



# CUTTING EDGE OF TRANSPLANTATION

TRANSPLANT SUMMIT 2023

## ACCESS FOR ALL:

*Embracing New Frontiers  
in Transplantation*

February 23-25, 2023  
Westin Kierland Hotel  
Scottsdale, AZ

For more information visit

[myAST.org/meetings/CEoT](https://myAST.org/meetings/CEoT)



**of Partnership**  
within the Kidney  
Transplant Community

# sanofi

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## General Information

### Registration and Badge Pick-Up

*Location: Culturekeepers West*

Wednesday	5:00 PM – 7:00 PM
Thursday	9:00 AM – 6:00 PM
Friday	7:00 AM – 5:00 PM
Saturday	7:00 AM – 3:00 PM

### Exhibits (Posters and Industry Displays)

*Location: Hall of State, Culturekeepers West & South*

Thursday	3:25 PM – 4:00 PM, 5:45 PM – 7:30 PM
Friday	12:00 PM – 12:30 PM
Saturday	10:10 AM – 10:45, 12:30 PM – 1:00 PM

### Meals

*Breakfast: Friday and Saturday*

Breakfast will be provided by the AST during the Breakfast Symposia on Friday and Saturday mornings from 7:00 AM – 8:15 AM. Please join us in Trailblazers C.

*Lunch: Thursday through Saturday*

Lunch will be provided by the AST during the symposium. There will be two concurrent symposia on Friday and three on Saturday. More details inside.

### Receptions

*Thursday, 6:00 PM – 7:30 PM, Poster Session and Welcome Reception*

Join your colleagues for a warm welcome to the Cutting Edge of Transplantation meeting. View abstract posters, visit the exhibit booths, and enjoy ample food and drinks with the AST.

*Saturday, 4:45 PM – 6:00 PM, Closing Reception*

Conclude your CEoT experience by winding down with your colleagues.

\*Breaks will also be provided throughout the meeting. Please visit the hotel concierge or the AST registration desk for dining suggestions for dinner on Thursday and Friday evenings.

### Wi-fi

**Network Name:** CEoT2023

**Password:** CareDx

### Name Badge

All attendees must wear the AST-provided name badge to gain access to CEoT events and sessions.



# 2023 C<sup>EoT</sup> MEETING SUPPORTERS

This educational activity is made possible with educational grants and support from the following companies:

## PLATINUM



## GOLD



## SILVER



## BRONZE



## MEETING PARTNERS





# RISE & GRIND

*with our  
CEoT  
Morning  
Wellness  
Events*

Kick start your mornings on Friday and Saturday  
with one of our wellness events.

Each participant that attends the wellness events will receive a water bottle and towel.

## **BOOTCAMP CLASS**

Be stronger than your excuses.  
Get your sweat on first thing in  
the morning.

Join us Friday, February 24th at 6:00 AM

Location: Trailblazers A



## **YOGA CLASS**

Find your zen on the last day of  
CEoT and join us for a Yoga Class.

Saturday, February 25th at 6:00 AM

Location: Trailblazers A

*This activity is generously supported by Eurofins Transplant Diagnostics*



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## Program Planning Committee

**Vineeta Kumar, MD, FAST**

Co-Chair

*University of Alabama at Birmingham*

**David P. Foley, MD, FACS, FAST, FAASLD**

Co-Chair

*University of Wisconsin*

**Rachel Patzer, PhD, MPH**

*Emory University School of Medicine*

**Michael Ison, MD, MS, FAST**

*Northwestern University Feinberg School of Medicine*

**Deborah Adey, MD**

*University of California San Francisco*

**Roy D. Bloom, MD**

*University of Pennsylvania*

**Lyndsey Bowman, PharmD**

*Tampa General Hospital*

**Andres Duarte-Rojo, MD, MS, DSc**

*Northwestern Medicine*

**Deborah Levine, MD**

*Stanford University*

**Molly McCarthy**

*Transplant Community Advisory Council*

**Kenneth McCurry, MD**

*Cleveland Clinic*

**Claus Niemann, MD**

*University of California San Francisco Medical Center*

**Jignesh Patel, MD, PhD**

*Cedars-Sinai Smidt Heart Institute*

**James Rodrigue, PhD**

*Harvard Medical School*

**Joanna Schaenman, MD, PhD**

*David Geffen School of Medicine at UCLA*

**Marina Serper, MD**

*University of Pennsylvania*

**Stuart Sweet, MD, PhD**

*Washington University St. Louis*

**Nicole Turgeon, MD**

*Dell Seton Medical Center at The University of Texas*

**Heidi Yeh, MD, MS**

*Massachusetts General Hospital*



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## Invited Faculty and Moderators



Scan the QR Code to view COI  
disclosures for all invited faculty.

**Deborah Adey, MD**  
*University of California San  
Francisco*

**Joel Adler, MD, MPH**  
*University of Texas at Austin*

**Roy Bloom, MD**  
*University of Pennsylvania*

**Lyndsey Bowman, PharmD,  
BCPS, BCTXP**  
*Tampa General Hospital*

**Juan Carlos Caicedo, MD, FACS**  
*Northwestern University Feinberg  
School of Medicine*

**Lisa Cantwell, MHA**  
*Carlson School of Management  
University of Minnesota*

**Pedro Catarino, MD, FRCS**  
*Cedars Sinai Medical Center*

**Anita Chong, PhD**  
*University of Chicago*

**Edward Drake II**  
*AST TCAC*

**Andres Duarte-Rojo, MD, MS, DSc**  
*Northwestern Medicine*

**Derek DuBay, MD, MSPH**  
*Medical University of South Carolina*

**David Foley, MD, FACS, FAST,  
FAASLD**  
*University of Wisconsin School of  
Medicine and Public Health*

**Mandy Ford, PhD, FAST**  
*Emory University*

**Richard Formica, MD**  
*Yale University*

**John Gill, MD, MS, FAST**  
*University of British Columbia*

**Alin Gragossian, DO, MPH**  
*EchoNous, Inc*

**Lorrinda Gray-Davis**  
*Transplant Recipients International  
Organization*

**Allyson Hart, MD, MS**  
*Hennepin Healthcare*

**Calvin Henry**  
*AST TCAC*

**Roberto Hernandez-Alejandro, MD**  
*University of Rochester New York*

**Abhinav Humar, MD**  
*University of Pittsburgh*

**Ajay Israni, MD, MS**  
*University of Minnesota*

**Kimberly Jacob Arriola, PhD, MPH**  
*Emory University*

**Michelle Jesse, PhD, FAST**  
*Henry Ford Health System*

**Prateeti Khazanie, MD, MPH**  
*University of Colorado*

**Kiran Khush, MD, MAS**  
*Stanford University*

**Allan Kirk, MD, PhD**  
*Duke University Medical Center*

**Jasleen Kukreja, MD, MPH**  
*University of California San  
Francisco*

**Sanjay Kulkarni, MD, MHCM,  
FACS**  
*Yale University School of Medicine*

**Deepali Kumar, MD, MSc, FRCPC  
FAST**  
*University Health Network Toronto*

**Vineeta Kumar, MD, FAST**  
*University of Alabama at Birmingham*

**Ricardo La Hoz, MD**  
*University of Texas Southwestern  
Medical Center*

**Keren Ladin, PhD, MSc**  
*Tufts University*

**Erika Lease, MD, FCCP**  
*University of Washington*

**Sylvie Leotin, MS**  
*Equify Health*

**Deborah Levine, MD, FAST, FCCP**  
*Stanford University*

**Jayne Locke, MD, MPH**  
*University of Alabama at Birmingham*

**Gabriel Loor, MD**  
*Baylor College of Medicine*

**Maricar Malinis, MD, FACP, FIDSA,  
FAST**  
*Yale University School of Medicine*

**Darren Malinoski, MD**  
*Oregon Health & Science University*

**Molly McCarthy**  
*AST TCAC*

**Kenneth McCurry, MD**  
*Cleveland Clinic*

**Lisa McElroy, MD, MS**  
*Duke University*

**Muhammad M. Mohiuddin, MD**  
*University of Maryland School of  
Medicine*

**Kevin Myer, MSHA**  
*LifeGift*

**Lauren Nephew, MD, MA, MSCE**  
*Indiana University School of  
Medicine*

**Claus Niemann, MD**  
*University of California San  
Francisco Medical Center*

**Jignesh Patel, MD, PhD**  
*Cedars-Sinai Smidt Heart Institute*

**Rachel Patzer, PhD, MPH**  
*Emory University*

**Martha Pavlakis, MD, FAST, FASN**  
*Beth Israel Deaconess Medical  
Center*

**Sean Pinney, MD**  
*University of Chicago*

**Raymund Razonable, MD**  
*Mayo Clinic*

**Morgan Reid, MSJ**  
*National Kidney Foundation*

**Jim Rodrigue, PhD**  
*Harvard Medical School*

**Varun Saxena, MD, MAS**  
*Kaiser Permanente Northern  
California*

**Joanna Schaenman, MD, PhD**  
*David Geffen School of Medicine at  
UCLA*

**Carrie Schinstock, MD**  
*Mayo Clinic*

**Andrea Schlegel, MD, MBA, FEBS**  
*Policlinico Milan*

**Jesse Schold, PhD, MStat, MEd**  
*University of Colorado*

**Marina Serper, MD**  
*University of Pennsylvania*

**Ashish Shah, MD**  
*Vanderbilt University Medical Center*

**Dinee Simpson, MD, FACS**  
*Northwestern University Feinberg  
School of Medicine*

**Jon Snyder, PhD**  
*Hennepin Healthcare Research  
Institute*

**Aruna Subramanian, MD**  
*Stanford University Hospital*

**Stuart Sweet, MD, PhD**  
*Washington University St. Louis*

**Anat Tambur, DMD, PhD**  
*Northwestern University*

**Nicole Turgeon, MD**  
*Dell Seton Medical Center at The  
University of Texas*

**Dennis Wagner, MPA**  
*Yes And Leadership LLC*

**Kymberly Watt, MD**  
*Mayo Clinic*

**Heidi Yeh, MD**  
*Massachusetts General Hospital*





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## Program

ALL TIMES LISTED IN MOUNTAIN STANDARD

### Thursday, February 23

- 12:00 PM – 1:15 PM** **Satellite Lunch Symposium Sponsored by Eurofins Transplant Diagnostics<sup>†</sup>**  
Location: Trailblazers ABC
- 1:30 PM – 1:45 PM** **Cutting Edge of Transplantation Welcome Remarks\***  
Location: Kierland 2&3  
*Deepali Kumar, MD, MSc, FRCPC, FAST, AST President, University Health Network Toronto*  
*Vineeta Kumar, MD, FAST, CEoT Planning Committee Chair, University of Alabama Birmingham*  
*David Foley, MD, FACS, FAST, FAASLD, CEoT Planning Committee Co-Chair, University of Wisconsin School of Medicine and Public Health*
- 1:45 PM – 3:25 PM** **Session 1: Setting the Stage: Defining the Access Challenge\***  
Location: Kierland 2&3  
Moderators: Rachel Patzer PhD, MPH, Emory University and Marina Serper, MD, University of Pennsylvania  
**Transplant Community Introduction**  
*Calvin Henry, AST Transplant Community Advisory Council Member*  
**What Do You Mean by Access for All?**  
*Kimberly Jacob Arriola, PhD, MPH, Emory University*  
**What Guideposts Do We Need to Follow to Improve Access to Transplant?**  
*Keren Ladin, PhD, MSc, Tufts University*  
**Where are the Gaps?**  
*Lauren Nephew, MD, MA, MSCE, Indiana University School of Medicine*  
**Charting the Path Forward**  
*Dennis Wagner, MPA, Yes And Leadership, LLC*  
**Panel Discussion**
- 3:25 PM – 4:00 PM** **Break**  
Sponsored by Eurofins Transplant Diagnostics
- 4:00 PM – 5:40 PM** **Session 2: Strategies to Improve Access to Referral for Transplantation\***  
Location: Kierland 2&3  
Moderators: Deborah Adey, MD, University of California San Francisco and Heidi Yeh, MD, Massachusetts General Hospital  
**Transplant Community Introduction**  
*Molly McCarthy, AST Transplant Community Advisory Council Member*  
**Time is Running Out – Early Referral Makes All the Difference**  
*Varun Saxena, MD, MAS, Kaiser Permanente Northern California*  
**Making Connections: Patient to Provider to Transplant Center**  
*Prateeti Khazanie, MD, MPH, University of Colorado*  
**Navigating the Maze – Access to Transplant Centers**  
**Understanding Access Points: It is All About Location and Communication**  
*Rachel Patzer, PhD, MPH, Emory University*  
**Accepting the Previously Unthinkable: H&P by Telehealth or Other Digital Modalities**  
*Marina Serper, MD, University of Pennsylvania*  
**Panel Discussion**
- 6:00 PM – 7:30 PM** **Welcome Reception and Poster Session**  
Sponsored by CareDx  
Location: Hall of State, Culturekeepers West & South

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## Friday, February 24

7:00 AM – 8:15 AM

**Satellite Breakfast Symposium Sponsored by CareDx<sup>†</sup>**

Location: Trailblazers C

8:30 AM – 10:10 AM

**Session 3: Strategies to Address Inequities in Transplant Evaluation and Selection Process\***

Location: Kierland 2&3

**Moderators:** Nicole Turgeon, MD, Dell Seton Medical Center at The University of Texas and Lyndsey Bowman, PharmD, BCPS, BCTXP, Tampa General Hospital

**Transplant Community Introduction**

Edward Drake, AST Transplant Community Advisory Council Member

**Inequities in Transplant Evaluation and Selection**

Joel Adler, MD, MPH, University of Texas at Austin

**Unintended Consequences: How Regulatory Factors Can Impact Access to Transplant Evaluation and Selection**

Jesse Schold, PhD, MStat, MEd, University of Colorado

**Strategies to Overcome Candidate Barriers to Evaluation and Selection**

Michelle Jesse, PhD, FAST, Henry Ford Health System

**Strategies to Overcome Transplant Center Barriers to Evaluation and Selection**

Juan Carlos Caicedo, MD, FACS, Northwestern University Feinberg School of Medicine

**Panel Discussion**

10:15 AM – 12:00 PM

**Session 4: Strategies to Address Inequities in Waitlist Management/Recipient Readiness\***

Location: Kierland 2&3

**Moderators:** Roy Bloom, MD, University of Pennsylvania and Molly McCarthy

**Transplant Community Introduction**

Lorrinda Gray-Davis, AST Transplant Community Advisory Council Member

**Do We Have a Transplant Readiness Problem? Defining the Issue**

Ajay Israni, MD, MS, University of Minnesota

**An Un-Level Playing Field in Organ Transplantation - Factors Contributing to Inequity in Active Waiting List Status and Candidate Readiness**

Allyson Hart, MD, MS, Hennepin Healthcare

**Strategies to Overcome Transplant Center Barriers to Candidate Active Waiting List Status and/or Transplant Readiness**

Derek Dubay, MD, MSPH, Medical University of South Carolina

**Strategies to Overcome Candidate Barriers to Active Waiting List Status and/or Transplant Readiness**

Dineen Simpson, MD, FACS, Northwestern University Feinberg School of Medicine

**Panel Discussion**

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## Friday, February 24 (continued)

**12:00 PM – 12:30 PM**    **Networking, Exhibitor Break & Grab Lunch**

**12:30 PM – 1:45 PM**    **Satellite Lunch Symposium Presented by CSL Behring\***

**Location:** Kierland 1

This activity is supported by an educational grant from CSL Behring.

**12:30 PM – 1:45 PM**    **Satellite Lunch Symposium Presented by Veloxis Pharmaceuticals, Inc.\***

**Location:** Kierland 4

This activity is supported by an educational grant from Veloxis Pharmaceuticals, Inc.

**2:00 PM – 3:00 PM**    **Keynote – Advancing Patient-Centered Innovation to Improve Access and Outcomes for All\***

**Location:** Kierland 2&3

*Sylvie Leotin, MS, CEO of EquifyHealth*

**3:00 PM – 4:40 PM**    **Session 5: Transplant ID Improving Transplant Access and Throughput\***

**Location:** Kierland 2&3

**Moderators:** Joanna Schaenman, MD, PhD, David Geffen School of Medicine at UCLA and  
Raymund Razonable, MD, Mayo Clinic

### Transplant Community Introduction

*Alin Gragossian, DO, MPH, AST Transplant Community Advisory Council Member*

#### Effective Implementation of Recommended Vaccinations Throughout the Transplant Lifecycle

*Aruna Subramanian, MD, Stanford University Hospital*

#### Streamlining Candidate Evaluation by Improving Interaction with Your Local Infectious Diseases Team

*Maricar Malinis, MD, FACP, FIDSA, FAST, Yale University School of Medicine*

#### Optimizing Donor Utilization and Testing

*Ricardo La Hoz, MD, University of Texas Southwestern Medical Center*

#### Improving Access for All: Case-Based Discussion

**Moderators:** Joanna Schaenman, MD, PhD and Raymund Razonable, MD

**Panel:** Deepali Kumar, MD, MSc, FRCPC, FAST; Aruna Subramanian, MD; Ricardo La Hoz, MD;  
Maricar Malinis, MD, FACP, FIDSA, FAST

**4:40 PM – 5:00 PM**

### Break

Sponsored by Eurofins Transplant Diagnostics

**5:00 PM – 6:30 PM**

### Transplant Visionaries Challenge

Sponsored by Sanofi

**Location:** Kierland 2&3

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## Saturday, February 25

7:00 AM – 8:15 AM

**Satellite Breakfast Symposium Sponsored by Mallinckrodt†**

Location: Trailblazers C

8:30 AM – 10:10 AM

**Session 6: Overcoming Barriers to Increase Patient Access to Deceased Donor Organs\***

Location: Kierland 2&3

**Moderators:** Jignesh Patel, MD, PhD, Cedars-Sinai Smidt Heart Institute and Claus Niemann, MD, University of California San Francisco Medical Center

### Transplant Community Introduction

Lisa Cantwell, MHA, AST Transplant Community Advisory Council Member

#### Organ Allocation and Continuous Distribution of Deceased Donor Organs

Kiran Khush, MD, MAS, Stanford University

#### Transplant Center Barriers to Increasing Organ Access to Wait List Patients

Sanjay Kulkarni, MD, MHCM, FACS, Yale University School of Medicine

#### Overcoming Barriers at the OPO to Increase Wait Listed Patient Access to Organs

Kevin Myer, MSHA, LifeGift

#### Donor Management and Donor Intervention

Darren Malinoski, MD, Oregon Health & Science University

#### Panel Discussion

10:10 AM – 10:45 AM

**Break**

Sponsored by Eurofins Transplant Diagnostics

10:45 AM – 12:30 PM

**Session 7: Overcoming Barriers to Access Organs for Patients on the Transplant List\***

Breakout Sessions

### Kidney

Location: Kierland 2&3

**Moderators:** Roy Bloom, MD, University of Pennsylvania and Nicole Turgeon, MD, Dell Seton Medical Center at The University of Texas

