



BRIGHAM AND WOMEN'S HOSPITAL

## What is New with Donation and Transplantation of Lungs

Phillip Camp, Jr., M.D.  
Director, Lung Transplant Program  
Brigham and Women's Hospital  
Assistant Professor, Harvard  
Boston, MA

January 15, 2010

 Brigham and Women's Hospital  Harvard Medical School

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## Ex-Vivo Resuscitation of Lungs

International Organ Preservation Conference  
On the Recovery and Repair of  
Deceased Donor Organs

Phillip Camp, Jr., M.D.  
Director, Lung Transplant Program  
Brigham and Women's Hospital  
Assistant Professor, Harvard  
Boston, MA

October 22, 2009

 Brigham and Women's Hospital  Transplant Team: *Continuing a Tradition of Excellence*  Harvard Medical School

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## Disclaimers-Professional

- No industry funding
- No speaking honoraria
- No financial relationships
  
- I will discuss off-label use of technology

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**Disclaimers-Personal**  
(I sit here on the shoulders of others)

- Stig Steen, M.D., Ph.D.
  - Leading Pioneer in field, and person who excited my partner...
- Michael Jaklitsch, M.D.
  - BWH Thoracic Surgery, who had me go learn from...
- Shaf Keshavjee, M.D., Ph.D.
  - Forward thinking surgeon-Scientist whose work my talk is so heavily dependent upon.

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**Evolution of Innovation**  
Finding New Ways to Improve Lung Transplantation

- Lung Resuscitation Protocols
- Perfusion techniques
  - Antegrade, Retrograde
- Perfusion solutions
- Metabolic manipulation
  - Additives
- Ischemic Pre-conditioning
  
- Graft function testing
- Graft function resuscitation
- Graft Function Engineering

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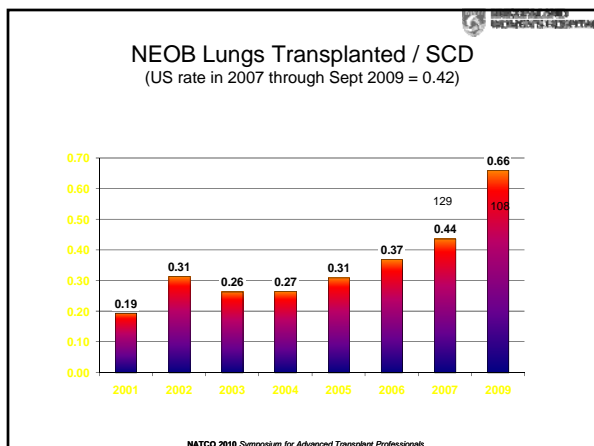
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### Evolution of Innovation

Finding New Ways to Improve Lung Transplantation

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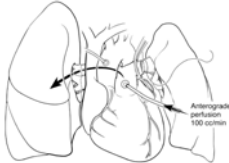
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### Ischemia-Reperfusion Modification Techniques

- Nitric Oxide
- Free Radical Scavengers
- Induction Protocols
  - BWH: Pre-Implant administration of ATG
  - Concurrent Counter current ultra-filtration while on CPB
  
- Minimized Ischemic Time
  - Controlled Antegrade perfusion of implanted organ before return of normal blood flow



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### Evolution of Innovation

Finding New Ways to Improve Lung Transplantation

- Lung Resuscitation Protocols
- Perfusion techniques
  - Antegrade, Retrograde
- Perfusion solutions
- Metabolic manipulation
  - Additives
- Ischemic Pre-conditioning
- But, this is only useful if the lungs can be used.....
- Graft function testing
- Graft function resuscitation
- Graft Function Engineering

