---

---

### Intestine transplantation in children




---

---

---

---

---

---

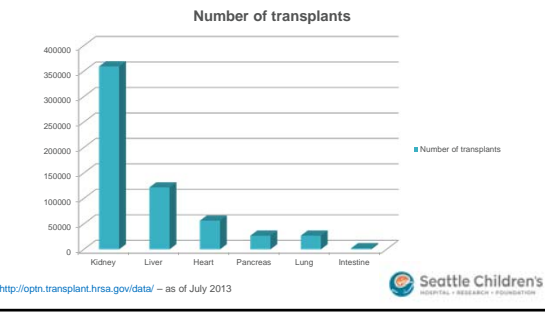
---

---

---

---

### Transplants performed by organ in US 1988 - 2013




---

---

---

---

---

---

---

---

---

---

### Content

- Compare information regarding intestinal transplant candidate and recipient populations over the last 15 years to identify what is changing
  - Patient numbers, age, gender, diagnosis
  - Mortality on waitlist
  - Graft and patient survival
  - Immunosuppression
- What factors are influencing these changes
- Discuss possible future of intestine transplantation in pediatrics




---

---

---

---

---

---

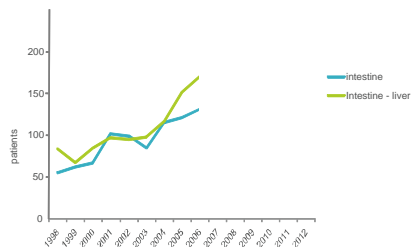
---

---

---

---

**New waitlist additions**



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

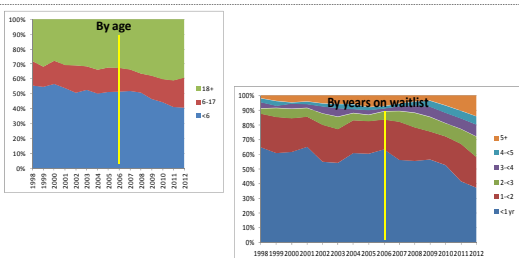
---

---

---

---

**Waitlist by age and time on list**



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

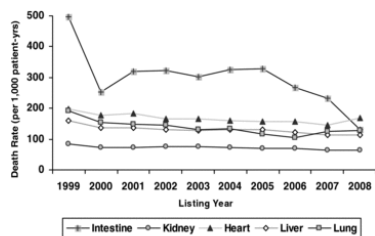
---

---

---

---

**Intestine waitlist mortality compared to other organs**



Source: 2009 OPTN/SRTR Annual Report, Table 1.6.

American Journal of Transplantation  
Volume 10, Issue 4p2, pages 1020-1034, 22 MAR 2010




---

---

---

---

---

---

---

---

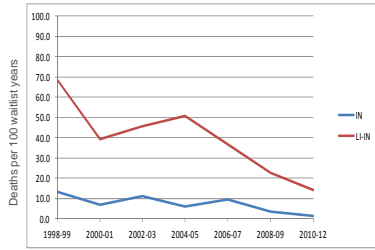
---

---

---

---

### Waitlist Mortality by graft type



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)



---

---

---

---

---

---

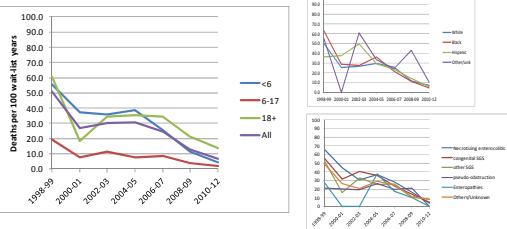
---

---

---

---

### Waitlist Mortality by age, race and diagnosis



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)



---

---

---

---

---

---

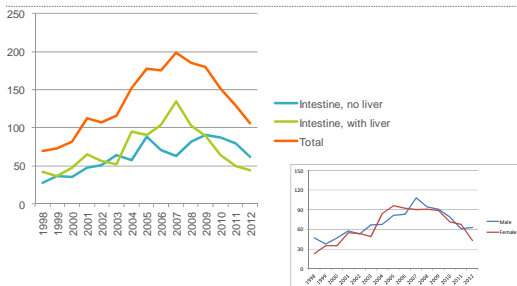
---

---

---

---

### Number of Intestine transplants per year



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)