#### Factors That Impact Access to Donor Organs for Actively Waitlisted Patients

Lisa McElroy, MD, MS, Duke University

#### Adapting Transplant Policy to Eliminate Inequity in Access to Deceased Organs

Martha Pavlakis, MD, FAST, FASN, Beth Israel Deaconess Medical Center

#### Opportunities to Increase Living Donations to Reduce Inequities in Transplant Access

Juan Carlos Caicedo, MD, FACS, Northwestern University Feinberg School of Medicine

#### Novel Strategies to Expand the Organ Donor Pool for Everyone: Opportunities and Challenges

Jayne Locke, MD, MPH, University of Alabama at Birmingham

#### Panel Discussion

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## Saturday, February 25 (continued)

### Breakouts (cont)

#### Liver

**Location:** Kierland 4B

**Moderators:** Andres Duarte-Rojo, MD, MS, DSc, Northwestern Medicine and Heidi Yeh, MD, Massachusetts General Hospital

##### **Expanding the Use of Medically Complex Livers: Cold, Warm and Regional Perfusion**

*Andrea Schlegel, MD, MBA, FEBS, Policlinico Milan*

##### **Paired Living Donation and Altruistic Living Donation**

*Abhinav Humar, MD, University of Pittsburgh*

##### **Transplant Oncology: Pushing the Boundaries**

*Roberto Hernandez-Alejandro, MD, University of Rochester New York*

##### **The Challenge of Low MELD Patients with Severe Portal Hypertension: How to Get Them to Transplant?**

*Kymberly Watt, MD, Mayo Clinic*

##### **Panel Discussion: Pairing Best Practices Across Waitlist Management and Organ Allocation**

#### Heart

**Location:** Kierland 4A

**Moderators:** Jignesh Patel, MD, PhD, Cedars-Sinai Smidt Heart Institute and Sean Pinney, MD, University of Chicago

##### **Ex-Vivo Perfusion Platforms – Will They Improve Access to Donor Organs?**

*Pedro Catarino, MD, FRCS, Cedars Sinai Medical Center*

##### **DCD in Heart Transplantation**

*Ashish Shah, MD, Vanderbilt University Medical Center*

##### **Heart Xenotransplantation**

*Muhummad M. Mohiuddin, MD, University of Maryland School of Medicine*

##### **Improving Access to Challenged Populations**

*Kiran Khush, MD, MAS, Stanford University*

##### **Panel Discussion**

#### Lung

**Location:** Kierland 4C

**Moderators:** Stuart Sweet MD, PhD, Washington University St. Louis and Deborah Levine, MD, FAST, FCCP, Stanford University

##### **Donor Acceptance Criteria: Can We Do Better in Partnership with OPOs?**

*Jasleen Kukreja, MD, MPH, University of California San Francisco*

##### **Continuous Distribution: How the Lungs are Leading This Effort and How it Will Affect Access to Organs**

*Erika Lease, MD, FCCP, University of Washington*

##### **Utilization of Organs: What Can We Do to Increase Utilization of Donor Organs? Focus on EVLP:**

**How We Use Today and the Potential for Tomorrow**

*Gabriel Loor, MD, Baylor College of Medicine*

##### **Utilization of Organs: What Can We Do to Increase Utilization of Donor Organs? Focus on DCD**

*Kenneth McCurry, MD, Cleveland Clinic*

##### **Panel Discussion**

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## Saturday, February 25 (continued)

**12:30 PM – 1:00 PM**     **Networking, Exhibitor Break & Grab Lunch**

**1:00 PM – 2:15 PM**     **Satellite Lunch Symposium Sponsored by Hansa Biopharma<sup>†</sup>**  
Location: *Kierland 1*

**1:00 PM – 2:15 PM**     **Satellite Lunch Symposium Sponsored by Natera<sup>†</sup>**  
Location: *Trailblazers AB*

**1:00 PM – 2:15 PM**     **Satellite Lunch Symposium Sponsored by Veloxis Pharmaceuticals, Inc.<sup>†</sup>**  
Location: *Trailblazers C*

**2:30 PM – 4:10 PM**     **Session 8: Overcoming Inertia\***

Location: *Kierland 2&3*

**Moderators:** *Stuart Sweet, MD, PhD, Washington University St. Louis and James Rodrigue, PhD, Harvard Medical School*

### Transplant Community Introduction

*Calvin Henry, AST Transplant Community Advisory Council Member*

#### CEoT 2023 Lessons Learned: Tangible Center-Level Take Backs to Improve Access to Transplant

*Stuart Sweet, MD, PhD, Washington University St. Louis and James Rodrigue, PhD, Harvard Medical School*

#### System-Level Metrics and Collaborative Measurements to Improve Access

*Jon Snyder, PhD, MS, Hennepin Healthcare Research Institute*

#### Patient Perspectives on Prioritization of Action Items and Efforts to Improve Access to Transplant

*Morgan Reid, MSJ, National Kidney Foundation*

#### What it Takes: Implementation and a Call to Action

*Richard Formica, MD, Yale University*

#### Panel Discussion

**4:10 PM – 4:45 PM**     **Summary/Closing**

**4:45 PM**     **Closing Reception**  
Location: *Northern Sky Terrace*

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## *Transplant Visionaries Challenge Winners*

Join us Friday, February 24 at 5:00 PM to cast  
your vote for the most innovative program.

**Jenna DiRito**

*Revalia Bio*

Revalia Bio's Organ Digital Twin Technology

**Ali Zarrinpar**

*University of Florida*

Response surface based application of  
quantitative biomarkers to personalize  
immunosuppression

**Cynthia Miller**

*Massachusetts General Hospital*

Induction of Heart Allograft Tolerance in Non-  
human Primates by Combining Mixed Chimerism  
with IL-6 Signaling Blockade

**Kelsey Drewry**

*Emory University*

Improving Equity in Access to Transplantation:  
Practical innovation by the Southeastern Kidney  
Transplant Coalition

**Mustafa Nazzal**

*SSM/Saint Louis University Hospital*

Novel NMP split liver model recapitulates human  
IRI and demonstrates ferroptosis modulators as a  
new therapeutic strategy

*This activity is generously supported by funding from Sanofi.*



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in Transplantation*

February 23-25, 2023

Westin Kierland Hotel | Scottsdale, AZ

# Connect and Learn

## NO RESERVATIONS REQUIRED

Forget the stress of meal planning and join your colleagues for complimentary meals while learning. They are offered at convenient locations throughout the meeting to maximize your time.

## Thursday, February 23

### Lunch Symposium\*

12:00 PM – 1:15 PM

Trailblazers ABC

Sponsored by Eurofins Transplant Diagnostics

## Friday, February 24

### Breakfast Symposium\*

7:00 AM – 8:15 AM

Trailblazers C

Sponsored by CareDx

### Lunch Symposium\*\*

12:30 PM – 1:45 PM

Kierland 1

Presented by CSL Behring

### Lunch Symposium\*\*

12:30 PM – 1:45 PM

Kierland 4

Presented by Veloxis Pharmaceuticals, Inc.

## Saturday, February 25

### Breakfast Symposium\*

7:00 AM – 8:15 AM

Trailblazers C

Sponsored by Mallinckrodt

### Lunch Symposium\*

1:00 PM – 2:15 PM

Kierland 1

Sponsored by Hansa Biopharma

### Lunch Symposium\*

1:00 PM – 2:15 PM

Trailblazers AB

Sponsored by Natera

### Lunch Symposium\*

1:00 PM – 2:15 PM

Trailblazers C

Sponsored by Veloxis Pharmaceuticals, Inc.

\* This is not an official function of the CEoT meeting and is not endorsed by the AST.

\*\* This activity is funded with an educational grant and offered for credit.

**SATELLITE SYMPOSIUM\*****Thursday, February 23, 2023**

12:00 P.M. to 1:15 P.M. MT

Trailblazers ABC | Westin Kierland Hotel

# Biomarkers for Kidney and Liver Transplant: Research Pathway to Personalizing Medicine

Join V. Ram Peddi, MD, FASN, FAST, Director of Clinical Research at California Medical Center and leaders of Eurofins Transplant Genomics for a discussion on the use of biomarkers in personalizing transplant medicine. Learn about the latest advancements in transplant diagnostic biomarkers and potential implications for patient care.

**V. Ram Peddi, MD, FASN, FAST**Director, Kidney Transplant Clinical Research  
California Pacific Medical Center**Steve Kleiboeker, PhD**Chief Scientific Officer  
Eurofins Clinical Diagnostics**James Fleming, PharmD, FAST**Director of Clinical Trials  
Eurofins Transplant Genomics**Danielle Lazear, PharmD, BCPS**Medical Science Liaison  
Eurofins Transplant Genomics[EurofinsTransplant.com](https://EurofinsTransplant.com)


# Join us for the CareDx Breakfast Symposium



Iris R, kidney transplant recipient

## Elevating Transplant Care by Combining Molecular Diagnostics and Artificial Intelligence

Join us to learn about the latest data on integrating molecular tools and artificial intelligence into your clinical practice to advance transplant care and hear from the panel of experts over breakfast.

 **Date: February 24, 2023 | 7:00 – 8:15 AM**

 **Location: Trailblazers C**



**SIGN UP FOR UPDATES**

<https://caredx.link/3wsLeHF>

### Abdominal Focused



**Sanjiv Anand, MD, MS**  
Intermountain Health



**Enver Akalin, MD, FAST, FASN**  
Montefiore



**Titte "Srini" Srinivas, MD, MBA, FAST**  
CareDx

### Moderator



**Nikhil Agrawal, MD**  
CareDx

### Cardiothoracic Focused



**Sean Pinney, MD, FACC**  
University of Chicago



**Howard Huang, MD**  
Houston Methodist



**Jeremy Kobulnik, MD, MHSc**  
CareDx

**Thursday, February 23 | 6:00–7:30 PM MST**  
Welcome Reception & Poster Session, Sponsored by CareDx  
**Thursday-Saturday, February 23–25 | All Day**  
Visit Our Booth



**YOU ARE INVITED**

## **TREATMENT OF ADULTS WITH HEPATORENAL SYNDROME – ADDITIONAL DATA IN LIVER TRANSPLANT PATIENTS**

**A CUTTING EDGE OF TRANSPLANTATION Non-Accredited Product Theater**

### **Join your colleagues as we discuss:**

- Recent clinical data for a treatment option for HRS and implications for clinical practice and patient care
- Transplant-related outcomes in hepatorenal syndrome (HRS) patients
- Hypothetical HRS patient examples

### **FEATURING:**

**Philippe J. Zamor, MD**

Clinical Associate Professor of Medicine  
Wake Forest University School of Medicine  
Charlotte, NC

**DATE:** Saturday, February 25, 2023

**TIME:** 7:00 AM MT

**LOCATION:** Trailblazers C

Westin Kierland Hotel

Scottsdale, AZ

**This is not an official function of the CEoT Meeting and is not endorsed by AST.  
Breakfast will be provided by AST.**

This event is only intended for appropriate US healthcare professionals (HCPs). No guests or relatives of HCPs are permitted unless they are also an appropriate HCP attendee. HCPs in any of the following categories are prohibited from participating in a meal and must select "Meal Opt Out" on the Sign-in Sheet: Federal employees, Minnesota prescribers, and Vermont-licensed HCPs. Mallinckrodt Pharmaceuticals is required to report all payments or exchanges of value (eg, meals) in compliance with the Sunshine Act and state laws.

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# Built for Confident Decisions



**Prospera™**  
Transplant assessment

**Renasight™**  
Kidney gene panel



**CEoT 2023** | February 23-25, 2023 | Westin Kierland Hotel | Scottsdale, AZ

## Satellite Lunch Symposium Sponsored by Natera

### Monitoring Kidney Transplant Recipients: Donor-derived Cell-free DNA (dd-cfDNA) and DSA Can Help Improve Prediction of ABMR

Saturday, February 25 | 1:00-2:15 PM | Westin Kierland Hotel, Trailblazers A/B



**Milagros Samaniego-Picota, MD**  
Henry Ford Health



**Tarek Alhamad, MD, MS, FACP, FASN**  
Washington University School of Medicine



**Emilio Poggio, MD**  
Cleveland Clinic



**Yasir Qazi, MD**  
Keck Medicine of USC

Principal investigators of the Trifecta Study will share results that demonstrate how donor-derived cfDNA (dd-cfDNA) can optimize the utility of DSA in predicting ABMR. Case studies will showcase how physicians incorporate Prospera™, a dd-cfDNA transplant rejection assessment and Renasight™, a kidney gene panel, into routine practice to improve the management of kidney transplant patients.

#### Session Objectives:


- Review the latest data on how dd-cfDNA can optimize the utility of DSA in predicting ABMR.
- Gain insight into how transplant nephrologists are utilizing both fraction and estimated amount of dd-cfDNA for routinely monitoring their kidney transplant patients.
- Learn how genetic testing for chronic kidney disease can impact the success of kidney transplants.

This is not an official function of the CEoT meeting and is not endorsed by the AST. Lunch will be provided by AST.

13011 McCallen Pass, Building A Suite 100 | Austin, TX 78753 | [natera.com](https://natera.com)

The tests described have been developed and their performance characteristics determined by the CLIA-certified laboratory performing the test. The tests have not been cleared or approved by the US Food and Drug Administration (FDA). Although FDA is exercising enforcement discretion of premarket review and other regulations for laboratory-developed tests in the US, certification of the laboratory is required under CLIA to ensure the quality and validity of the tests. CAP accredited, ISO 13485 certified, and CLIA certified.  
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Please Join Us for a Lunch Presentation at CEoT 2023



# Championing Adherence to Improve Long-term Renal Graft Health

Saturday, February 25, 2023 • 1:00 PM - 2:15 PM (MT)

## The Westin Kierland Resort and Spa

[Trailblazers Ballroom C]  
Scottsdale, Arizona

### Program Description

Join Dr. Christina Klein, a transplant nephrologist, and Andrea Bossie, a transplant nurse practitioner, for a discussion about how their team at the Piedmont Transplant Institute helps patients maintain adherence to immunosuppressant medications following renal transplant. They will share their learnings and expertise on how to detect and address non-adherence throughout various stages of the patient journey and care transitions.

## Christina Klein, MD, FAST

Transplant Nephrologist and Medical Director  
Piedmont Transplant Institute  
Atlanta, Georgia

## Andrea Bossie, FNP-C, CNN

Transplant Nurse Practitioner  
Piedmont Transplant Institute  
Atlanta, Georgia

This is an industry-sponsored session. CE/CME credit will not be available.

In compliance with PhRMA and AMA guidelines, only healthcare professionals and office personnel may attend this program. Spouses or other guests are not permitted. This session is brought to you by Veloxis Pharmaceuticals, Inc. The speakers are presenting on behalf of Veloxis Pharmaceuticals, Inc., and must present information in compliance with FDA requirements.

If you are licensed in any state or other jurisdiction (eg, DC, ME, MN, NJ, VT) or are an employee or contractor of any organization or governmental entity that limits or prohibits meals from pharmaceutical companies, please identify yourself so that you (and we) are able to comply with such requirements. Your name, the value, and the purpose of any educational item, meal, or other items of value you receive may be reported as required by state or federal law. Once reported, this information may be publicly accessible.

This is not an official function of CEoT Meeting and not endorsed by AST. Lunch will be provided by AST.

Sponsored by Veloxis Pharmaceuticals, Inc.





Please join our  
esteemed faculty for  
a live symposium  
to discuss



## Providing Access for All: Current Best Practices and Novel Paradigms Ahead for the **Highly Sensitized Kidney Transplant Patient**

**Saturday, February 25, 2023**  
**1:00 PM-2:15 PM MT**  
**Kierland 1 A-C**

Lunch provided

### Featuring:



**Stanley C. Jordan, MD (Chair)**

*Professor of Medicine, Director, Division of Nephrology Medicine, Medical Director, Histocompatibility and Immunogenetics Lab (HLA) and Transplant Immunology Laboratory Medicine, Cedars-Sinai Comprehensive Transplant Center, Los Angeles, CA*



**Oriol Bestard, MD, PhD**

*Head of Department, Nephrology and Kidney Transplantation, Vall d'Hebron University Hospital (HUVH), Research Lab Group Leader, Vall d'Hebron Research Institute (VHIR), Associate Professor of Medicine, Barcelona Autonomous University (UAB), Vall d'Hebron, Barcelona Hospital Campus, Barcelona, Spain*



**Carrie A. Schinstock, MD**

*Associate Professor of Medicine, Division of Nephrology and Hypertension, William J. von Liebig Center for Transplantation and Clinical Regeneration, Mayo Clinic, Rochester, MN*

Topic	Faculty
Welcome, Introductions, and Objectives	Stanley C. Jordan, MD
Current State of Kidney Transplantation in the US	Carrie A. Schinstock, MD
Antibody-Mediated Rejection and the Unmet Needs for Desensitization	Stanley C. Jordan, MD
Future Hope: Potential Methods for Transplantation in the “Unmatchable” Highly Sensitized Kidney Transplant Candidate	Oriol Bestard, MD, PhD
Q&A	All Faculty

This is not an official function of the CEoT Meeting and is not endorsed by AST. Lunch will be provided by AST.







The American Society of Transplantation sincerely thanks the following companies for their generous support of the AST and its activities:

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**ACCESS FOR ALL:**  
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in Transplantation*

February 23-25, 2023

Westin Kierland Hotel | Scottsdale, AZ

## 2023 AST Supporter & Exhibitor Information

### CareDx, Inc.

CareDx, Inc., headquartered in Brisbane, California, is a leading precision medicine solutions company focused on the discovery, development and commercialization of clinically differentiated, high-value healthcare solutions for transplant patients and caregivers. CareDx offers testing services, products, and digital healthcare solutions along the pre- and post-transplant patient journey and is the leading provider of genomics-based information for transplant patients.

### CSL Behring

For over 100 years, CSL Behring has delivered on its promise to discover and develop innovative life-changing therapies to address many of the world's most serious and rare disorders

CSL Behring recognizes that the transplant community continues to face significant challenges in both solid organ and stem cell transplantation. We look to apply our leadership, experience, and discoveries in immunology and autoimmune diseases to help patients who require, or have received, a transplant.

### Eurofins Transplant Diagnostics

#### INTEGRATE

We harness the power of our network of companies to deliver comprehensive solutions across the transplant spectrum.