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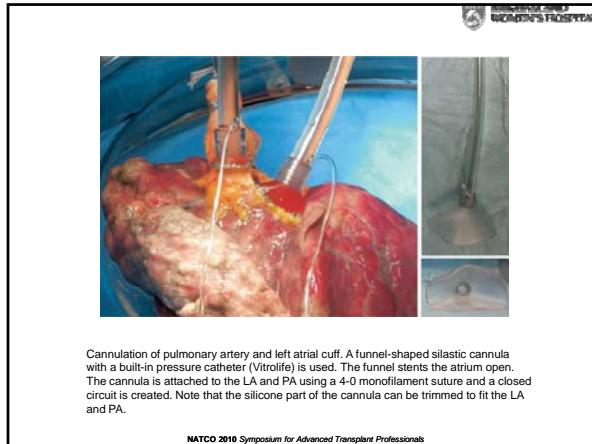
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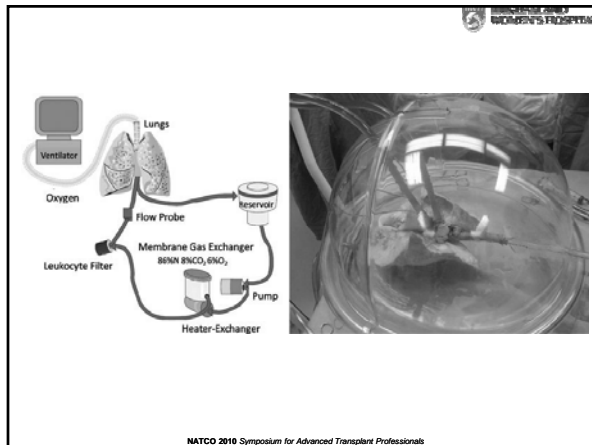
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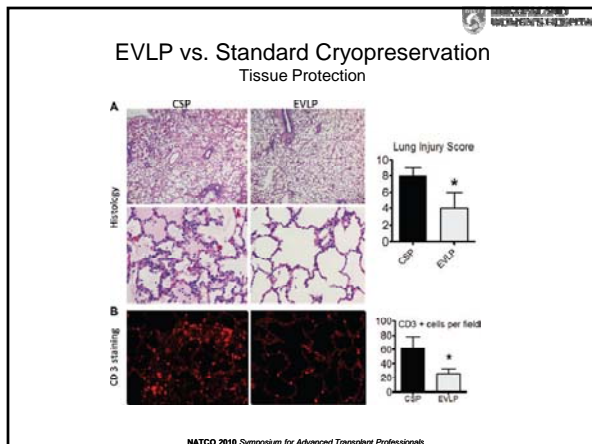
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WILSON'S PROGRAM

### Correlation between cytokine levels and death from Primary Graft Dysfunction

Variable*	Correlation coefficient	p-value
IL-8	0.141	0.19
IL-6	0.288	0.0061
IL-10	-0.141	0.19
IFN- $\gamma$	-0.208	0.051
TNF- $\alpha$	0.049	0.65
IL-1 $\beta$	0.137	0.20
IL-8/IL-10	0.332	0.0015
IL-6/IL-10	0.307	0.0034

\* log<sub>2</sub>-transformed mRNA expression levels for Spearman correlation analysis

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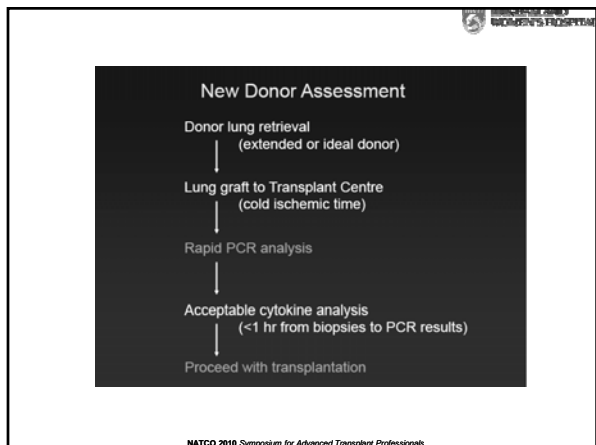
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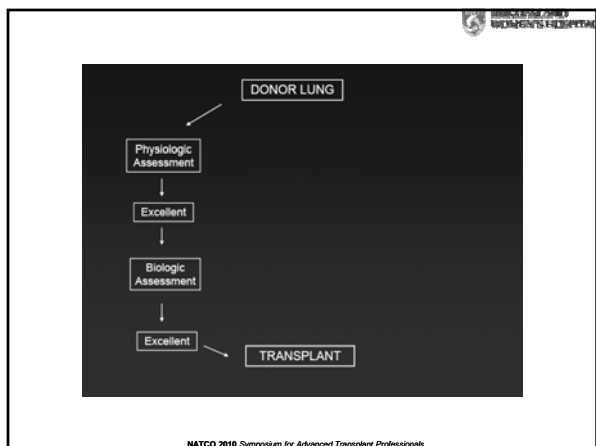
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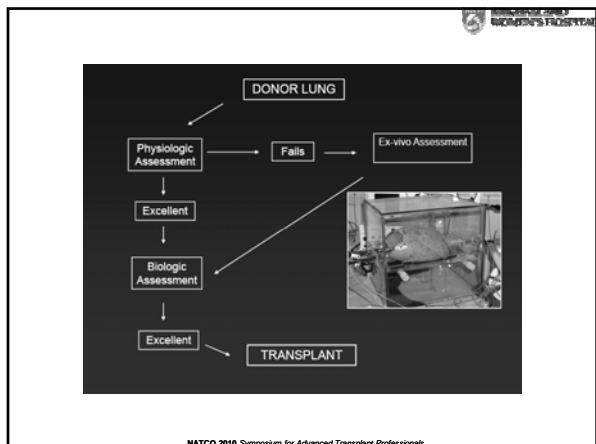
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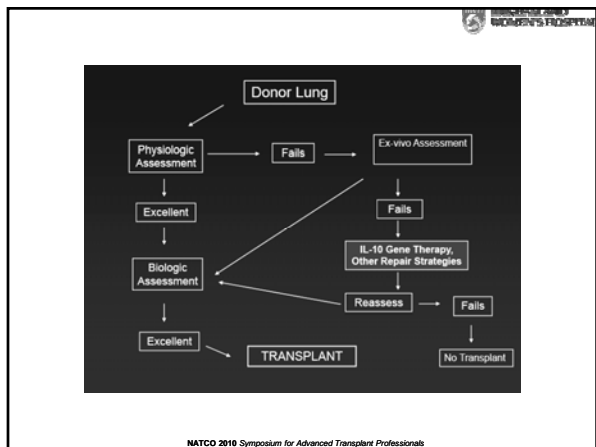
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What Does the Chest Transplant Surgeon want the Donation Coordinator Know When They Talk.....