---

---

---

---

---

---

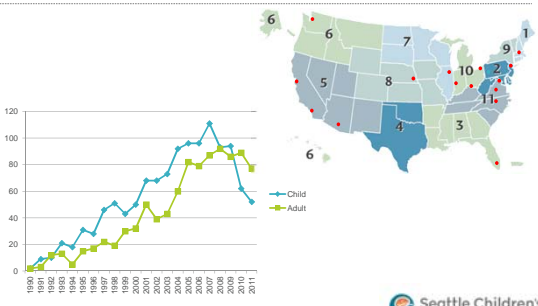
---

---

---

---

### Who's doing Intestine Transplants?




---

---

---

---

---

---

---

---

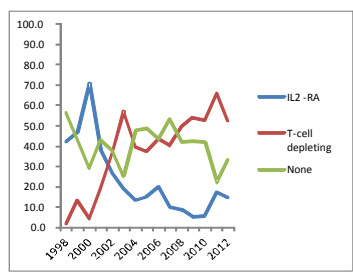
---

---

---

---

### Immunosuppression – induction agents



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

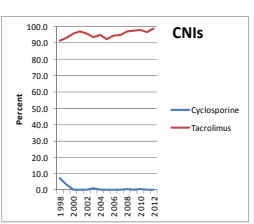
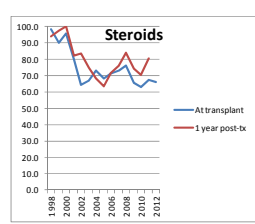
---

---

---

---

### Immunosuppression



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

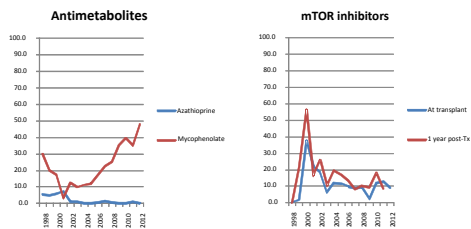
---

---

---

---

## Immunosuppression



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

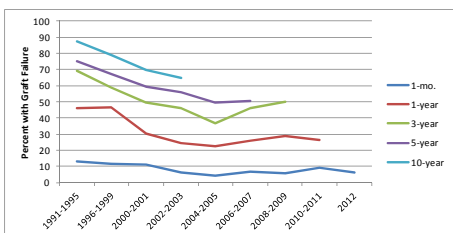
---

---

---

---

## Graft failure



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

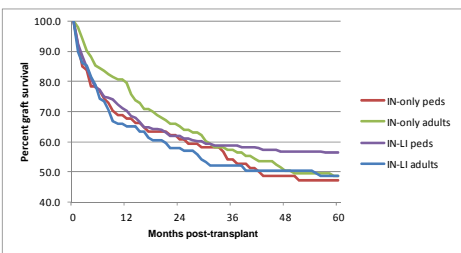
---

---

---

---

## Graft survival



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

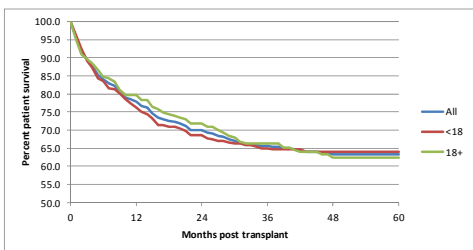
---

---

---

---

### Patient Survival



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

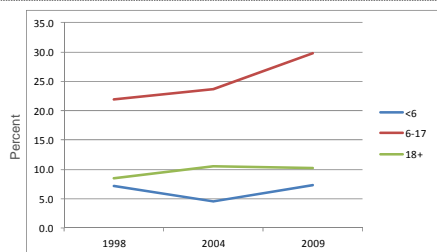
---

---

---

---

### Retransplantation percentage



OPTN/SRTR 2012 Annual Data Report: Intestine (unpublished data)