#### INNOVATE

We never stop moving forward and are always looking for solutions that will solve the complex challenges of tomorrow.

#### INFORM

We empower patients and providers to make informed decisions about current treatments and future therapies.

Meeting the needs of transplant patients and providers is a challenge unlike another. From pre- to post-transplant, we're equipped with testing solutions that can do just that.

### Gold Standard Preservation

At GSP, we're more than just a company - we're a team of dedicated organ procurement specialists based in Atlanta, committed to making a real difference in the lives of transplant patients. Whether providing local procurement, out-of-state fly-out preservation or expertly managing non-related kidney preservation and kidney pumping, our team is trained to the highest standards. And with liver normothermic pumping coming soon, we're constantly pushing ourselves to offer the most advanced and practical solutions. But above all, our mission is to honor the gift of giving by providing unparalleled customer service and exemplary assistance to the transplant centers we work with. Let us help you save lives, one organ at a time.

### Hansa Biopharma

Hansa Biopharma is a commercial-stage biopharmaceutical company pioneering the development and commercialization of innovative, lifesaving and life altering treatments for patients with rare immunological conditions. The Company's lead product, imlifidase, is an antibody-cleaving enzyme being developed to enable kidney transplantation in highly sensitized patients and may be further developed for use in other organ and tissue transplantation and acute autoimmune indications. The European Commission has conditionally approved imlifidase for the desensitization treatment of highly sensitized adult kidney transplant patients with a positive crossmatch against an available deceased donor with use reserved for patients unlikely to be transplanted under available kidney allocation systems including prioritisation programmes for highly sensitised patients. Hansa Biopharma is based in Lund, Sweden with operations in other European countries and in the U.S.

### Immucor

Immucor is a leading provider of transfusion and transplantation diagnostic products worldwide. We strive to create a world where anyone, anywhere in need of blood or transplantation gets the right blood or transplant that is safe, accessible, and affordable. With today's dual focus on improving health outcomes and lowering healthcare costs, preventing negative reactions through better-matched donations is the ultimate goal in transfusion and transplantation medicine. With the right match, we can transform a life together.

### InVita Healthcare Technologies

From our award-winning iTransplantSM Platform trusted to manage 75% of the nation's organ donors and providing transplant programs the critical next generation of tools to streamline the full transplant patient process, to our iReferralSM interfaces automating the donor referral process across the country, and our iTx App enabling speed across the donation-transplant ecosystem, InVita is proud to enable the work of donation and transplantation heroes.

### Lung Bioengineering Inc.

Lung Bioengineering Inc. (LBE) is the first centralized ex vivo lung perfusion service model in the United States. With a team of trained specialists, one-of-a-kind facilities and cloud-based case management exchange, we provide continuous monitoring that allows clinicians to make real-time assessments remotely with confidence. Our seamless service is available 24/7, removing barriers and providing touchpoints at every step of the donation and transplantation process to optimize organ utilization."



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Mallinckrodt is a global business consisting of multiple wholly owned subsidiaries that develop, manufacture, market and distribute specialty pharmaceutical products and therapies. The company's Specialty Brands reportable segments areas of focus include autoimmune and rare diseases in specialty areas like neurology, rheumatology, nephrology, pulmonology, ophthalmology, and oncology; immunotherapy and neonatal respiratory critical care therapies; analgesics; cultured skin substitutes and gastrointestinal products. Its Specialty Generics reportable segment includes specialty generic drugs and active pharmaceutical ingredients.

### MedSleuth

MedSleuth creates greater connectivity among transplant candidates, transplant centers, physicians, and care teams to improve the experience and outcomes for kidney and liver transplant patients. Our BREEZE TRANSPLANT™ and Matchgrid™ KPD software helps increase living donor volume and streamline transplantation for patients and their caregivers.

### Natera

Natera provides advanced DNA technology that enables transplant providers to deliver quality, personalized care. As a diagnostics company with proprietary bioinformatics and molecular technology, we've performed more than 3 million cfDNA tests and are dedicated to improving kidney care for good.

### One Lambda A Thermo Fisher Scientific Brand

As part of One Lambda A Thermo Fisher Scientific Brand, we offer products and services to advance the science of transplant diagnostics. Our solutions help transplant labs and clinical teams provide personalized care across the patient experience.

Transplantation is life-changing for recipients, and clinical diagnostics play a vital role in supporting all phases of treatment. Through our commitment to scientific innovation, product quality, patient advocacy, and excellent customer service, we are helping the transplant community raise the standard of care and improve outcomes for patients and their families.

### Paragonix Technologies

Paragonix Technologies is a leading provider of FDA cleared and CE marked organ preservation devices that safeguard organs during the journey between donor and recipient patients. Our devices incorporate clinically proven and medically trusted cold preservation techniques with digital tools for organ tracking, monitoring, and reporting to provide patients and providers with every possible advantage.

### Sanofi

We are an innovative global healthcare company, driven by one purpose: we chase the miracles of science to improve people's lives. Our team, across some 100 countries, is dedicated to transforming the practice of medicine by working to turn the impossible into the possible. We provide potentially life-changing treatment options and lifesaving vaccine protection to millions of people globally, while putting sustainability and social responsibility at the center of our ambitions.

### Takeda

Takeda is a global, values-based, R&D-driven biopharmaceutical leader headquartered in Japan, committed to discover and deliver life-transforming treatments, guided by our commitment to patients, our people and the planet.

### Talaris Therapeutics

Talaris Therapeutics is a late-clinical stage cell therapy company that is developing an innovative method of allogeneic stem cell transplantation that we believe has the potential to transform the standard of care in solid organ transplantation, certain severe autoimmune diseases, and other indications. In the organ transplant setting, we believe that our proprietary therapeutic approach could prevent organ rejection without the consequences associated with the use of chronic immunosuppression.

### Veloxis Pharmaceuticals, Inc

Veloxis Pharmaceuticals, Inc., an Asahi Kasei company, is a fully integrated specialty pharmaceutical company committed to improving the lives of transplant patients. Headquartered in Cary, North Carolina, USA, Veloxis is focused on the direct commercialization of immunosuppression medications in the US, expansion of partnerships for markets around the world, and acquisition of assets utilized in transplant patients and by adjacent medical specialties.



# Living Donor *Circle of Excellence*

## Change Policies. Save Lives.

Today, many employers do not have policies providing coverage for lost wages from donating an organ. The Circle aims to change that. By recognizing companies who provide salary support after living donation surgery, the AST envisions more people will consider this altruistic act.

The AST strongly encourages its members to discuss this program with their internal HR departments, as well as any other external organizations that may be interested in this program. More information can be found by visiting the website below.

★ [LivingDonorCircle.com](http://LivingDonorCircle.com) ★

*The AST thanks its Founding Partner, UnitedHealth Group, as well as Strategic Partners, the Canadian Society of Transplantation, the National Kidney Foundation, and The Kidney Foundation of Canada for supporting the Circle and for their work to advance this initiative. The AST also thanks its current Circle members.*



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## Featured Partners



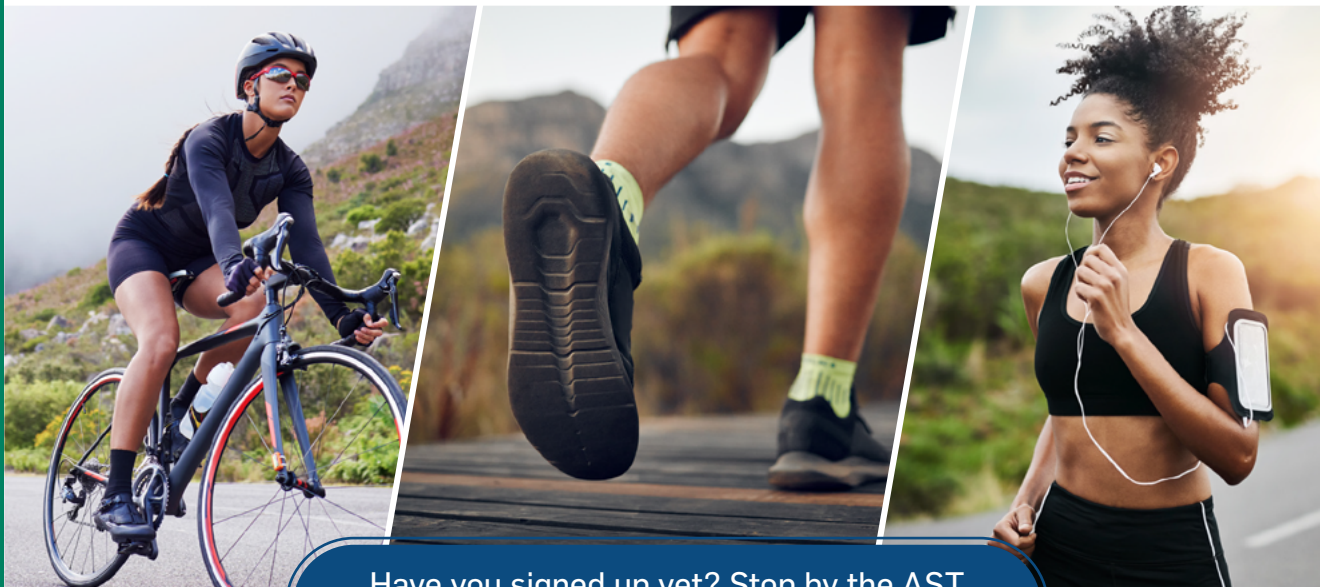
# 2023 AST VIRTUAL RUN AND FITNESS CHALLENGE

GET HEALTHY WHILE SUPPORTING  
THE FIELD OF TRANSPLANTATION.

**February 14 – May 16, 2023**

You're invited to join the 2023 AST Virtual Run and Fitness Challenge! Achieve your fitness goals as an individual – or create a team with your friends, family, or colleagues. All participants will receive a t-shirt and access to our interactive race platform.

This Run and Fitness Challenge is powered by a partnership with Veloxis.



Have you signed up yet? Stop by the AST booth or visit [myAST.org/2023Run](https://myAST.org/2023Run)

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# One Transplant *for* Life

**Check out Power2Save, an initiative of the American Society of Transplantation.**

Through the Power2Save initiative, we aim to increase public awareness around the importance of funding transplant research, provide patient education, and connect with the community.

➡ **LEARN MORE** at [Power2Save.org](https://Power2Save.org)



An Initiative of the American Society of Transplantation



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*The first 120 people to  
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will receive an AST Bear!*



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# FELLOWS

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DATE**

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**GRAPEVINE, TX • SEPTEMBER 22–24, 2023**

[myAST.org](https://myAST.org)

The logo for the American Society of Transplantation (AST) features the letters 'AST' in a bold, white, sans-serif font.

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CUTTING EDGE of  
TRANSPLANTATION

**BACK TO  
THE BILTMORE  
IN 2024**

**TRANSPLANT  
SUMMIT 2024**

**SAVE THE DATE**

**FEBRUARY 22-24, 2024**

**ARIZONA BILTMORE  
PHOENIX, AZ**



THE SCIENCE OF  
TOMORROW  
STARTS **TODAY**

AMERICAN TRANSPLANT CONGRESS

**ATC2023**

**SAN DIEGO, CA • JUNE 3-7, 2023**

**SAN DIEGO CONVENTION CENTER**

[atcmeeting.org](https://atcmeeting.org) / [#ATC2023SanDiego](https://twitter.com/ATC2023SanDiego)

**DISCOUNTED REGISTRATION**  
**DEADLINE: MAY 3, 2023**



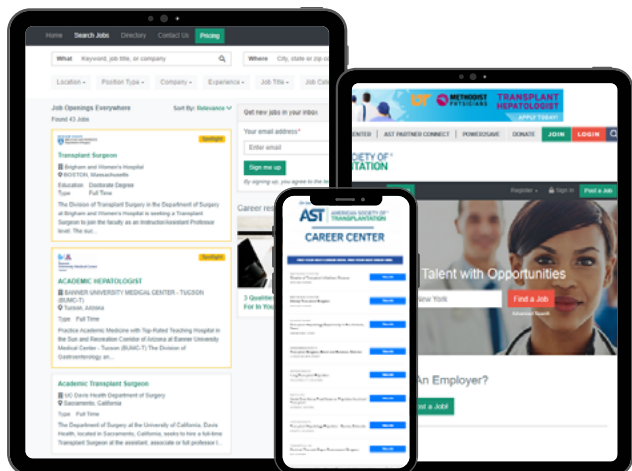
## AST CAREER CENTER

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TALENT WITH OPPORTUNITIES

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- Resume/CV critiques
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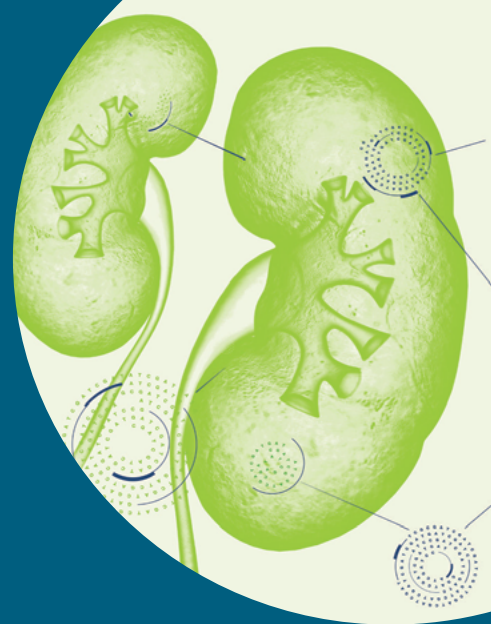
“ The combination of dd-cfDNA fraction and quantity was found to be significantly more predictive than either variable alone.

– HALLORAN, ET AL<sup>1</sup>

This research, part of the broader Trifecta study, demonstrated that a dual threshold test—based on donor fraction and estimated amount of donor-derived cfDNA (dd-cfDNA) —can significantly improve the identification of active rejection, compared to either variable alone.

In this study, the two threshold test, Prospera™, showed exceptional performance in discriminating between active rejection and non-rejection using Molecular Microscope Diagnostic System (MMDx®) or Banff histology as a benchmark.

This research underscores that the Prospera transplant assessment’s two-threshold algorithm significantly improved assessment of rejection compared with donor fraction alone.



Scan the QR code to read the study

#### Area under the curve

*rejection from non-rejection using MMDx® as truth of graft status*

0.88

#### Area under the curve

*rejection from non-rejection using criteria from the BANFF 2019 guidelines*

0.82

#### Area under the curve

*rejection from “quiescence”*

0.91

**Reference:** Halloran, Philip F. MD, PhD, et al. Combining Donor-derived Cell-free DNA Fraction and Quantity to Detect Kidney Transplant Rejection Using Molecular Diagnoses and Histology as Confirmation. Transplantation: June 29, 2022 - Volume - Issue - 10.1097/TP.0000000000004212 doi: 10.1097/TP.0000000000004212

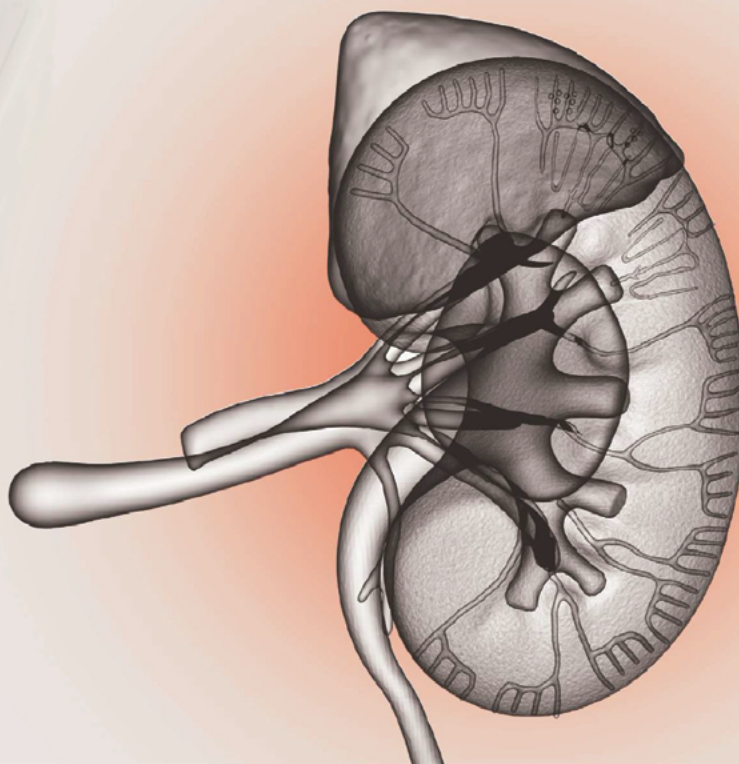
# CSL Behring

"At CSL, we work each day as if  
someone's life depends on it  
—because it really does."

—PAUL PERREAULT,  
CEO AND MANAGING DIRECTOR, CSL BEHRING

For over **100 years**, CSL Behring has delivered on its promise to discover and develop **innovative life-changing therapies** to address many of the world's most serious and rare disorders.

**We're now bringing that same commitment to transplantation.**



## NOW RECRUITING



**IMAGINE** is an ongoing Phase 3, multicenter, double-blind, placebo-controlled trial of approximately 350 kidney transplant recipients.<sup>1</sup> Adult kidney transplant recipients aged 18–70 with biopsy-proven diagnosis of **chronic active AMR** who are DSA-positive may be eligible.<sup>1</sup> **IMAGINE** is the first large study to evaluate the **safety and efficacy of direct IL-6 inhibition** for the **treatment of chronic active AMR** in adult kidney transplant recipients.<sup>1,2</sup>

### FOR INQUIRIES RELATED TO THE IMAGINE TRIAL:

**James Lee, MD** Clinical Program Director  
[clinicaltrials@cslbehring.com](mailto:clinicaltrials@cslbehring.com)

AMR, antibody-mediated rejection; DSA, donor-specific antibody; IL-6, interleukin-6.

**1.** Clazakizumab for the Treatment of Chronic Active Antibody Mediated Rejection in Kidney Transplant Recipients (IMAGINE). NCT03744910. ClinicalTrials.gov website. <https://clinicaltrials.gov/ct2/show/NCT03744910>. Accessed August 2022; **2.** Irish W, et al. *Transplantation*. 2021;105(3):648–659.

# FEATURED WEBINARS



## Biomarkers in Kidney Transplantation: Current Needs and Future Direction

Watch Dr. Alexander Wiseman, the Executive Director of Kidney Transplantation for Centura Health, explain the current state of biomarkers in the field of kidney transplantation and why they're important in clinical use.