Phillip Camp, Jr., M.D.  
Director, Lung Transplant Program  
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WORLD'S PREMIER  
SYMPOSIUM

“So we have a couple of lungs and a heart here... what else do you need from us?”

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WORLD'S PREMIER  
SYMPOSIUM

In Terms of placing organs, a very good philosophy to embrace...



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WORLD'S PREMIER  
SYMPOSIUM

In terms of knowing how to place the most organs, you need to know the enemy you are doing battle with.....

Remember the Audience that you are serving....

- Tired
- Busy
- Cranky (except me of course)
- Data driven
- Looking for Highpoints before delving into the bulk of the data
- Inherently suspicious and concerned about the outcomes of their centers' transplants
- These people go back to work after the get the notification...
- first presentation is your best opportunity



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### Objectives

- Defining what the key target points for heart and lung surgeons
- Identify how to present "problem data"
- Focus on some specific clinical issues:
  - Imaging
  - Bronchoscopy
  - Cardiopulmonary pressures and outputs
  - Gram Stains and ID data
- Normal and Abnormal anatomy

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### DonorNet

- Is a great tool
- Is a lot of data
- In general, you have about 2 minutes to make your case to the surgeon reviewing the donation offer
- DonorNet will never be anymore useful than the quality and completeness of the data placed into the Database
- The Big picture can often keep the interest of a fussy surgeon
- A good explanation of "interesting" or abnormal findings can often dissuade surgeon from a quick decline of your patient

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### Imaging

- Imaging, Imaging, Imaging
  - CXR
  - CT
  - Cine
  - Echo
- Will more often serve you than sink you.....
- Even a reasonable quality picture of a film sent by email is better than nothing.

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## Imaging

- CXR
  - Serial, big files, no camera phone with lights
- CT
  - Multiple cuts of Normal and Abnormal Lung
  - NO contrast
  - Ask the questions we want to rule out.....
    - COPD, Brochiectasis/tree and bud, nature of lesions (units)
  - Cine
    - Full series
  - Echo
    - Important to both heart and lung teams
    - Global and regional wall motion
    - Valve function and leak (rule out previous "diagnosis")
    - Septal and posterior (free) wall thickness

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Actual Case of How a Picture is Worth a Thousand Words

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- Chest X-ray report: Newly placed pulmonary artery catheter is in proper location, no new pneumothorax or hemothorax present, No change in persistent right peri-hilar infiltrates, stable. May represent mild pulmonary edema

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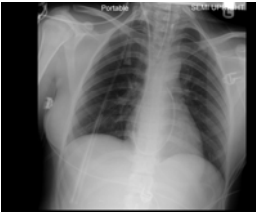
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WOMEN'S HOSPITAL

- Chest X-ray report: Newly placed pulmonary artery catheter is in proper location, no pneumothorax or hemothorax present, No change in right peri-hilar infiltrates, stable. May represent mild pulmonary edema



This is actual case where most programs passed due to a fair ABG with a PaO2 of 299 in a 30 year old female with mild smoking history. Surgeon had to "bug" the DC to find a radiology resident to find a way to post this film.