---

---

---

---

---

---

---

---

---

---

---

---

### Summary of changes

- Fewer children being listed for intestine transplant
- Larger proportion listed for isolated intestine
- Young children proportionally being listed less
- Deaths on waitlist reduced substantially
- Dramatically fewer transplants being done, with greatest decline in children
- Increased use of lymphocyte depleting induction and MMF as adjunctive maintenance immunosuppression
- Some improvements in incidence of graft loss, but long-term graft attrition unchanging




---

---

---

---

---

---

---

---

---

---

---

---

### Keys to the "changed face of intestinal transplantation"

1. Improved intestinal failure care
2. Failure to control late allograft loss



---

---

---

---

---

---

---

---

### What has driven improved intestinal failure care?

- Intestine transplantation
  - Death not inevitable with severe or complicated intestinal failure
  - Aggressive management to get tiny infants to a transplantable size
  - Adaptation and spontaneous survival without transplant
- Intestinal rehabilitation programs
  - Multidisciplinary teams
  - Control of both inpatient and outpatient management
  - Aggressive infection prevention and treatment
  - Lipid modification
  - Surgical "tailoring"



---

---

---

---

---

---

---

---

### Data to Support Intestinal Rehabilitation Programs

- Stanger JD, Oliveira C, Blackmore C, Avitzur Y, Wales PW. The impact of multi-disciplinary intestinal rehabilitation programs on the outcome of pediatric patients with intestinal failure: a systematic review and meta-analysis. *J Pediatr Surg.* 2013 May;48(5):983-92.
- Nusinovich Y, Revenis M, Torres C. Long-Term Outcomes for Infants with Intestinal Atresia Followed at Children's National Medical Center, Washington, DC. *J Pediatr Gastroenterol Nutr.* 2013 May 8 [Epub ahead of print]
- Khalil BA, Ba'ath ME, Aziz A, Forsythe L, Gozzini S, Murphy F, Carlson G, Bianchi A, Morabito A. Intestinal rehabilitation and bowel reconstructive surgery: improved outcomes in children with short bowel syndrome. *J Pediatr Gastroenterol Nutr.* 2012 Apr;54(4):505-9.



---

---

---

---

---

---

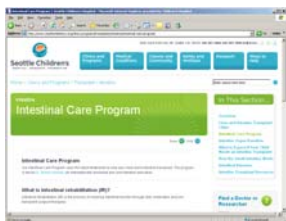
---

---



## Intestinal Failure Program

- Established 2005
- Team includes:
  - GI/Hepatology
  - Pediatric Surgery
  - Transplant Surgery
  - Nutritionists
  - Nurse Practitioners
  - Nurse Coordinators
  - Social Workers
  - Pharmacists



---

---

---

---

---

---

---

---

## Late intestinal allograft loss



---

---

---

---

---

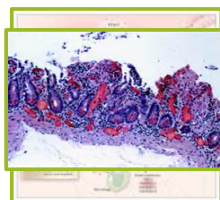
---

---

---

## Causes of late allograft loss

- Late acute rejection
- Chronic allograft inflammation
- Chronic rejection



Fishbein T. N Engl J Med 2009;361:998-1008



---

---

---

---

---

---

---

---

### What's the future of intestine transplantation

- Continued improvement in intestinal failure care
- Control AMR/chronic rejection
  - More graft HLA matching
  - Avoid sensitization/ desensitization protocols
  - PRA and DSA testing
  - B-cell/plasma cell directed immunosuppression
- Acceptance of concept of half-life as in kidneys and retransplantation
- Quality of Life indications



---

---

---

---

---

---

---

---

### Conclusion

- The face of intestine transplantation has changed considerably over the last 5 to 8 years
- Fewer children are meeting the inclusion criteria and subsequently undergoing transplantation
- Intestinal rehabilitation programs are at the forefront of this revolution
- Give all patients with intestinal failure the opportunity of evaluation by an experienced center
- Work continues on how best to manage late intestine allograft attrition



---

---

---

---

---

---

---

---

### The reason we do what we do!



---

---

---

---

---

---

---

---