## Addressing CMV in Solid Organ Transplant Patients with CMV inSIGHT™ T Cell Immunity

Hear from knowledgeable physicians about how they manage their solid organ transplant patients at risk for CMV by utilizing CMV inSIGHT™ T Cell immunity. These unique case studies will cover situations like neutropenia, low-level CMV, the importance of CD4 T Cells and more. Learn when they use CMV inSIGHT T Cell Immunity testing to evaluate CMV-specific cell mediated immunity, what they do with the information from the lab report, and the outcomes of their patients.



From Pre-Transplant to Post Recovery  
**WE'RE YOUR PARTNER  
THROUGH ALL OF IT**





# Let's transform transplant medicine. Together.

Achieving more through our shared  
commitment to transplant medicine



We're leading innovation to  
help improve the patient experience

Our focus is developing new therapies and programs to help  
transplant healthcare providers and the patients they treat

**Visit Us in the Exhibit Hall**



**Visit [Veloxis.com](https://www.veloxis.com) to learn about partnership opportunities**





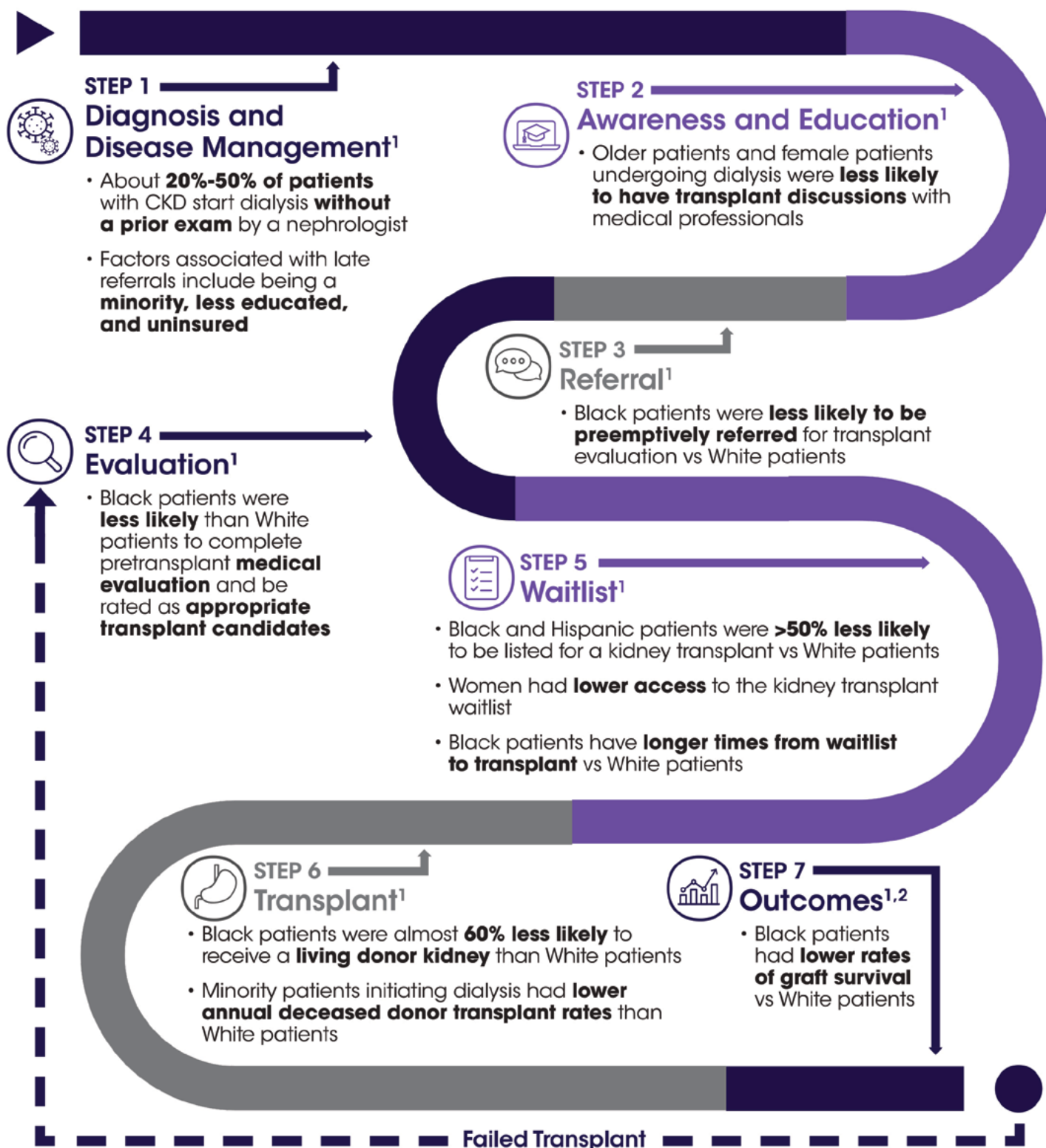
**kSORT® is a non-invasive blood test that evaluates the immune status of kidney transplant patients to rule in or out allograft rejection.**

kSORT may be used to augment clinical decisions in the management of kidney transplant patients. kSORT is available exclusively as a Laboratory Developed Test (LDT) through Immucor DX, the company's CLIA certified and CAP accredited independent clinical laboratory.

If you would like more information contact us at [ksortinfo@immucor.com](mailto:ksortinfo@immucor.com)



# Disparities Appear Throughout the Kidney Transplant Patient Journey



Sanofi is proud to support initiatives that help address disparities in transplant

**Abbreviations:** CKD, chronic kidney disease.

**References:** 1. Kizer KW, et al: Committee on A Fairer and More Equitable, Cost-Effective, and Transparent System of Donor Organ Procurement, Allocation, and Distribution. Realizing the Promise of Equity in the Organ Transplantation System. Washington (DC): National Academies Press (US); 2022. 2. National data. Organ Procurement and Transplantation Network website. <https://optn.transplant.hrsa.gov/data/view-data-reports/national-data/>. Accessed April 13, 2022.

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The First and Only Multi-Modality Test  
to Provide a **Comprehensive View of  
Graft Injury** and **Immune Quiescence**

Marilyn W, heart transplant recipient

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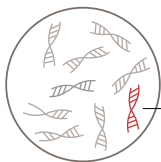
Immune Quiescence	Detection	
	ACR	AMR
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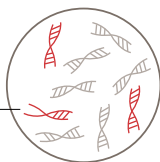
### Donor-Derived Cell-Free DNA

Molecular marker of allograft injury

dd-cfDNA No Graft Injury



dd-cfDNA During Graft Injury



Detection

ACR	AMR
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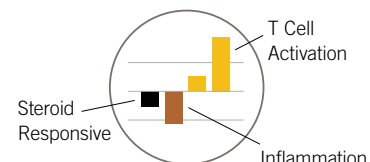
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### Gene Expression Profiling

Identify patients with stable allograft function  
and low probability of cellular rejection

Recipient Immune Activity



Immune Quiescence	Detection
	ACR
+++	++

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## ABSTRACTS & CASE REPORTS

### 1. Women Have Reduced Access At All Steps Of The Complex Kidney Transplant Process – Evidence From A Multi-Regional Cohort Study

**AUTHOR(S) (FIRST NAME, LAST NAME):** Jessica Harding, Mengyu Di, Stephen Pastan, Nicole Doucet, Ana Rossi, Teresa Rice, Derek DuBay, Rachel Patzer

**INSTITUTIONS (ALL):** Emory University, Emory University, Emory University, Emory University, Piedmont Transplant Institute, Medical University of South Carolina, Medical University of South Carolina, Emory University School of Medicine

**ABSTRACT:** Women (vs. men) are less likely to be waitlisted or receive a kidney transplant. Whether these sex disparities exist across the continuum of transplant care, including the necessary early transplant steps of referral and evaluation, remains unknown due to a lack of national data collected on these critical steps. We included all adults (aged 18–80 years; N = 34,272; 44.6% women) initiating dialysis in Georgia (GA), North Carolina (NC), or South Carolina (SC) (December 2014 and December 2018) from the United States Renal Data System and linked to the Early Steps to Transplant Access Registry (E-STAR), with follow-up through December 2020. Using logistic regression, we assessed the association between sex and 1) referral within 12 months (among incident dialysis patients); 2) evaluation within 6 months (among referred patients); and 3) waitlisting (among evaluated patients). We also included interaction terms for age, race and ethnicity, and obesity to assess potential effect modification by these factors. Overall, women (were 13% (odds ratio (OR): 0.87 (95% confidence interval (CI): 0.85-0.90)), 13% (0.87 (0.84-0.91)), and 9% (0.91 (0.85-0.98)) less likely to be referred, evaluated, and waitlisted as compared with men, respectively. Sex disparities differed by subgroups of race and ethnicity, age, and obesity, Figure. In the Southeast, women with ESKD have reduced access at all steps of the complex transplant process. Understanding the underlying causes for reduced access among women (and in subgroups of women, e.g., by race) is a key next step to design equitable interventions and policies to reduce sex disparities in transplant.

**KEYWORDS:** kidney transplantation; epidemiology; dialysis; inequities; sex

### 2. Identifying and understanding variation in population-based access to liver transplantation in the United States

**AUTHOR(S) (FIRST NAME, LAST NAME):** Katie Ross-Driscoll, Jon Gunasti, Arrey-Takor Ayuk-Arrey, Joel Adler, David Axelrod, Lisa McElroy, Rachel Patzer, Raymond Lynch

**INSTITUTIONS (ALL):** Emory University, Emory University, Emory University, University of Texas at Austin, University of Iowa, Duke University, Emory University School of Medicine, Emory University

**ABSTRACT:** By identifying variation in liver transplant access across geographic catchment areas created for transplant centers (transplant referral regions, TRRs) and accounting for differences in population characteristics and practice environment across regions, we aim to clarify the extent to which variation in access is attributable to practice patterns and therefore amenable to health systems interventions. Data on ESLD deaths were obtained from the National Center for Health Statistics. Data on waitlist additions were obtained from the Scientific Registry of Transplant Recipients. Deaths and were included if they occurred between 01/01/2015 and 12/31/2019. The primary outcome was listing to death ratio (LDR) for each TRR. In a sensitivity analysis, we calculated LDR with the numerator restricted to listings living within each TRR. We included four categories of covariates: underlying cause of ESLD, demographic factors of ESLD decedents (age, race, ethnicity, gender, educational attainment), socioeconomic characteristics of the TRR (poverty, insurance, rurality), and transplant environment within the TRR (organ availability, competition). We modeled the LDR as a continuous variable and used our final model to obtain adjusted LDR estimates for each TRR. The overall mean LDR was 0.24 (range: 0.10, 0.53). In the fully adjusted model, proportion of other race ESLD deaths, proportion of patients living in poverty, concentrated poverty, and proportion of uninsured patients were significantly negatively associated with LDRs; organ donation rate was significantly positively associated with the LDR. In this model, the R<sup>2</sup> was 0.59, indicating that 59% of the variability in LDR was explained by the model. The distribution of LDR varied across the United States (Figure 1). Results of a sensitivity analysis constrained to local patients were similar. We identified substantial variation in access to liver transplantation across the United States. While socioeconomic status and transplant environment were associated with access, nearly 40% of the variation remained unexplained and may be due to transplant center behaviors that are amenable to intervention to improve access to care for ESLD patients.

**KEYWORDS:** liver, access, geography, disparity





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### 3. Improved Transplant Time Study Billing and Compliance Using Communication Data

**AUTHOR(S) (FIRST NAME, LAST NAME):** Eric Pahl

**INSTITUTIONS (ALL):** *University of Iowa*

**ABSTRACT:** Transplant-related communications during organ offer reviews, organ recovery, as well as patient referral evaluation and waitlist management are considered 'pre-transplant expenses' and reimbursable on the Medicare Cost Report.

One area of revenue leakage that has the most opportunity for improvement and can make a considerable impact on transplant center finances is the accuracy and compliance of time reported during organ offer review and recovery, or phase 3 of pre-transplant activities. Faculty under report their time spent reviewing organ offers and procurement services by 60% according to estimates from a national benchmark survey conducted by a third party in 2022. Said differently, even if your center has strong time study compliance, the accuracy of that time is probably grossly underestimated and thus underbilled.

Time study compliance typically drops sharply among non-transplant department staff, such as HLA or OR staff, whose time spent on organ procurement is eligible on the transplant center time study and cost report. These compliance drop-offs occur even in well-managed programs with strong compliance within the transplant department. With communication and clinical workflow automation software, all time and activities performed by transplant staff, and time study eligible staff outside of the transplant center, are automatically tracked. This provides administrators and staff the ability to not only automate the collection of time logs, but equally important, to increase the accuracy of the time reported. This drives revenue to help offset the organ recovery cost increases that have impacted so many transplant centers nationwide. The Transplant Center implemented a dedicated real-time team-based mobile communication from a clinical workflow automation health IT vendor. The system was used by all transplant team members to communicate and coordinate around all organ offers. The system's audit logs were analyzed for per user activity during weeks identified by CMS for time reporting during the past fiscal year, October 23-29 and September 11-17 of 2022, and July 25-31 and December 12-18 of 2021. The case and user activity were stored for documentation purposes and the total time was billed directly to CMS at the average Medicare ratio for kidney was 71.3% in 2021. There were 33 staff members ranging from surgeon, physicians, nurse coordinators, and other support, at

the center were registered on the mobile communication system during the time reporting periods. The average additional billable rate for users was \$150/hr, the total time tracked was 112.35 hours, and there were 39 total cases observed. The specific counts of cases and additional time reported for each period are shown in Table 1. There was an additional \$432.12 per case that was captured using the messaging audit logs from the communication system.

There were a total of 223 kidneys transplanted in 2021 with a Medicare ratio of 71.3% and \$5,366 reimbursed per organ without leveraging the additional billable time captured from the communication system shown in Table 2. An additional \$432.12 per case billable time captured during the CMS observation periods can be applied to the kidney volume (223) resulting in an additional \$96,362.76 in annual revenue. An additional \$96,362.76 of time study revenue was captured and documented because of the use of the mobile communication and workflow system by staff members during procurement activities at the transplant center. Audit logs generated by the system are automatically recorded and reported. The resulting documentation is more accurate and removes a barrier to staff compliance with time study requests.

**KEYWORDS:** medicare ratio procurement time study reimbursement

### 4. Clinical Workflow Automation in Organ Transplantation

**AUTHOR(S) (FIRST NAME, LAST NAME):** Eric Pahl

**INSTITUTIONS (ALL):** *University of Iowa*

**ABSTRACT:** Possible solutions for staff burnout, cost containment, capacity, and interoperability lie within automated clinical workflows. Automating repetitive tasks in clinical care are commonplace in healthcare where standardization and documentation are required, yet organ transplantation has lacked implementation of these solutions. Unique circumstances in organ transplant require use of external team members and resources that are relatively undocumented within the normal EHR process flows usually surrounding a patient rather than donor or organ evaluation and procurement activities. With increased governmental scrutiny and pressures on the industry in recent years it is imperative to consider automation in many new activities in organ transplant. An industry-wide survey was conducted from September 2022 to November 2022 to describe the priority areas and current state of clinical workflow



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automation. The survey considered stakeholders in the following groups across the country with a total of 99 respondents; C-level (29.3%), Surgeon (9.1%), Clinical Leaders (19.2), Transplant Leaders (13.1%), Other. Clinical workflow automation was a priority for 61.3% of respondents who already have automation systems or are planning to implement within the next two years. Shown in Figure 1, current programs leveraging clinical workflow automation include in order of prevalence; patient referral for transplant, waitlist management, post-transplant, living donor, and organ intake, followed by other situations. Shown in Figure 2, The highest-ranking goals in order of prevalence were improving staff productivity, efficiency, standardization, case volume, managing complex care, and addressing staffing shortages followed by other goals. Shown in Figure 3, the primary features required for clinical workflow automation in order of prevalence were reporting for QI, business goals, and optimized reimbursement followed by a strong importance of ease of implementation. Most transplant programs have identified, prioritized, and implemented clinical workflow automation projects as a way to control costs while improving staff retention and productivity. In implemented cases, automation has increased case volume and documentation, both required aspects of the recent governmental oversight. The findings of this research project suggest that transplant centers will need to implement and optimize clinical workflow automation systems in order to grow their programs and remain financially solvent.

**KEYWORDS:** clinical workflow optimization quality improvement automation efficiency operations

## 5. The secret to improving long-term patient outcomes after heart transplantation

**AUTHOR(S) (FIRST NAME, LAST NAME):** Nikhil Patel, Shinichi Nunoda, Michelle Kittleson, Seong Kyu Kim, Tahlil Singer-Englar, David Chang, Evan Kransdorf, Andriana Nikolova, Lawrence Czer, Jignesh Patel, Jon Kobashigawa

**INSTITUTIONS (ALL):** *Smidt Heart Institute at Cedars-Sinai, Tokyo Women's Medical University, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai*

**ABSTRACT:** Short-term survival after heart transplant (HTx)

has been gradually improving. However, long-term survival has stayed relatively the same with 3-4% mortality each year resulting in an average 10-year survival of 50% (ISHLT registry). Of note, the 10-year survival in Japan is approaching 90%. We compared patient outcomes from our large single center in the US to that of the Japanese cohort to assess for differences in post-transplant treatment. Between 1999 and 2012, we assessed 610 Japanese patients from their national registry. During the same period, 573 HTx patients were assessed from the Cedars-Sinai cohort. 10-year survival in both groups was assessed. Maintenance immunosuppression and follow-up protocols were included. The 10-year survival was 58% in the Cedars-Sinai group compared to 88% in the Japanese cohort ( $p < 0.001$ ). Maintenance immunosuppression was similar and included tacrolimus, mycophenolate, and corticosteroids. The main difference between the two groups was that of the follow-up protocols. The Japanese followed their patients every 5-8 weeks regardless of years post-transplant. Their examinations included routine blood testing, blood pressure and diabetes monitoring, and medication adherence. In contrast, in the Cedars' cohort, after 2 years, patients were seen at 6-month intervals unless problems occurred. As for routine coronary angiograms (CAGs), the Japanese performed these annually for 5 years post-transplant with subsequent frequency decreased and stopped after 10 years if CAGs were normal. During this study period at Cedars, routine CAGs were performed annually in the first 6 years and then every other year if no cardiac allograft vasculopathy was detected. 10-year survival after HTx is superior in the Japanese cohort compared to the Cedars-Sinai cohort representing the USA. It appears that closer follow up may be beneficial in terms of medication compliance and control of comorbidities. In addition, there may be cultural influences by which adherence is increased in Japan.