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**– Bronchoscopy**

- Most programs put patient on back burner until this data is available
- OPO specific Bronch form with COMMON issues to R/O
- A follow up bronch to abnormal findings is worth its weight in gold
  - It is OK to remind your consultant that they get paid to do this...

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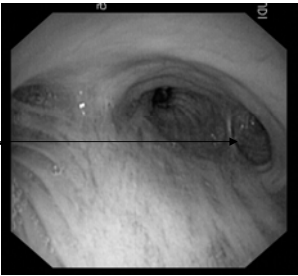
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### Tracheal bronchus



Tracheal bronchus orifice at level of carina and at entrance to the Right main bronchus

So what is the big deal? Well, we like to overlap the airway to help healing...

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**– ABG's and Ventilator settings**

- Absolute numbers will often outshine many other issues
  - (so early recruitment is key...)
- PEEP
- Time from recruitment to ABG
- Relationship to travel, bronch, de-recruitment events

**– Serologies**

- Do not offer before done
- If NAT pending, but local done REPORT IT

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- Cardiac Information
  - Drips
  - Outputs
  - Filling pressures
  - Response to changes in therapy
  - Rhythms
    - New, How long, how treated

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Gram Stains and Infection Indicators

Very important to document improvement

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Thank You for Your Time  
and Consideration!

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Questions?



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Thank You For Your Time



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## What is new in liver transplantation, and what does the surgeon want the coordinator to know?

No Disclosures

**Julie Heimbach, MD**  
**Surgical Director, Liver Transplantation**  
**Mayo Clinic**  
**Rochester, MN**

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### Goals: review key trends in Liver TX

American Journal of Transplantation 2008; 8 (Pt 1): 307-331  
 Wiley InterScience, Inc.

An Official Journal of the American Society of  
 Transplantation and the American Society of Transplant Surgeons  
 www.interscience.wiley.com

#### Liver and Intestine Transplantation in the United States 1998-2007

C. E. Rumpf<sup>1\*</sup>, D. P. Knecht<sup>1\*</sup>,  
 E. B. Edwards<sup>2†</sup>, J. E. Heimbach<sup>3\*</sup>,  
 J. C. Magee<sup>4,5</sup>, W. K. Washburn<sup>6\*</sup>  
 and G. V. Mazaris<sup>7\*</sup>

Key words: Decreased donor, living donors, organ donation, organ procurement, Scientific Registry of Transplant Recipients

- Characteristics of recipients/donors
- Allocation issues
- DCD organ transplantation

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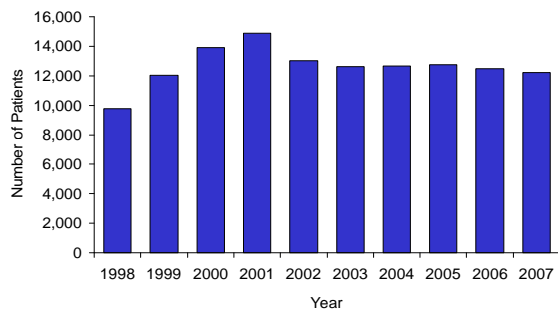
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**Figure V-1. Number of Candidates on the Liver Waiting List, Active at Year-End, 1998-2007**



Source: 2008 OPTN/SRTR Annual Report, Table 9.1a.

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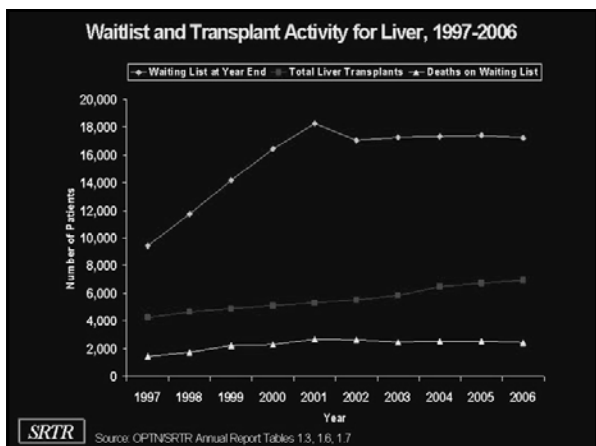
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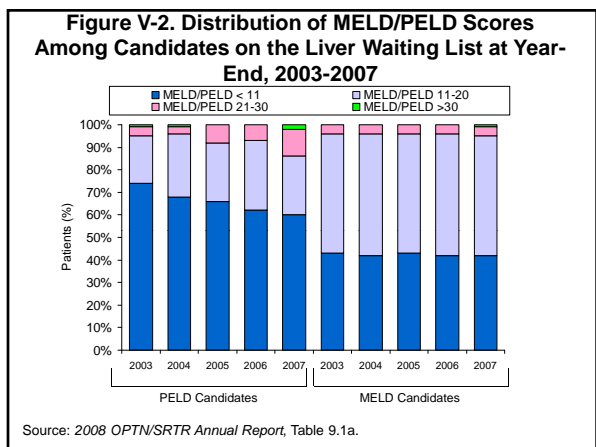
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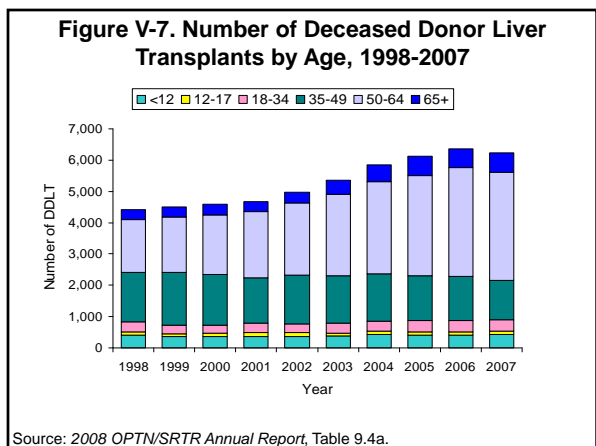
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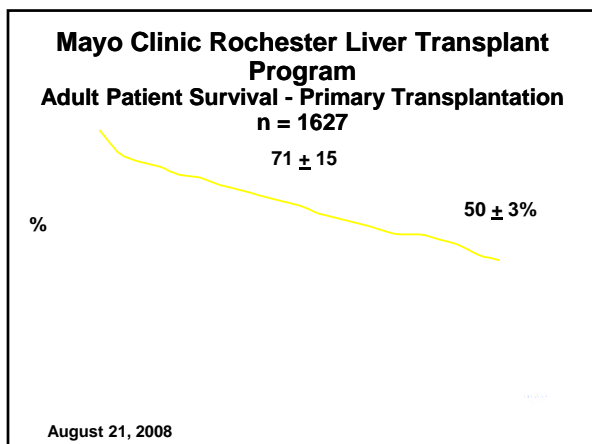
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- Liver transplantation Indications**
- Acute liver failure
  - Chronic liver disease (decompensated cirrhosis)
  - Other accepted indications
  - Controversial indications

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- Liver transplantation Contraindications - Absolute**
- Extrahepatic malignancy, unless tumor free for  $\geq 2$  years and low probability of recurrence
  - *Untreated* alcoholism / Alcoholic hepatitis
  - Extrahepatic sepsis *unresponsive to medical therapy*
  - High dose multiple pressors
  - Severe multiorgan failure
  - Severe psychological disease likely to affect compliance
  - Severe pulmonary HTN
  - Advanced cardiopulmonary disease

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### Liver transplantation

#### Contraindications - Relative

- General debility
- Advanced age
- Extensive prior abdominal surgery
- Extensive portal/mesenteric thrombosis
- Social isolation

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### Liver transplantation

#### Timing and Indications

Timing of OLT with deceased donor liver depends on risk of mortality

- Acute liver failure (PNF/early HAT): Status 1
- Chronic liver disease – calculated MELD/PELD
- MELD exceptions – assigned MELD
- Controversial indications - appeal

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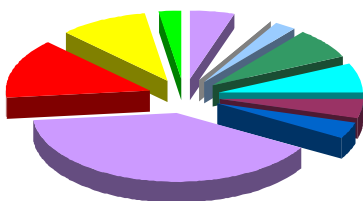
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### Indications for Liver Transplantation (UNOS Registry)