**KEYWORDS:** heart transplantation, survival, coronary angiogram, cardiac allograft vasculopathy, patient outcomes

## 6. Anonymous heart transplant patient survey with insights into the impact of racial disparity on long-term clinical outcomes

**AUTHOR(S) (FIRST NAME, LAST NAME):** Seong Kyu Kim, In-Cheol Kim, Jong-Chan Youn, David Chang, Evan Kransdorf, Michelle Kittleson, Jignesh Patel, Robert Cole, Andriana Nikolova, Fardad Esmailian, Lawrence Czer, Jon Kobashigawa

**INSTITUTIONS (ALL):** *Smidt Heart Institute at Cedars-Sinai, Smidt*



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*Heart Institute at Cedars-Sinai, Catholic Research Institute for Intractable Cardiovascular Disease at Seoul St. Mary's Hospital, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai*

**ABSTRACT:** We have performed a prospective survey to speculate an extensive spectrum of patients' health and social status and their impact on long-term outcomes after heart transplantation. Between July 2011 and December 2012, patients over 18 years old who survived more than one year after heart transplantation enrolled in this prospective survey study. Survey questions included race, economic status, social status, and health perception. The composite outcome of all-cause death, retransplantation, any treated rejection, and coronary allograft vasculopathy were evaluated according to the groups stratified by race (White, Black/African American, Asian, and others) and economic status (mid-high household income  $\geq$ \$50,000 per year, low household income  $<$ \$50,000 per year). A total of 402 patients were analyzed. The race of the study patients consisted of White (n=275, 68.4%), Black/African American (n=50, 12.4%), Asian (n=39, 9.7%), and others (n=38, 9.5%). The mean period from heart transplantation to survey was  $7.3 \pm 5.2$  years without difference between groups ( $p=0.509$ ). The patient group of White and Asian (W/A) had a higher level of education and household income compared to the patient group of Black/African American and others (B/O): higher than university or college graduates (53.8% vs. 42.3%,  $p=0.020$ ); average household income  $\geq$ \$50,000 (55.1% vs. 35.2%,  $p=0.001$ ). Patient group W/A with mid-high income reported the highest rate of maintaining marriage before (80.2%) and after (77.2%) the transplantation (both  $p<0.001$ ). Patient group B/O with low income reported the lowest level of health perception ( $p=0.016$ ) compared to the other groups. During the median follow-up of 3337 days (interquartile range 1368, 4002 days) after the study enrollment, patient group B/O with low income showed the lowest event-free survival (Breslow=0.022). Racial disparity combined with economic inequality significantly affected long-term clinical outcomes after heart transplantation. More attention needs to be focused on social and racial status to improve health equality in the field of heart transplantation.

**KEYWORDS:** racial disparity, economic inequality, health equality, clinical outcomes, heart transplantation

## 7. Factors Including Angiotensin II Type 1 Receptor (AT1R) Antibodies As Risk For Stroke After Left Ventricular Assist Device Placement

**AUTHOR(S) (FIRST NAME, LAST NAME):** Adriana Shen, Michelle Kittleson, Jignesh Patel, Tahli Singer-Englar, Nikhil Patel, Carmelita Runyan, Robert Cole, Jaime Moriguchi, Dominick Megna, Lawrence Czer, Jon Kobashigawa

**INSTITUTIONS (ALL):** Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai

**ABSTRACT:** Left ventricular assist device (LVAD) has been lifesaving for many patients with severe end-stage heart disease. One of the main complications of LVAD placement is the development of stroke, seen in approximately 10% of LVAD patients. Angiotensin II type 1 receptor (AT1R) antibodies, if detected, are reported to be thrombogenic and may be related to strokes. It is not clear as to what risk factors are present to lead to higher incidence of stroke development. Between January 2010 and December 2019, we assessed 33 LVAD patients who developed stroke within 3 years after LVAD implantation. The following risk factors were assessed for development of stroke in these patients: baseline characteristics/demographics, presence of AT1R antibodies, history of hypertension and diabetes, and history of previous stroke. Patients were also assessed for presence of peripheral vascular disease such as carotid artery stenoses or plaquing. The average time from LVAD to stroke was  $273 \pm 310$  days. LVAD patients who developed stroke had a higher incidence of history of hypertension and higher blood pressures at LVAD placement. There was no significant difference in baseline gender or age. In addition, there was no significant difference in patients with a history of diabetes or peripheral vascular disease or presence of AT1R positive antibodies. Hypertension is associated with stroke after LVAD which suggests that improved blood pressure control may minimize this complication. Although AT1R antibodies are known to increase thrombosis, its detection did not factor into more stroke occurrence.

**KEYWORDS:** LVAD, stroke, AT1R antibodies, blood pressure control





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### 8. Transthyretin Amyloid May Have A Protective Effect For Rejection After Heart Transplantation

**AUTHOR(S) (FIRST NAME, LAST NAME):** Adriana Shen, Jignesh Patel, Michelle Kittleson, David Chang, Seong Kyu Kim, Tahli Singer-Englar, Frances De Leon, Michele Hamilton, Dael Geft, Lawrence Czer, Dominick Megna, Jon Kobashigawa

**INSTITUTIONS (ALL):** *Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai, Smidt Heart Institute at Cedars-Sinai*

**ABSTRACT:** Transthyretin (TTR) amyloid is an infiltrative disease process that can involve the heart, among other organs. Performing heart transplantation (HTx) is the treatment plan of choice for end-stage heart disease, however patients with late-stage amyloid cardiomyopathy may have poorer outcomes. We sought to assess post-transplant outcomes in TTR amyloid patients in the current era. Between 2010 and 2019, we assessed 33 patients with TTR amyloid who underwent HTx. Patients were compared to a contemporaneous control cohort, case-matched by age and gender. Study endpoints included 3-year survival, freedom from cardiac allograft vasculopathy (CAV: stenosis  $\geq 30\%$ ), and freedom from non-fatal major adverse cardiac event (NF-MACE: myocardial infarction, new congestive heart failure, percutaneous coronary intervention, implantable cardioverter defibrillator/pacemaker implant, stroke), and 1-year freedom from acute cellular rejection (ACR) and antibody-mediated rejection (AMR). Recipient age and gender, pre-transplant sensitization, use of antithymocyte globulin (ATG) induction, prior mechanical circulatory support, crossmatching of donor specific antibodies were similar between the TTR amyloid group and control group. The TTR amyloid group compared to the control group had significantly fewer antibody-mediated rejection episodes (100% vs 81.8%,  $p=0.013$ ). 3-year survival, freedom from CAV, and freedom from NF-MACE were no different between the two groups. TTR amyloid appears to have a protective effect following heart transplantation, reducing the occurrence of antibody-mediated rejection compared to non-TTR amyloid patients. Larger studies are needed to confirm these findings.

**KEYWORDS:** transthyretin amyloid, heart transplant, antibody-mediated rejection

### 9. A Grounded Theory Approach to Understanding Dialysis Providers' Transplant Referral Decisions for Patients with Past Non-Adherence

**AUTHOR(S) (FIRST NAME, LAST NAME):** Jennifer McDonnell, Megan Urbanski, Stephen Pastan, Janice Lea, Kimberly Jacob-Arriola, Cam Escoffery, Rachel Patzer, Adam Wilk

**INSTITUTIONS (ALL):** *Emory University, Emory University, Emory University, Emory University, Emory University, Emory University, Emory University School of Medicine, Emory University*

**ABSTRACT:** Kidney transplant improves patient survival and quality of life as compared to dialysis, yet evidence suggests that not all qualified candidates are referred for transplant evaluation. KDIGO guidelines recognize the importance of assessing patient adherence to treatment among dialysis patients and also advise referring patients with past non-adherence to a transplant center. Identifying dialysis providers' beliefs about the causes and implications of non-adherence is important, as these beliefs may inform how they respond to patient non-adherence and make transplant referral decisions. We conducted 39 in-depth interviews during June-August 2022 with dialysis clinic providers in Georgia, North Carolina, and South Carolina about their processes leading up to referral or non-referral to a transplant center. We recruited dialysis social workers, nurse managers, nephrologists, and administrators using purposive sampling to capture diversity by participants' role, years of experience, and county median household income. Semi-structured telephone interviews were recorded and transcribed. We managed textual data using MAXQDA software. We used a grounded theory approach to craft a novel theoretical model of provider beliefs about non-adherence, with multiple coders developing the codebook and interpreting data. Without specific prompting, participants often organically named patient non-adherence—including to medications, diet or fluid intake restrictions, dialysis attendance, and dialysis session completion—as a key barrier to transplant referral. Preliminary analyses suggest dialysis providers' non-adherence-related beliefs may be classified into 3 domains: (1) causes of non-adherence; (2) implications of non-adherence for referral decisions; and (3) waitlist eligibility for patients with past non-adherence. Some participants identified patients' limited social and financial resources as causes of non-adherence; others attributed patient non-adherence to disinterest in transplant or an inability to self-manage. Several participants reflected that referring non-adherent patients was "a waste" because these patients would be unwilling to meet transplant evaluation requirements. Many participants foresaw that



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all referred patients with past non-adherence would be determined ineligible for waitlisting at the transplant center. Participants' beliefs were consistent across forms of non-adherence (e.g., medications, diet/fluids) in all 3 domains. How dialysis providers respond to patient non-adherence may be affected by their beliefs about the causes and implications of non-adherence. Though KDIGO guidelines advise referring patients with past non-adherence to a transplant center for evaluation—and for intervention as needed—dialysis providers may delay referral or opt not to refer based on their beliefs about non-adherence.

**KEYWORDS:** transplant, dialysis, non-adherence, qualitative

## 10. Deliberate Delay in Transplant Education for “Overwhelmed” Dialysis Patients

**AUTHOR(S) (FIRST NAME, LAST NAME):** Jennifer McDonnell, Megan Urbanski, Stephen Pastan, Janice Lea, Kimberly Jacob-Arriola, Cam Escoffery, Rachel Patzer, Adam Wilk

**INSTITUTIONS (ALL):** Emory University, Emory University, Emory University, Emory University, Emory University, Emory University, Emory University School of Medicine, Emory University

**ABSTRACT:** Access to timely transplant education at a dialysis facility increases patient interest in transplant, likelihood of waitlisting, and transplant receipt. Evidence shows some dialysis patient groups are less likely to receive appropriate transplant education than others. It is unclear how dialysis providers' transplant education practices may differ for patients who initiate dialysis unexpectedly (e.g., following hospitalization for ESRD). We conducted 39 in-depth interviews during June-August 2022 with dialysis clinic providers in Georgia, North Carolina, and South Carolina about their processes leading up to referral or non-referral to a transplant center. We recruited dialysis social workers, nurse managers, nephrologists, and administrators using purposive sampling to capture diversity by participants' role, years of experience, and county median household income. Semi-structured telephone interviews were recorded and transcribed. We managed textual data using MAXQDA software. We used thematic analysis to identify themes, with multiple coders developing the codebook and interpreting data. Some dialysis providers described providing uniform transplant education to all patients. However, most providers perceived that patients who initiate dialysis unexpectedly are “overwhelmed” and require delayed or limited transplant education. These providers described 3 types of transplant education practices for ESRD patients

who initiate dialysis unexpectedly. In Type (1), these patients need time to stabilize and “settle into dialysis” before providers share any transplant education. In Type (2), patients who initiate dialysis unexpectedly receive transplant education best when it is limited and provided slowly over many weeks or months. In Type (3), these patients have greater transplant knowledge deficits compared to patients who had prior nephrology care; identifying and filling these patients' knowledge gaps demands more of providers' time. Despite recognition that ESRD patients who initiate dialysis unexpectedly often require more extensive transplant education than patients who had prior nephrology care, providers often delay or limit discussing transplant with these patients. Promoting equitable transplant education practices will require accommodating diverse patient needs as well as diverse provider perspectives on best practices in transplant education for all patient groups.

**KEYWORDS:** transplant, hospitalization, unexpected dialysis initiation, transplant education, qualitative

## 11. Health Disparity In Pre-emptive Transplant And Dialysis Vintage Based on Social Vulnerability Index

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**INSTITUTIONS (ALL):** Indiana University School of Medicine, Indiana University, Indiana University, Indiana University, Indiana University, Indiana University, Indiana University School of Medicine, Indiana University School of Medicine, Indiana University School of Medicine, Indiana University, Indiana University

**ABSTRACT:** There are significant benefits of Pre-emptive kidney transplant and less dialysis vintage (length of dialysis time) but Socio-economic status of the patient plays key role in achieving those benefits.

USA Center for Disease's (CDC) social vulnerability index (SVI) data was used to evaluate pre-emptive transplant and dialysis duration before kidney transplantation. The SVI as a social health determinant tool comprised of 16 multidimensional social factors, estimated in a range of 0-1.

It is retrospective study of kidney recipients in the USA using Scientific Registry of Transplant Recipients (SRTR) from January



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1st 2012 to December 31, 2020 with community level SVI based on zip-code at the time of transplant. The analysis was further restricted to first transplant only. The SVI was treated both continuously and categorically by splitting into 4 groups (0-<0.25, 0.25-<0.5, 0.50-<0.75, 0.75-1). Chi-square test was used to find association b/w 4 categories of SVI on dialysis vintage. Univariable logistic

regression modeled SVI groups on pre-transplant dialysis time or not. 152,400 adult kidney recipients met the study inclusion criteria. Pre-emptive transplant patient (n=26376, 17.31%) had a lower median SVI of 0.5 vs 0.75 in patients with pre-transplant dialysis (n=126024, 82.69%) with median dialysis stay of 3.4 yrs.

Patients residing in zip-codes with lower SVI were significantly more likely to receive a pre-emptive kidney transplant (30.42% in 0-<0.25 vs 24.70% in 0.25<0.5 vs 18.71% in 0.5-<0.75 vs 11.16% in 0.75-1), p<0.0001).

Median SVI was likewise lower in patients with less pre transplant dialysis duration (0.64 in <1 Year, 0.7 in 1-3 Years and 0.8 in >3 years respectively) (figure1). Likewise, patients residing in zip-codes with lower SVI had the least median dialysis vintage time (2.2 Years in 0-<0.25 vs 2.6 years in 0.25<0.5 vs 3.1 years in 0.5-<0.75 vs 4 years in 0.75-1). The odd ratio for pre transplant dialysis was highest in the 0.75-1 SVI group (3.48, p<0.0001)

This study showed inequity for pre-emptive transplant and dialysis duration in patients receiving kidney allograft in the US. Our findings suggest more target studies need to be done in communities with higher SVI to improve equal access to pre-emptive kidney transplant and shorter dialysis duration for waitlisted patients.

**KEYWORDS:** Pre-emptive transplant and SVI

## 12. Concordance of Social Vulnerability Index with Clinical outcomes In Kidney Transplant Recipients

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**ABSTRACT:** The socio-economic status of a kidney transplant recipient plays a substantial role in the overall allograft outcomes, but it is not considered much important as compared to traditional risk factors for outcome analysis.

USA Center for Disease's (CDC) social vulnerability index (SVI) data was used to evaluate the effect in clinical outcomes in kidney transplant recipients. The SVI comprised of 16 social determinants of health estimated in a range of 0-1 is one of the potent surrogates of social determinant of health at community level. Lower SVI is associated with a more favorable outcome for kidney allograft.

It is retrospective study of kidney recipients in the USA using Scientific Registry of Transplant Recipients (SRTR) from Jan1st 2012 to Dec 31st, 2020 with community level SVI based on zip-code at the time of transplant. The analysis was further restricted to first transplant only. The SVI was treated both continuously and categorically by splitting into 4 groups (0-<0.25, 0.25-<0.5, 0.50-<0.75, 0.75-1). Kaplan-Meier probabilities were applied for patient survival, graft survival and death-censored graft. Univariate and multiple Cox proportional hazards regression models were used to test the association of race, SVI and other predictors on patient survival, DCGS, and graft failure. 153,706 adult kidney recipients met the study inclusion criteria with majority having SVI > 0.5(72%). Mean study SVI was 0.7 +/- 0.3 and significantly higher in African American and Hispanics (Figure 1). Patient survival, unadjusted graft survival and death censored graft survival was significantly better in patients residing in zip codes with the least SVI range (0-<0.25, P,0.0001). African American recipients of kidney transplant had the worse outcome even when residing in zip codes with lowest SVI range 0-<0.25. Multiple cox regression model with exclusion of race showed a hazard ratio of 4.04 for death and 2.99 for death for every 0.1 increase in SVI (p<0.05) Our study showed recipients of kidney transplant with high SVI have the greatest risk for worse outcome. SVI based on zip codes data could be used for steps taken towards reducing health disparity in clinical outcomes of kidney transplant recipients. Further studies are needed to evaluate disparity in outcomes in kidney transplant recipients with similar SVI.

**KEYWORDS:** Kidney Allograft outcome, Higher SVI





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### 13. Increasing Hemoglobin Concentration with HBOC-201 Improves Renal Function in Severe Anemia: A Case Report

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**ABSTRACT:** Post-operative anemia, after kidney transplantation, is a common occurrence. Severe anemia is associated with a higher all-cause mortality and is often multifactorial. Pre-existing anemia from kidney disease, anticipated surgical blood loss and bone marrow suppression from immunosuppressive therapy are commonly associated with anemia. This leads to decreased oxygen carrying capacity and tissue hypoxia. Severe or symptomatic anemia is often treated with blood transfusion however this is not always possible in certain circumstances, such as blood product shortages or personal and religious restrictions. HBOC-201 is a purified polymerized bovine hemoglobin product with an oxygen carrying capacity similar to human hemoglobin. Its utility in kidney transplant recipients has yet to be determined. We present a case of a Jehovah's Witness patient with severe post-operative anemia treated with HBOC-201. Retrospective review of clinical case. The patient was a 54-year-old Jehovah's Witness woman that had a past medical history of end stage kidney disease on hemodialysis, presumed secondary diabetes mellitus and hypertension. Preoperative evaluation includes an unremarkable physical examination and a preoperative operative hemoglobin of 11.8 g/dL. She received a pediatric deceased cardiac donor kidney transplant with an estimated surgical blood loss of 50mL. Thymoglobulin 3 mg/kg was used for induction after which she was maintained on tacrolimus, mycophenolate and prednisone. Her post-operative course was complicated by delayed allograft function and severe anemia associated with the development of a perinephric hematoma measuring 14.5 cm in length. The patient's hemoglobin continued to decline reaching a nadir of 5.0 g/dL, this was associated with hypotension, weakness and shortness of breath. Due to her religious beliefs, the patient declined blood products. Extensive evaluation of her anemia included nutritional deficiencies, viral infections and a bone marrow biopsy which revealed hypoproliferation. She was subsequently started on erythrocyte stimulating agents, but this was ineffective. Her serum creatinine continued to increase and peaked at 3.6 mg/dL at which point 10 units of HBOC-21 was given over 5 days

which resulted in significant improvement of her blood pressure, serum hemoglobin and creatinine. Methemoglobin levels peaked at 6.9% but no intervention was required. As the effect of HBOC-21 dissipated, her hemoglobin began to decline and her creatinine starting to trend upward. She was given an additional 10 units which resulted in significant improvement. She was eventually liberated from hemodialysis and had serum creatinine of 1.0 mg/dL at the time of discharge. This case demonstrates the clinic efficacy of HBOC-21, in a kidney transplant with ischemia reperfusion injury and delayed allograft function in the setting of severe anemia. A temporal relationship between HBOC-21 administration and kidney allograft function improvement was demonstrated. In this patient, HBOC-21 was noted to be a safe and feasible alternative to blood transfusion and resulted in improvement of blood pressure, liberation from hemodialysis and recovery from ischemic allograft injury. To the best of our knowledge, this is the second case report of HBOC-21 used in a kidney transplant recipient.