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### Deceased Donor Liver Allocation February 2002 Changes

<p><b>OLD UNOS POLICY: CTP</b></p> <ul style="list-style-type: none"> <li>• Medical status ↔</li> <li>• Waiting time ↔</li> <li>• Local, regional, national</li> <li>• Regional sharing for status 1</li> <li>• Status 2A for ICU ↔</li> </ul>	<p><b>NEW POLICY: MELD</b></p> <ul style="list-style-type: none"> <li>• Probability of death</li> <li>• No waiting time</li> <li>• Local, regional, national</li> <li>• Regional sharing for status 1</li> <li>• No preference for ICU patients</li> </ul>
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<http://www.unos.org/resources/meldPeldCalculator.asp>

What is the INR ?

What is the bilirubin ?

What is the serum creatinine?

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Has the patient been on dialysis at least twice in the past week? yes  no

MELD

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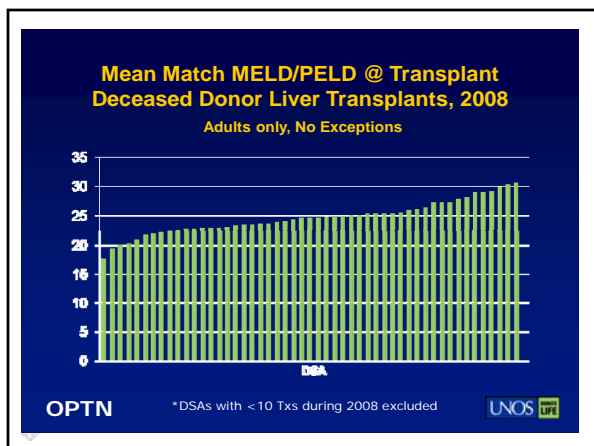
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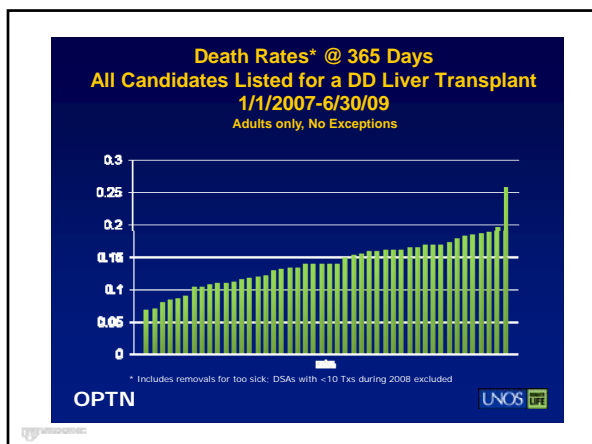
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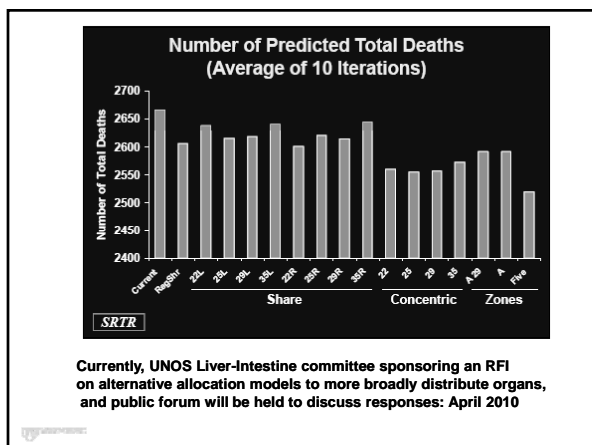
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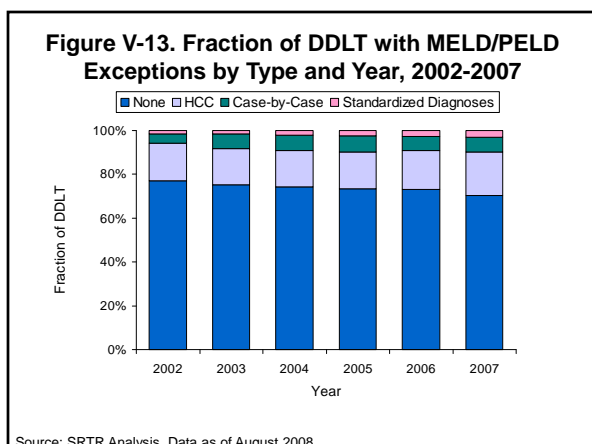
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### Liver Transplantation Standardized MELD Exceptions (June 09) = MELD 22