**KEYWORDS:** Kidney transplant, anemia, bovine hemoglobin, blood product alternative

### 14. Heart transplant survival: Genetics, social determinants of health, or race?

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**ABSTRACT:** Racial disparities in heart transplant (HT) survival persist. Social determinants of health (SDOH) and genetics are postulated as contributing factors. This study explored the impact of genetic risk, California-Healthy Places index (Cal-HPI), and race on HT survival. Genetic risk score (GRS) from a single center sample of 224 (n=181 White, n=43 Black) HT recipients were combined with Cal-HPI, age, gender, treated hypertension, and pre-transplant diabetes to determine impact on survival using a multivariable Cox Model and hazard ratios (HR). Cal-HPI includes 8 SDOH domains (economy, education, healthcare-access, housing, neighborhoods, clean environment, transportation, and



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social environment) associated with life expectancy. In the overall model, only genetic risk was significant [HR = 5.56 [95% CI = 3.17-9.73],  $p < 0.0001$ ]. In high GRS group race (Black v White) was significant risk: [HR = 2.01, [95% CI = 1.05 to 3.85],  $p = 0.034$ ]. In the low GRS group only Cal-HPI showed a trend [HR = 0.980, [95% CI = 0.95 to 1.00],  $p = 0.057$ ]. In the overall model, genetics drove survival outcomes. Race (Black) in the high-GRS group was a significant risk factor. Social determinants of health were not significant in either group analysis. Larger studies are needed.

**KEYWORDS:** racial disparities, heart transplant outcomes, genetic risk, social determinants of health

## 15. Optimal steroid taper strategy and impact of acute cellular rejection in long term cardiac transplant survival

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**ABSTRACT:** Immunosuppression therapy in heart transplant has progressed tremendously over the past decades. Steroids are a pillar of the current immunosuppressive regimen, however, there is a lack of a standardized steroid taper regimen and numerous transplant centers continue to follow long taper protocols. In this study, we sought to evaluate the impact of a short steroid taper on post orthotopic heart transplant (OHT) patients life expectancy by comparing patients who develop acute cellular rejection grade 2 or above (ACR2+) versus patients without ACR2+.

**Hypothesis:** The increase in ACR2+ prevalence related to short steroid taper is not associated with worsening life expectancy outcomes in post OHT patients. After obtaining an IRB approval, we retrospectively reviewed clinical data of all patients older than 18 years who underwent OHT at Memorial Hermann - Texas Medical Center from 11/01/2012 to 2/12/2021. Clinical data included demographics, comorbidities, survival and acute cellular rejection status. Patients were grouped retrospectively into two

groups, patients who develop ACR2+ and patients without ACR2+. All statistical analyses were performed using STATA version 17. Continuous variables were summarized as mean +/- standard deviation for normally distributed variables and interquartile range for non-normally distributed variables. Categorical variables were summarized as proportions and frequencies. Clinical characteristics were compared between groups using Student's t-test for normally distributed variables and Wilcoxon's rank sum test for non normally distributed variables. All p-values are from a 2-sided test with  $p < 0.05$  considered statistically significant. Cox proportional hazard model was used to assess the relation between ACR2+ presence and survival. A total of 279 OTH patients were identified, among which 175 patients (62%) were diagnosed with at least one episode of ACR2+ within the first 12 months following OTH with an average time from OTH to first rejection of 73 days. Among them, 15% had more than one episode of ACR2+ and 20% were also diagnosed with acute antibody mediated rejection.

There was no significant demographic difference between patient groups. Both groups were taking the recommended therapeutic dose of mycophenolate (between 1,000-1,500mg bid), and the ACR2+ group had a Tacrolimus serum level in the therapeutic range (9.4 +/- 3.6 ng/mL) at the time of the first ACR.

Both groups received the short steroid taper as follows:

- Day 0: Methylprednisolone 125 mg IV every 8 hrs starting 8 hrs after the second dose of Methylprednisolone 500 mg IV in the OR,
- Day 1: Methylprednisolone 50 mg IV every 12 hrs,
- Day 2-3: Methylprednisolone 40 mg IV every 12 hrs,
- Day 4-5: Prednisone 30 mg PO every 12 hrs,
- Day 6-7: Prednisone 20 mg PO every 12 hrs,
- Day 8-9: Prednisone 20 mg daily,
- Day 10-12: Prednisone 10 mg daily,
- Day 13 and beyond prednisone 5 mg daily.

An alternative protocol replacing prednisone PO if the patient remains intubated:

- Day 4-5: Methylprednisolone IV 24 mg every 12 hrs,
- Days 6-7: Methylprednisolone 16 mg IV every 12 hrs,



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- Days 8-9: Methylprednisolone 16 mg IV daily,
- Days 10-12: Methylprednisolone 8 mg IV daily,
- Days 13 and beyond: Methylprednisolone 4 mg IV daily.

Finally, both groups' survival rate was not statistically different (HR 0.72,  $p=0.32$ ). Survival rate of post OHT patients diagnosed with ACR2+ during the first 12 months post OHT was not statistically different when compared to patients without ACR2+. As short steroids taper is typically associated with higher ACR2+ incidence, these findings suggest that a short steroid taper coupled with close monitoring may provide equal survival benefit while preventing harmful side effects associated with longer steroids exposure. A larger study with longer follow up is warranted to further corroborate this finding.

**KEYWORDS:** ACR, Steroid, Immune suppression therapy, survival, cardiac transplant, OHT, rejection

## 16. Donor Selection for Kidney Recipients Younger than 14 Years old Using the Reverse Survival Model

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**ABSTRACT:** Pediatric kidney transplantation is the most reliable treatment option for children with end-stage renal disease (ESRD), as it allows for normal growth and development, improved quality of life, and a reduction in morbidity and mortality compared to alternative options such as dialysis. Despite the clear benefits of transplantation for children with ESRD, the availability of suitable organ donors is limited due to children's unique physiological and immunological features. The discrepancy between the supply and demand of kidneys continues to grow. Consequently, the

long waiting time for kidney transplantation is an issue of growing importance.

Donor characteristics such as age, kidney function, and human leukocyte antigen (HLA) matching are essential factors in determining transplantation outcomes. HLA matching, in particular, plays a crucial role in the success of transplantation, as it determines the compatibility of the donor and recipient tissue. Various approaches have been developed to optimize the selection of organ donors for pediatric transplantation, including using deep survival models, and statistical tools used to predict the likelihood of successful transplantation based on donor and recipient characteristics. Proposing a reverse survival model (RSM) which has the capability to extract similar patients from a dataset and rank them based on the most relevant features, ensures the reliability and explainability of deep survival models deployed in the healthcare system. These models can identify potential donors who are most likely to result in good outcomes for pediatric recipients. The selection of suitable organ donors is critical to the success of pediatric kidney transplantation, mainly by avoiding early failures that lead to the recipients' return to the waiting time for another transplant.

**Objective:** We aimed to employ the capabilities of a deep neural network (DNN) model to identify the donors who make a specific survival profile for individual pediatric kidney transplantation candidates.

RSM was proposed to provide evidence for predicted survival functions. An analysis was conducted on 231 recipients aged 14 or less in a subset of the Scientific Registry of Transplant Recipients (SRTR) dataset. The maximum survival time in this cohort was around 60 months, due to the inaccuracies in the data of patients with longer graft survivals. To create the survival profiles, the most important donor factors for predicting the likelihood of successful transplantation in pediatric recipients were identified. The DNN model was used to correlate donor-recipient features with the transplant outcome. The RSM executed three main steps. First, it identified distinct survival profiles, defined as aggregated survival functions of similar deceased donor-recipient pairs. Second, it identified the predictive factors and finally, it found the donors compatible with the closest survival function to the targeted survival profile for the given recipient.

RSM identified four distinct survival profiles of donor-recipient pairs based on their survival times (Fig. 1). Cluster 0 indicates the shortest survivorship for an organ, and Cluster 3 represents the longest. The most relevant donor factors that affect organ survival were found by the RSM to be a history of hypertension, use of





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Inotropic medication, Cerebral Vascular Accident (CVA) cause of death, high-risk donor based on Centers for Disease Control and prevention (CDC) guidelines, use of pre-recovery medication and cardiac arrest cause of death. Of note, the distribution and significance of each factor differ among the four clusters (Fig. 2).

In conclusion, our results indicate that RSM can effectively provide insight into the decision-making process during matchmaking. This approach has the potential to optimize the selection of kidney donors for pediatric recipients, reduce the waiting time for transplantation and improve the outcomes for this vulnerable patient population. Ideally, donors who fall into Cluster 3 for that particular donor will be selected. However, this may not be always possible due to the features of the recipient and the availability of donors, in which case lower clusters may be targeted by the transplant physicians. In addition, by using this model, transplant candidates could get a better insight while deciding if to accept an offered organ. This is a preliminary result on a subset of patients that failed within 6 years. This model will be functional on patients with all survival ranges once trained with a full dataset with acceptable accuracy.

**KEYWORDS:** kidney transplant, Artificial Intelligence, Pediatric recipients, Donor selection, Reverse survival model

## 17. Effects of body mass index on importance of variables for kidney transplant outcomes

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**ABSTRACT:** Body Mass Index (BMI) is one of the known indicators affecting overall health and the outcome of many medical conditions, including End Stage Kidney Disease

(ESRD). It is suggested that the recipient's baseline BMI can impact the outcome of organ transplantation. Over 800 million people worldwide suffer from chronic kidney disease (CKD) that gradually progresses to ESRD. This notable prevalence prompted us to examine the correlation between CKD and BMI levels. Higher BMI levels are associated with hypertension and increased glomerular filtration rate leading to accelerating kidney damage and deteriorating its function. Kidney transplantation is the definitive treatment for patients suffering from ESRD. The outcome of kidney transplantation is not always optimal and graft failures, especially the early-stage ones, lead to increased morbidity and financial burden on the healthcare systems. The introduction of artificial intelligence techniques has offered a new opportunity to investigate the complex interaction patterns among the large number of variables affecting the outcome of kidney transplantation. We aimed to assess if variables with the highest impact on the outcome of kidney transplantation would be different in recipients with different BMIs.

**Objective:** to find the order of important variables correlating to early kidney failure for different BMI ranges. We used Tabnet, a new class in Deep Neural Network (DNN) models proposed by Google, to identify the most important variables affecting early kidney rejection within the first six months and 12 months in three BMI categories as normal weight, overweight and obese. The DNN models were trained using the Scientific Registry of Transplant Recipients (SRTR) dataset. We selected kidney recipient patients in the dataset whose transplants were made after the year 2000, aged 18 years and older and had a certain failure time. Incompatible blood groups and failures due to surgical complications were removed. The resulting cohort has 5825 donor-recipient pairs out of which for 2360 patients the heights and weights are reported. Most of these patients had maximum survivorship of 6 years, as patients with longer survivorship were excluded due to inaccuracies in their data. We selected 80% of the dataset to train the models, and the rest of the dataset was utilized by the models to identify and recognize variables. After training, the AI model investigated a total of 463 recipients. The number of patients in each BMI category is depicted in table 1. The model in two-time horizons identified the top 20% of the most important variables in each BMI category Tables 2 and 3 show the summary of the findings.

The obtained area under the curve (AUC) for the 6-month time horizons was 0.79 in the normal weight, 0.80 in the overweight and 0.89 in the obese group. These numbers were 0.76, 0.83 and 0.82 in the respective three BMI groups for the 12-month time horizon.



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In the six months time horizon, the recipient's history of pulmonary embolism, the recipient's incidental tumor found at the time of transplant and dobutamine inotropic use were important in all three BMI groups. Moreover, the recipient's HLA-DPw (1) locus, being a high-risk organ donor and donor's dobutamine use were significant in the normal weight and obese groups. The recipient's most recent auto crossmatch was important in the normal weight and overweight groups. Furthermore, the recipient's most recent class 2 PRA, donor's structural cardiac abnormalities such as LVH and inotropic medication use were important between the overweight and obese categories. In addition to these variables, certain items were found to be uniquely important in each group as follows:

Recipient's pretransplant dialysis, donor's T-cell crossmatch, recipient's physical capacity and donor's use of arginine vasopressin in the normal weight group.

Recipient's anti-HLA class II antibody and recipient's most recent class I PRA in the overweight group.

Recipient's peak serum anti-HLA class I, donor's death due to CVA, donor's dopamine use, recipient's crossmatch prospective to transplant, recipient's anti-HLA class I antibody and donor's circumstances of death in the obese group.

In the 12 months time horizon, the recipient's incidental tumor found at the time of transplant, the recipient crossmatch prospective to transplant, the target source for class II, the donor's HLA - DR-51 locus and the donor's anti-HIV I/II were commonly important in all three BMI cohorts. The donor's history of hypertension and dopamine use were important in the normal weight and obese groups. In contrast, the donor's heavy alcohol use (defined as more than two drinks daily) was found to be important in the overweight and obese categories. The summary of the findings is illustrated in table 3. Besides the variables that were found to be important in 2 or 3 BMI groups, certain variables were reported by the models to be uniquely important in each group as follows:

Donor's other drug abuse in the last six months, T3 and T4 given to the donor pre-recovery, recipient's anti-HLA class I antibody, percentage of donor's right kidney glomerulosclerosis, recipient's history of coronary artery disease, recipient's previous pregnancies and recipient's most recent class 2 PRA in the normal weight group.

Donor RNA NAT serology value for HBV test, donor's Anti-HTLV I/II, donor's steroid use pre-recovery, being a high-

risk organ donor, recipient's coronary artery disease status, history of positive auto crossmatch, recipient's most recent auto crossmatch, donor's mechanism of death, being a double kidney donor and donor's number of transfusions in the last hospitalization in the overweight group.

Recipient's peak serum class 2 PRA, drug-treated COPD, donor's HLA - DPw (2) locus, recipient's serum anti-HLA class II antibody, insulin-dependent diabetes and donor's coronary angiogram in the obese group.

The functionality of this model was proved on this dataset, which mainly includes patients with relatively early failure. In general, identifying variables impacting organ transplants in recipients with different body habitus, help care providers optimize the outcomes at an individual level. It can be utilized in implementing new healthcare policies and targeting specific factors to achieve a better success rate in organ transplantation. Improving graft survival could reduce the number of patients returning to dialysis and shorten the waiting lists. The same model will be employed for cases with all survivorship ranges once we train it with a full dataset.

**KEYWORDS:** Kidney transplant, Donor selection, Body Mass Index, Artificial Intelligence

## 18. Paired Donor Kidney Transplant Recipients: Social Vulnerability Index and Clinical Outcomes

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**INSTITUTIONS (ALL):** Indiana University, Indiana University, Indiana University, Indiana University, Indiana University, Indiana University, Indiana University

**ABSTRACT:** An equitable health care system incorporates medical factors and socioeconomic circumstances of patients. Kidney transplant recipients are particularly vulnerable to socioeconomic inequities when observing overall patient outcomes. In this study, we observe the Center for Disease Control's social vulnerability index (SVI) looking at clinical outcomes of paired donor kidney transplant recipients. The SVI is a composite score weighing social disparities and community-level vulnerabilities as social determinants of health. This score is representative of the economic and social conditions that



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influence patient outcomes. A higher SVI is associated with less favorable conditions at a community-level. This retrospective study includes kidney-only paired donor transplant recipient data in the US Scientific Registry of Transplant Recipients between January 1, 2012 and December 31, 2020. Inclusion criteria were a zip-code-based community-level SVI at the time of transplant, dialysis vintage < 15 years, and recipient pairs with the same deceased donor. No recipients were involved in multiple transplants. The SVI was treated as both a continuous and categorical variable. Pairs were classified by SVI range (lower vs. higher). Kaplan-Meier probabilities were calculated for patient survival, death-censored graft survival, and graft survival stratified by SVI. Univariate and multiple Cox proportional hazard regression models were used to test the association of race, SVI, and other predictors including dialysis vintage, body mass index categories, age and gender mismatch. 41,619 donors provided kidneys to 83,238 paired recipients. Mean SVI of the recipients was 0.7 +/- 0.2. The higher SVI recipient of a paired donation was more likely to be Black or African American (38.9%). Paired recipients with different SVI scores showed no significant difference in patient survival and higher SVI recipients had worse death-censored graft survival ( $p < 0.0001$ , Figure 1). In the univariate analysis, the high SVI group showed a significant risk for worse patient survival ( $p = 0.0407$ ), DCGS and graft failure (both  $p < 0.001$ ). Multivariate analysis demonstrated that recipient pairs with a higher SVI had worse patient survival ( $p < 0.001$ ), although not statistically significant DCGS ( $p = 0.09$ ). Both univariate and multivariate analyses showed that for every increase of 0.1 in SVI, there was an increased risk for worse patient survival, DCGS, and graft failure. Our study shows that even with paired donation analysis and the removal of potential confounding donor variables, kidney transplant recipients with a high SVI are at a greater risk of poor outcomes. This suggests that SVI should be used to help predict the clinical outcomes of kidney transplant recipients. But, while SVI and healthcare disparities are essential factors in clinical outcomes, further studies are needed to explore the etiologies for outcome differences.

**KEYWORDS:** paired donor, kidney transplant, psychosocial determinants, graft outcomes, SVI, social vulnerability index, healthcare equality

## 19. The Association of 0-antigen Mismatch with Graft Outcomes is Modified by Donor Race

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**ABSTRACT:** 0-ABDR antigen mismatch transplants are associated with better allograft survival, as better matching lowers the likelihood of allorecognition and rejection and reduces immunosuppression requirements. We hypothesize that patients of racial and ethnical minorities may benefit more from 0-ABDR antigen mismatch transplants, given possible systemic barriers to receiving adequate care, including immune surveillance and immunosuppressant medications. We assembled a cohort of 98,645 adult, single-organ, deceased-donor kidney transplants occurring between 2007 and 2016 in the United States. We examined time to allograft failure using Cox proportional hazards regression (treating death as a competing risk), including 0-antigen mismatch, recipient race (White vs non-White), and an interaction term. We stratified analysis by donor race (White vs Black).

Of the 98,645 total transplants, 83,986 used kidneys from White donors (51,295 White recipients, 32,691 non-White recipients) and 14,659 used kidneys from Black donors (6,304 White recipients, 8,355 non-White recipients). A total of 16,307 graft loss events (16.5%) occurred within a median follow up time of 5.61 years.

Figure 1 illustrates the main results. In the entire cohort, 0-antigen mismatch is associated with improved allograft survival (subproportional hazard ratio [sHR] 0.69). The effect of 0-antigen mismatch is more pronounced in White recipients (sHR 0.76 [95% CI 0.71-0.81]) compared to non-White recipients (sHR 0.88 [95% CI 0.78-0.99, p-value for interaction 0.04).

In transplants utilizing kidneys from White donors, the effect of 0-antigen mismatch is similar in White (sHR 0.79 [95% CI 0.73-0.85]) versus non-White recipients (0.85 [95% CI 0.73-0.99], p-value for interaction 0.38). In contrast, in transplants utilizing kidneys from Black donors, the effect of 0-antigen mismatch trends toward different in White (sHR 0.67 [0.43-1.05]) versus non-White recipients (sHR 0.95 [0.78-1.16], p-value for interaction 0.17).

Contrary to our hypothesis, we found that 0-antigen mismatch is associated with significantly less benefit in non-White recipients





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compared to White recipients when analyzing transplants from all kidney donors. Part of this effect may be mediated by donor race: White and non-White recipients seem to derive similar levels of benefit from 0-antigen mismatch kidneys from White donors. The effect from Black kidney donors is less clear but does not appear to provide as strong a protective effect. One explanation for this observation could be prevalence of high-risk APOL1 alleles in Black American donors, thus counteracting the protective effect of 0-antigen mismatch. These associations are also limited by the overall uncertainty around how race is labeled: whether self-identified or provider-identified, and lack of consistency regarding labeling of individuals who may identify as mixed race.

**KEYWORDS:** HLA Matching, Kidney Transplant Outcomes, Racial Disparities

## 20. Belatacept Use as a Salvage Immunosuppressive Agent in Liver Transplant Recipients

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**ABSTRACT:** Life-long use of immunosuppression is required after liver transplantation to preserve allograft function and prevent rejection. The current standard of care involves the use of a combination of four classes of maintenance immunosuppression drugs: calcineurin inhibitors, antiproliferative agents, mTOR inhibitors, and glucocorticoids. However, the use of these medications may be limited by adverse drug reactions or lack of clinical response, necessitating initiation of novel agents as salvage therapy.

Belatacept is a fusion protein that provides selective T cell co-stimulation blockade and has been shown to be an effective immunosuppressive agent in kidney transplant recipients. The BENEFIT study compared belatacept-based and cyclosporine-based immunosuppression regimens in renal transplant patients, showing higher patient and graft survival, higher mean eGFR, and minimal adverse effects in the belatacept-based group at 7 years post-transplant. These same benefits, however, have not been seen in liver transplant recipients. A phase II study was conducted in de novo adult liver transplant recipients comparing the use of belatacept and mycophenolate versus tacrolimus-based regimens. The study, however, was terminated early to increased

rates of death and graft loss in the belatacept group resulting in a black box warning cautioning its use in liver transplant recipients. Subsequently, a limited number of case studies have shown the successful and safe use of belatacept in liver transplant recipients as a renal sparing or salvage agent. This case series examines the use of belatacept as a salvage immunosuppressive agent in liver transplant recipients. We present three cases of adult patients with ongoing allograft rejection, who were treated with belatacept. Clinical information was obtained through retrospective chart review. Belatacept was reserved as a salvage therapy for recurrent and difficult to manage hepatic allograft rejection despite trials of multiple immunosuppressive agents. All patients responded favorably to belatacept therapy with improvement in liver chemistries and allograft function. Unfortunately, one person developed hemorrhagic cystitis, which limited further belatacept use and eventually led to chronic rejection and dysfunction of the allograft. Following this event, lower doses of belatacept were utilized at our center. In the subsequent two cases, allograft function normalized and no infectious or severe drug-related complications were observed. Our case series provides further evidence to support the use of belatacept as a salvage agent in liver transplant recipients with refractory or recurrent allograft rejection despite standard immunosuppressive regimens. High dose induction therapy should be used cautiously given the risk of complications. Further long-term prospective data is needed to confirm the safety of belatacept use in liver transplant recipients.

**KEYWORDS:** Belatacept, liver transplantation, steroid refractory rejection, salvage therapy

## 21. Racial and ethnic differences in transplant referral and evaluation start by dialysis facility assignment to Medicare's payment reform

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**ABSTRACT:** Medicare implemented the End-Stage Renal Disease Treatment Choices (ETC) model in 2021, randomly assigning ~30% of U.S. dialysis facilities to new financial incentives



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intended to promote transplantation and home dialysis. The ETC model's payment adjustments are calculated by comparing living-donor transplantation, transplant wait-listing, and home dialysis use between ETC-assigned and non-ETC-assigned control facilities. A novel Health Equity incentive additionally encourages participants to reduce socioeconomic disparities in these outcomes. We sought to determine whether timely access to referral and evaluation for transplantation—as well as racial and ethnic disparities in these outcomes—differed between ETC-assigned and control regions before the program's implementation. This cross-sectional study compared preintervention rates of 1-year referral and 3-month transplant evaluation among adults with incident end-stage kidney disease (ESKD) treated at ETC-assigned and control dialysis facilities in Georgia, North Carolina, and South Carolina from 2014-2018. Patients initiating treatment for ESKD between January 1, 2014 and December 31, 2018 were identified in the United States Renal Data System, and followed through December 31, 2019 for transplant evaluation referral or start using a linked data set corresponding data from all nine transplant centers in Georgia, North Carolina, and South Carolina. Among 729 dialysis facilities treating 52,404 adults with incident kidney failure in our sample, 281 (39%) facilities treating 21,050 (40%) patients were randomly assigned to ETC model participation. Among incident patients, 45% were female, 51% were non-Hispanic Black, 43% were non-Hispanic White, and mean (SD) age was 61 (14) years. One-year referral and 3-month evaluation start rates were 2.3 percentage point (8%) and 5.6 percentage point (34%) lower, respectively, among patients treated in ETC-assigned facilities than patients in control facilities. Overall differences in the crude odds of 1-year referral by patient race/ethnicity persisted in ETC-assigned (OR 1.70 for non-Hispanic Black vs. non-Hispanic white patients, 95% CI 1.59—1.82) and control facilities (OR 1.77, 95% CI 1.65—1.89), as did differences in the crude odds of 3-month evaluation start (OR 1.42 [95% CI 1.29—1.55] and 1.66 [95% CI 1.53—1.80] for non-Hispanic Black vs. non-Hispanic white patients in ETC-assigned and control facilities, respectively). ETC-assigned dialysis facilities in the Southeast U.S. had lower preintervention 1-year referral and 3-month evaluation start rates compared to control facilities. Racial/ethnic differences in these outcomes were greater in control regions. Future evaluations of the ETC Model must account for these preintervention differences to avoid biased estimates of the model's impact on disparities in access to transplantation.

**KEYWORDS:** Kidney transplant, renal transplant, transplant evaluation, Medicare payment reform, alternative payment models

## 22. Early Liver Retransplantation with Living Donor Allografts in Pediatric Recipients

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**INSTITUTIONS (ALL):** *University of Michigan, Center for Healthcare Outcomes and Policy, University of Michigan, Department of Surgery, University of Michigan, Department of Surgery*

**ABSTRACT:** Retransplantation using living donor allografts (re-LDLT) could increase timely access to retransplantation without decreasing the pool of donor organs. Prior work suggests re-LDLT is feasible, but little is known about re-LDLT in the United States, particularly in pediatric recipients. We performed a retrospective analysis of the incidence and outcomes of living donor allografts for pediatric patients requiring early liver re-transplantation within 30 days of their initial transplant. We identified all pediatric (<18 years) re-LDLT and retransplant using deceased donor allografts (re-DDLT) in the United States from 1/1/2000 to 6/30/2020 using UNOS/OPTN Standard Transplant Analysis and Research file. Variables extracted included recipient and donor demographics, primary diagnosis, indication for retransplantation, Model for End-Stage Liver Disease (MELD)/Pediatric End-Stage Liver Disease (PELD) score, graft type, graft and patient status, cause of graft failure and death. Early retransplantation was defined as retransplantation within 30 days of the prior liver transplant. Posttransplant graft and patient survival were estimated using standard Kaplan-Meier methods. Graft failure was defined as the earlier of retransplantation or death. There were a total of 52 (4.5%) pediatric re-LDLT compared with 999 pediatric re-DDLT in the United States from 1/1/2000 to 6/30/2020. There were 33 (62%) early pediatric re-LDLT and 425 (42%) early pediatric re-DDLT that occurred within 30 days of the previous transplant. The most common indication for primary transplant was biliary atresia for both early pediatric re-LDLT 15 (45%) and re-DDLT 181 (43%). MELD or PELD score at the time of transplant was a median of 21 (IQR 15-32) for early re-LDLT and 19 (10-28) for early re-DDLT and exception points were rare for both. The primary transplant was a living donor allograft for 4 (12%) of re-LDLT and 57 (13%) for re-DDLT. Graft failure was the most common reason for re-transplantation for early re-LDLT and re-DDLT. The second most common indication was primary non-function for early re-LDLT (10 (30%)) and hepatic artery thrombosis for early re-DDLT (108 (25%)). Median (range) follow-up in years after early pediatric re-LDLT was 6.6 (IQR 0.1-11.3) and 5.0 (IQR 0.3-10.7) for re-DDLT.



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For early pediatric re-LDLT, unadjusted patient survival was 82% at 30 days and 74% at 1 year, and unadjusted graft survival was 75% at 30 days and 60% at 1 year. For early pediatric re-DDLT, unadjusted patient survival was 86% at 30 days and 76% at 1 year, and unadjusted graft survival was 81% at 30 days and 70% at 1 year. Retransplantation with living donor allograft may represent a potential mechanism for early rescue for pediatric liver transplant recipients requiring early retransplantation. This study is limited by its retrospective nature and small cohort size. Further work is needed to identify recipient and donor characteristics that may guide optimal candidate selection practices and clinical decision-making for pediatric re-LDLT.

**KEYWORDS:** Pediatric transplantation, living donor liver transplantation, retransplantation, outcomes

### 23. Re-evaluating risk factors for ESRD in the African American transplant waitlist population

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**ABSTRACT:** In this study, we investigated the occurrence of two known risk factors for end-stage kidney disease, high-risk APOL1 variants, and diabetes mellitus, as well as one known risk factor for increased risk of development of chronic kidney disease, sickle cell trait, in our African American ESRD patient population to determine if there is an increased prevalence of these factors to assist in the identification of individuals at high risk for kidney failure. In our institution, we conducted a retrospective analysis and identified 97 African American ESRD patients waitlisted for kidney transplantation that had undergone genetic testing using a non-targeted panel of genes associated with kidney disease, Renasight. We also analyzed histological findings of a subset of this population who had previously had a native kidney biopsy. In our analysis, we observed three common factors that have a predilection for kidney disease in the majority of cases: diabetes mellitus (34.0%), high-risk homozygous/compound heterozygous APOL1 variants (38.1%), and sickle cell trait (13.4%). The prevalence of all three conditions was much higher than has been reported in the general population; collectively, these three factors represented 62.9% of the study population. Additionally, 39.2% of the study populations were identified through the genetic testing

as being positive for other genetic carrier traits associated with kidney disease. Of the 97 ESRD patients reviewed, only nine were absent of any common factors and were not identified as carriers. Notably, the prevalence of positivity for carrier traits in a population of related/unrelated potential living donors was considerably lower.

When analyzing the biopsy reports, a correlation between genotype and histology was not seen. However, we observed that the age range at the time of biopsy for individuals who were positive for high-risk APOL1 variants was narrower and younger than those who were negative for APOL1 high-risk genes. In over 50% of cases of ESRD, the cause of kidney failure is unidentified at the time of kidney failure. The development of kidney disease is thought to be multifactorial, and with widely available, more affordable genetic screening, we've been able to define an increasing number of risk factors. While none of these factors are predeterminants of kidney disease, the higher incidence of these factors combined with higher rates of kidney failure in the African American population is notable. Non-targeted genetic testing could assist in better identifying individuals with a higher risk of more rapid progression to kidney failure, especially when targeted towards those that already have some evidence of kidney dysfunction for earlier interventions and evaluation for transplantation.

**KEYWORDS:** African American, High-risk, Screening, Genetic Testing, Resource Utilization, Risk factors, Genomic Markers

### 24. Sequential Liver-Kidney Transplantation from the Same Living Donor in a Highly Sensitized Recipient

**AUTHOR(S) (FIRST NAME, LAST NAME):** Ibrahim Elali, Andrew Bentall, Timucin Taner

**INSTITUTIONS (ALL):** *Mayo Clinic, Mayo Clinic, Mayo Clinic*

**CASE REPORT:** Highly sensitized kidney transplant recipients continue to have the lowest rate of transplantation and longer waiting times due to immunologic barriers. In contrast, simultaneous liver-kidney transplantation (SLK) from the same deceased donor, can be performed in highly-sensitized patients without any antibody-targeting therapy. We have previously shown that in highly sensitized SLK patients, preformed DSA disappear within 4 months of the transplant, and the incidence of kidney allograft antibody-mediated rejection (AMR) is significantly lower compared to similarly sensitized solitary kidney transplant recipients [3]. Furthermore, the kidney allograft function is





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preserved in the SLK patients in the long-term [3]. Here, we present a unique case of sequential liver-kidney transplantation in a highly sensitized recipient from the same living donor, with demonstrable decline of DSA overtime, and normalization of flow cytometric cross match.

"56-year-old white female with history of end stage renal disease in the setting of diabetic nephropathy, found to have liver cirrhosis during pre-kidney transplant workup. The liver disease was complicated by portal hypertension, gastric antral vascular ectasia, splenomegaly and pancytopenia. Bone marrow biopsy showed slightly hypocellular bone marrow and slightly increased erythropoiesis, otherwise unremarkable. Model for end stage liver disease sodium score was 22. Patient underwent a right lobe living-donor liver transplant from daughter. Induction therapy consisted of CD25 monoclonal antibody, and methylprednisolone, followed by a protocolled prednisone taper. Post liver transplant course was complicated with *Enterobacter cloacae* bacteremia, and anemia requiring blood transfusion. She has a history of hypertension, diabetes mellitus Type II for 7 years, and chronic NSAIDs use. kidney biopsy showed evidence of severe arteriosclerosis, arteriolar hyalinosis, with extensive global sclerosis. She was on renal replacement therapy for 7 years. Patient received a kidney transplant approximately 14 months post liver transplant from same donor. Post-transplant hospital course was uncomplicated, with day 3 post-transplant serum creatinine reached a nadir of 0.64 mg/dL. Prior to kidney transplant patient immunosuppressive therapy consisted of mycophenolate mofetil of 1 g every 12 hours and tacrolimus adjusted to trough goal of 6-8. Kidney transplant induction therapy consisted of CD25 monoclonal antibody and methylprednisolone, protocolled prednisone taper, followed by maintenance therapy with mycophenolate mofetil and tacrolimus adjusted to trough goal of 8-10 first 30 days, then 6-8 afterward. Donor with no prior history of organ transplant. History of multiple pregnancies.

### Donor and recipient immune characteristics:

Donor is a 28-year-old female. Human leukocyte antigen (HLA) typing showed a mismatch of 5/10 (Fig.1). Prior to liver transplant, Flow cytometric cross match revealed B and T-cell positivity, with calculated panel reactive antibody frequency (cPRA) of 100 %. Repeat serial cytometric cross match trended toward negative values as early as 3 days post liver transplant (Figure 2). Donor specific antibody (DSA), single antigen bead, by mean fluorescence intensity (MFI) showed similar drop in levels. At the time of kidney transplant, flow cytometric cross match testing resulted B/T cell negative, still with cPRA of 100 %, yet DSA by MFI significantly lower than around liver transplant (Fig.3,4).

Rapid HLA specific antibody depletion by an allogenic liver is a well described phenomenon, but serological changes during the immediate post-transplant period still not well described to our knowledge. Neutralization of circulating DSA is likely donor specific. Ramon et al reported a case of SLKT with clearance of all DSA 4 days post-transplant, but due to primary nonfunctional liver the patient received a second liver transplant, which resulted in the re-emergence of high DSA levels refractory to treatment and leading to AMR and kidney allograft failure [1]. Daly et al described a heart after liver transplantation in highly sensitized 7 patient case series with median cPRA of 77 %, and near elimination of circulating DSA post-transplant. 5/7 patients experienced mild T Cell mediated rejection, 2/7 mild antibody mediated rejection (ABMR), and 2/7 mild cardiac allograft vasculopathy, yet none of the patients experienced any hyperacute rejection or primary cardiac allograft failure, median follow up period of 48 months (14-100 months) [2].

In a study by Taner et al, comparing SLK to solitary kidney transplant. SLK transplant recipients had a lower overall tendency to circulating CD8+, activated CD4+, effector memory T cells, interferon gamma producing alloreactive T cells, as well as lower T cells proliferative response to the donor cells compared to solitary kidney transplant recipients. Those above-mentioned immune responses were equally observed in solitary liver transplant recipients, hence leading to a donor-specific hypo-alloresponsiveness [3]. Additionally liver derived mesenchymal stem cells may contribute to the liver tolerogenic effect, by its ability to inhibit alloreactive T cell proliferation, also influencing gene expression associated with immune regulation, further contributing to favorable immune milieu in multiorgan highly sensitized transplant population [4].

In this case report we observed a steady decrease in class I and II DSA. It was associated with significant change in median channel shift as early as 3 days post liver transplant and normalization of flow cytometric crossmatch. The immune tolerance was sustained for more than a year post liver transplant and prior to the kidney transplant, despite patient not receiving a T cell depletion induction agent. The patient had immediate evidence of good kidney function post-transplant with good urine output and normalization of serum creatinine to 0.64 mg/dL in just 3 days post-transplant. We believe kidney after liver transplant from the same donor in this highly sensitized patient will provide better kidney allograft outcome long-term, and less probability of both T-cell-mediated and antibody-mediated rejection, as compared to kidney alone transplant, or kidney after liver from different donors. The protective effect of the liver allograft is likely contingent to the level of liver function. Furthermore, as it was previously described the incidence of chronic subclinical inflammation in the kidney



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allograft is less with simultaneous liver transplant and concur a favorably preservation of kidney allograft function [3].