- Hepatopulmonary syndrome
- Familial amyloid polyneuropathy
- Cholangiocarcinoma ( neoadjuvant protocol approval)
- Portopulmonary hypertension
- Cystic fibrosis
- Primary hyperoxaluria (starts at MELD 28)

*(Templates and more info coming soon)*

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### Liver Transplants using DCD donors

year	Total donors	DCD donors	DCD donors (% of total)	DCD liver TX programs
2000	4407	39	0.88	11
2001	4465	68	1.52	20
2002	4697	76	1.62	28
2003	5042	110	2.18	38
2004	5459	178	3.26	42
2005	5679	260	4.58	54
2006	5849	278	4.75	60
2007	5625	295	5.24	62

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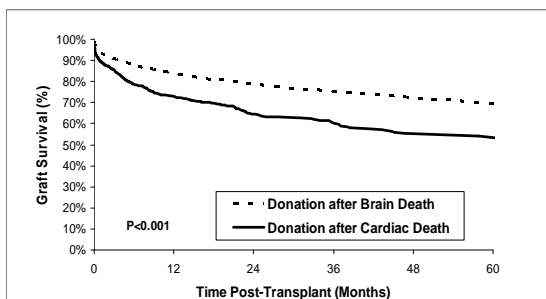
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### Outcomes of DCD Liver allografts



\*\*Adjusted for donor age, donor cause of death, donor race, donor sex, donor height, recipient age, recipient sex, recipient diabetes, recipient race, recipient diagnosis, recipient medical condition at transplant, recipient status 1 at transplant, pretransplant dialysis, need for pretransplant life support, recipient history of malignancy, recipient previous abdominal surgery, recipient body mass index (BMI), previous liver transplant, recipient MELD/ELD or Status 1A/B at transplant, recipient history of portal vein thrombosis, recipient hepatitis B positive, recipient hepatitis C positive, blood type compatibility, regional/national transplant, cold ischemia time, and partial/split liver transplant. SRTX analysis.

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### Donor Factors predictive of graft loss

Factor	Hazard Ratio	Confidence Interval	P-value
Donor weight>100 kg	1.57	1.13-2.19	0.008
Cold ischemia time >9 hours	1.79	1.02-3.14	0.042
Cold ischemia time missing	2.29	1.32-3.95	0.003
Age >50 (ref. 18-39)	1.37	0.98-1.91	0.067
Age>50 and CIT>9 hours	3.71	0.89-2.60	<0.001

Not predictive: donor cause of death, race, gender, height, organ sharing local vs. regional and national, and interaction between CIT>9 hours and donor age >50

ATC, 2009

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### The impact of ischemic cholangiopathy in liver transplantation using donors after cardiac death: The untold story

Amara I. Skaro, MD, PhD,\* Colleen L. Jay, MD,\* Taha B. Baker, MD,\* Edward Wong, PhD,\* Satina Pasricha, BS,\* Yuhua Lu, MD, PhD,\* John A. Martin, MD,\* Joseph M. Wragg, PhD,\* Katherine Proczanski,\* and Michael M. Abecassis, MD, MBA,\* Chicago, IL

Surgery, vol. 146, 543-553, 2009



- Increased resource utilization, graft loss, and re-transplant rate
- “Any efforts to promote increases DCD livers should include precautions against cannibalization of DBD livers.”

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### DCD conclusion

- Rates of DCD organ utilization continue to increase
- DCD allografts are associated with inferior graft survival (donor weight and cold ischemia time important factors)
- As DCD organ recovery increases, important not to use DCD option in place DBD for sake of time to declaration of brain death, etc.

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**Summary:**

- Liver transplantation is the standard of care for patients with end-stage disease and is associated with excellent outcomes.
- Optimizing access to liver TX is a priority
- Due to the extreme shortage of suitable donor organs, many options exist in addition to standard criteria deceased donation (living donor, DCD, ECD, high-risk)
- Organ recovery and transplantation-- only possible because of the extraordinary gift offered by individuals or their family members



*We cannot live only for ourselves. A thousand fibers connect us with our fellow men. ~Herman Melville*

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