It is a first case report of a highly sensitized patient receiving a kidney after liver transplant from same donor, which will provide further insight into the liver immune influence, and its ability to positively impact and manipulate the immune system expression, leading to better overall graft survival.

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## 25. Post-transplant Thrombotic Microangiopathy: A Miraculous Outcome with Eculizumab and Belatacept

**AUTHOR(S) (FIRST NAME, LAST NAME):** Maria Christina Victoria Capistrano, Daniel Corning, Krishna Agarwal

**INSTITUTIONS (ALL):** *Tufts Medical Center, Tufts Medical Center, Tufts Medical Center*

**CASE REPORT:** Post-transplant TMA is a rare but devastating complication, often resulting in graft loss. Calcineurin-inhibitors, antibody-mediated rejection and complement pathway

mutations are commonly implicated but the diagnosis is often challenging. We present a case of TMA highlighting these diagnostic challenges. A 57-year-old woman with ESKD from reflux nephropathy (spina bifida) underwent her 3rd deceased donor kidney transplant (prior grafts failed from chronic AMR, cPRA 100%, KDPI 1%, rATG for induction and tacro/MMF/pred maintenance), complicated by delayed graft function. On post-op day 6, she developed microangiopathic hemolytic anemia, thrombocytopenia, and a kidney biopsy with focal TMA, 10% cortical necrosis, and negative C4d. HLA testing revealed persistent preformed low-level B44 and new Bw4 DSAs (MFI 3537). Plasmapheresis x 5, IVIG and rituximab were employed for AMR and tacrolimus was switched to cyclosporine. A repeat biopsy on day 14 for persistent DGF revealed diffuse TMA with 50% cortical necrosis and negative C4d/SV40. DSAs were at lower levels. Eculizumab was started and cyclosporine switched to sirolimus. MMF was switched to azathioprine for severe diarrhea, but this caused severe pancytopenia. Antimetabolites were stopped and she started belatacept 5 weeks post-transplant. She made urine shortly thereafter and came off dialysis by week 6. An aHUS panel returned with CFH mutation. She continues belatacept, eculizumab and prednisone (5mg daily) with creatinine 1.2 (eGFR 50), now 100 days post-transplant. We present a challenging case with multiple causes of TMA acting in combination on a background of CFH gene mutation. While eculizumab is commonly used for complement-related TMA, experience with belatacept is limited. The treatment of calcineurin-inhibitor induced TMA is withdrawal of the offending agent but there may be refractory cases like ours. A regimen of belatacept and the mTOR inhibitor, sirolimus, resulted in rapid improvement in graft function in our patient. While AMR was probably contributing to the TMA, treatment with lowering of DSA levels did not immediately improve graft function. Testing for complement pathway mutation is not readily available and has a long turnaround time. But this should not deter physicians from sending this as it is a valuable guide for continued use of eculizumab. Post transplant TMA is a rare complication which requires prompt and accurate evaluation. The use of belatacept and mTOR inhibitors, as well as eculizumab, has been shown to rapidly reverse renal allograft dysfunction.

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## 26. Normothermic machine perfusion and donation after cardiac death: expanding the organ pool for liver retransplantation

**AUTHOR(S) (FIRST NAME, LAST NAME):** Kayla Kumm, Brianna Ruch, Chi Zhang, Amit Mathur

**INSTITUTIONS (ALL):** *Mayo Clinic, Mayo Clinic, Mayo Clinic*

**CASE REPORT:** Repeat liver transplantation has been a controversial topic for many years. Although multifactorial, historical graft and patient survival outcomes were significantly lower than primary liver transplant recipients (1). Recent literature has found that, with careful donor and recipient selection, retransplantation recipient outcomes have improved. (2,3).

A late (> 1month after transplant) repeat liver transplant is often technically challenging with a more complex reconstruction than previous. Adhesions and scarring from prior dissection often result in difficult and tedious hepatectomy. Existing vascular anastomosis may limit the surgeon's choices for vascular reconstruction and lead to need for extension grafts or conduits. Finally, a prior liver transplant will often influence the choice for biliary reconstruction, with many surgeons opting for a choledochoenterostomy rather than a choledocho-choledochostomy. Anecdotally, blood loss may be higher with greater shifts in hemodynamics (4, 5).

In order to minimize graft and recipient loss in retransplantation, donor selection has been deemed of increased importance to optimize chances of success (6,7). Classically donation after cardiac death (DCD) allografts have resulted in inferior outcomes in patients with greater disease severity and those undergoing retransplant. Increased cold ischemia time is associated with increased risk of graft failure as well (8). For these reasons and others, usually DCD allografts are not considered for retransplantation candidates. The strict donor criteria for retransplantation candidates leads to increased wait times as the donor pool is significantly decreased (6).

More recently, the use of normothermic machine perfusion (NMP) has been evaluated in utilization of high risk allografts or in the use of allograft storage for high risk recipients with acceptable outcomes (9). It has been shown to decrease post-reperfusion syndrome, ischemia-reperfusion injury, ischemia-type biliary lesions (10, 11, 12).

In this case we describe the utilization of normothermic machine perfusion in the preservation of a DCD allograft transplanted into a repeat liver transplant recipient.

### Recipient

57 year old male with allograft dysfunction after deceased donor liver transplant approximately 6 months previously. Allograft failure etiology unclear but manifested by early severe cholestasis despite unobstructed biliary tree and patent vasculature. At the time of re-listing for transplantation he had also developed portal hypertension with refractory ascites and subclinical encephalopathy. At the time of his second transplant, patient's MELD-Na was 19 (Serum Creatinine 1.0 mg/dL, Serum Sodium 136 mmol/L, Bilirubin 8.1mg/dL, INR 1.3).

Patient has a history of primary sclerosis cholangitis with resulting cirrhosis. Prior to his first liver transplantation his MELD-NA score was 22. His functional status was excellent. First liver allograft was a donation after brain death allograft with 9 hours of cold ischemia time. His primary liver transplant reconstruction included piggyback caval anastomosis, donor common hepatic artery to recipient proper hepatic artery, portal vein to portal vein anastomosis and a choledochoduodenostomy.

### Donor

The donor was a 55 year old female who suffered cardiopulmonary arrest after asphyxiation. Her neurological prognosis was poor and family elected to proceed with donation after cardiac death. Past medical history included hypertension. Donor's body mass index was 34. After withdrawal of life support, warm ischemia time was 23min. Liver anatomy was conventional. The liver was recovered by our Mayo Clinic transplant team and placed on the OCS normothermic machine perfusion device. During machine perfusion the allograft's lactate downtrended appropriately and bile was produced.

### Intraoperative

During our patient's retransplantation, significant adhesions were noted which increased the difficulty and length of the operation. Allograft reconstruction included repeat piggyback caval





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anastomosis, portal vein to portal vein reconstruction, and donor common hepatic/splenic branch patch to recipient common hepatic/gastroduodenal branch patch anastomosis. The team elected to perform a repeat choledochoduodenostomy after oversewing the transected end of the prior allograft common bile duct.

The total cold ischemia time (cross clamp to portal vein reperfusion) for the allograft was 17 hours and 36 minutes with 13 hours and 22 minutes of normothermic machine perfusion. Intraoperative transfusion requirements included 19 units of packed red blood cells and 6 units of fresh frozen plasma.

### Post operative course

Post-operatively the patient initially did very well. He was extubated and off vasopressor support within 12 hours. Peak postoperative aspartate aminotransferase (AST) was 535 u/L, alanine aminotransferase (ALT) was 223 u/L. His bilirubin peaked on post operative day 1 and then downtrended appropriately. He developed Prevothella bacteremia requiring a course of piperacillin-tazobactam. He was discharged to home on post operative day 9.

On post operative day 22 he was noted to have an elevated alkaline phosphatase to >1000u/L with mild elevations in his AST/ALT and total bilirubin (1.3 mg/dL). He subsequently underwent percutaneous liver biopsy (revealed moderate acute cellular rejection) and endoscopic retrograde cholangiogram which revealed anastomotic stricture (balloon dilated and stented for treatment).

Approximately 2 months after transplant a stenosis of the portal vein was noted to be worsening with increasing velocities up to 205cm/s. This was successfully dilated and stented by our interventional radiology colleagues with normalizations portal vein velocity after the procedure.

Since then, the patient's biliary stent has been removed with no residual stenosis. He is continuing to do well at home and is >6 months post retransplantation. "This case demonstrates the use of NMP for storage of a DCD liver allograft which was transplanted into a second time liver recipient. The use of NMP in this scenario helped the transplant team in several ways to successfully achieve retransplantation. Our experience with NMP has greatly increased our institutions comfort in utilizing DCD allografts with longer transportation times and subsequent cold ischemia times, increasing our donor pool. In addition, by utilizing NMP, our team was not under pressure to complete the hepatectomy as quickly as possible to minimize ischemia time, instead it can be done more meticulously if the patients physiology allows because the allograft is not in cold storage. Finally, the operation can be timed to take

place when additional help is readily available, such as during the midmorning (as in this case) or afternoon, rather than overnight.

In high risk recipients who have already suffered one graft failure, the risk of subsequent complications after retransplantation can be very intimidating to both the patient and the care team. The lowered risk of post-reperfusion syndrome and ischemic-type biliary lesions when utilizing NMP also can increase providers sense of comfort with utilizing a marginal graft such as a DCD liver. Normothermic machine perfusion may prove to be a valuable tool to increase the utilization of marginal allografts (such as deceased after cardiac death donors) in the transplantation of higher risk recipients. It offers several benefits over static cold storage in the setting of retransplantation, especially decreased urgency to achieve reperfusion, lessened post-reperfusion hemodynamic instability, and shortened duration of coagulopathy.

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## 27. Cause of elevated pancreatic enzymes in pancreas after kidney transplant recipient-a diagnostic dilemma

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**CASE REPORT:** Pancreas and kidney transplantation in patients with end-stage kidney disease related to type 1 diabetes mellitus helps to improve the quality of life and provides insulin independence[1]. Pancreas graft rejection can occur early on or several years post-transplant. There is a lack of specific biomarkers to help detect rejection in the pancreatic allograft, and graft biopsy remains the gold standard. However, comfort with the interpretation of pancreatic biopsies and application to patient care vary over different centers, as is the clinical experience with the procedure. Elevation in pancreatic enzymes, although suspicious for rejection, is not pathognomonic, and alternate diagnosis needs to be ruled out[2]. Here we present a 48-year-old male patient with pancreas after kidney (PAK) transplant who had asymptomatic elevations in amylase and lipase due to reflex pancreatitis caused by constipation from diabetic gastroparesis.

A 48-year-old male with a past medical history of end-stage kidney disease secondary to type 1 diabetes mellitus status post-living related kidney transplant in 2011 and pancreas transplant in 2013,

hypertension, chronic diarrhea needing daily Imodium, small bowel obstruction in 2015 requiring surgery for omental band adhesions to pancreas graft was being followed in the outpatient clinic on a regular basis. His baseline immunosuppression regimen included tacrolimus with a goal trough of 5-7 ng/mL and mycophenolate mofetil 500 mg twice daily. His renal allograft function was stable, with creatinine ranging around 1.7-1.8mg/dl and no proteinuria. He did not need any insulin, and pancreatic graft function was stable too. His post-transplant course was unremarkable, apart from the development of chronic diarrhea shortly after his kidney transplant due to ongoing autonomic neuropathy related to type 1 diabetes.

He presented to the outpatient clinic in December 2021 with acute kidney injury, creatinine up to 3mg/dl in the setting of hypotension, worsening diarrhea, poor appetite, and weight loss necessitating admission. He was found to be COVID-19 virus positive, and his tacrolimus levels were found to be elevated up to 14ng/ml. He responded well to supportive therapy and was discharged after 5 days. His antimetabolite was put on hold, and tacrolimus dose was reduced.

During the post-discharge follow-up, his lipase was elevated to 2,641, and amylase was 422, despite having no abdominal symptoms (Figure 1). His endocrine function remained intact, as reflected by normal glucose, HbA1C, and a C peptide level. Renal allograft function remained at baseline. He was hospitalized again for urgent evaluation of pancreatic graft rejection being post-COVID and maintained on monotherapy with tacrolimus. A Donor specific antibody (DSA) testing revealed Class II DSA with MFI up to 20,000. CT abdomen without contrast showed edematous appearance of the transplant pancreas with trace peripancreatic edema and moderate colonic stool burden (Figure 2 A and B). Pancreatic allograft biopsy was not feasible due to anatomical difficulty due to bowel loops precluding a safe window. The renal biopsy did not show any signs of rejection and was considered low yield in the setting of PAK. The decision was made to empirically treat him for both cell-mediated and antibody-mediated rejection of pancreas allograft with plasmapheresis, intravenous immunoglobulin, rituximab, and 3 doses of thymoglobulin, in the absence of a biopsy, just based on the serological elevation of pancreatic enzymes, elevated DSA and imaging. Baseline immunosuppression was increased. Imodium was stopped, and a bowel regimen was initiated with the aim of 3-4 bowel motions a day. Following hospitalization, the patient remained asymptomatic and stable. Repeat CT abdomen without contrast showed stable pancreatic morphology with reduced stool burden. He was discharged home with a plan for weekly serial monitoring of endocrine and exocrine pancreatic function. Amylase and lipase levels normalized in 1 month and 2 months post-discharge,



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respectively. Of note, C-peptide, hemoglobin A1c and glucose levels were within normal limits during the entire hospital course and post-discharge follow-up.

- It is unclear if COVID infection can elicit damage to allograft in the setting of reduced immunosuppression via triggering immunological processes[3]. No clear-cut guidelines for the treatment of pancreatic graft rejection exist, and generally, anti-T and anti-B cell therapies are used together. Assessing functional pancreatic allograft reserve by checking fasting glucose levels or HbA1c and C-peptide prior to initiating anti-rejection therapy is paramount[2].
- While pancreas allograft biopsy is considered the gold standard for the diagnosis of pancreas allograft rejection, the risk of complications may be higher compared to kidney allograft biopsy[4]. Pancreatic biopsies may not be done in many centers due to risks involved, like pancreatic leaks and the need for pancreatectomy.
- No clear-cut biomarkers exist to guide therapy in dual organ transplants like PAK. Elevations in Amylase and lipase are nonspecific for pancreas allograft rejection.
- Empiric treatment for rejection, although done rarely, based on the elevation of enzymes and DSA, is still an option.
- Using the kidney as a sentinel organ in PAK or SPK can be misleading, and generally, there can be significant discordance between kidney and pancreatic allograft biopsy findings.
- Coexistent non-immunological causes need to be identified with the aid of imaging which helps with management.

Pancreatic biopsy remains the gold standard for diagnosing rejection episodes related to pancreatic allografts. However, not all centers have the expertise and comfort levels to perform such interventions associated with high complication rates calling for a rare event for empiric treatment with anti-rejection therapies[5]. Alternative diagnoses related to anatomy and previous risk factors must be investigated carefully while managing such complex patients. Effective communication between surgical and nephrology teams is always important for better patient outcomes.

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## 28. Belatacept as a CNI-Sparing Agent After Lung Transplantation: Graft Function, Acute Cellular Rejection, and Antibody-Mediated Rejection

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**ABSTRACT:** Calcineurin inhibitors (CNIs) remain the foundation of the immunosuppressive regimen used after lung transplantation. However, they have been linked to significant nephrotoxicity leading to chronic kidney dysfunction and other undesirable side effects that may require drug modification or withdrawal, leaving lung transplant recipients (LTRs) without well-studied therapeutic options. Belatacept is an immunosuppressive drug that is a selective T-cell costimulation antagonist that binds to the CD80 and CD86 receptors on antigen-presenting cells, preventing them from binding to the corresponding CD28 T cell receptors. This inhibits cellular signaling, which reduces cell division and cytokine release in response to antigen presentation. Belatacept





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has been extensively studied and approved for use in renal transplantation to stabilize renal function; however, data for its use in lung transplantation are limited. We aimed to describe how patients at our center responded to belatacept as a renal-sparing agent while sustaining allograft function after CNI failure. Following IRB approval, a secure institutional database was searched for clinical data and outcomes of LTRs who received belatacept and were followed for 12 months. Patients were evaluated clinically and with laboratory tests at 1 month, 3 months, 6 months, 9 months, and 12 months after starting belatacept. The primary outcomes were the incidence of acute cellular rejection (ACR) and antibody-mediated rejection (AMR) and improvement and stabilization of renal function in the year after initiation of belatacept. Secondary outcomes included chronic rejection and death. At our facility, 30 patients who transitioned from a CNI-based immunosuppressive regimen to one based on belatacept with lowering CNI goal levels starting in 2019 were reviewed. Ten patients were excluded: 4 for viremia or sepsis-related deaths, 3 for worsening renal function/renal failure requiring discontinuation of belatacept and hemodialysis, 2 for early 12-month mortality, and 1 for insufficient follow-up. Belatacept was initiated in 95% of our patients mainly for worsening renal function and in 5% for thrombotic microangiopathy. The mean creatinine level was 2.25 mg/dL at the start of belatacept treatment and 2.36 mg/dL at one month and then declined at 3 months (2.11 mg/dL), 6 months (1.94 mg/dL), 9 months (1.99 mg/dL), and 12 months (1.87 mg/dL) before stabilizing. At the time belatacept was started, the mean FEV1 and FVC were 2.2 and 2.7 liters, respectively. At month 1, 3, 6, 9, and 12, the FEV1 and FVC was 2.3 and 2.8 liters, 2.1 and 2.7 liters, 2.2 and 2.8 liters, 2.2 and 2.7 liters, and 2.1 and 2.7 liters, respectively. Only 1 patient experienced AMR, and no instances of acute cellular rejection occurred within a year of the start of belatacept treatment. None of the included patients had evidence of chronic rejection or died in the year after initiation of belatacept. We continue to follow them. To our knowledge, this is the largest cohort to date using belatacept as a CNI-sparing agent without deterring graft function with respect to lung function or evidence of ACR and AMR. Stability of renal function was achieved in the cohort. The effects of belatacept on bone marrow suppression and incidence of infections form the basis for our ongoing research efforts. In the interim, we continue to use belatacept at our center as a part of our regimen with acceptable outcomes, further increasing our cohort sample. On-going analysis will help us further understand the effects of this drug in lung transplant recipients.

**KEYWORDS:** Belatacept, chronic kidney dysfunction, acute cellular rejection, antibody-mediated rejection

## 29. Predicting Poor Survival and Postoperative Complications After Re-Do Lung Transplant in Patients With Lower KPS and Higher LAS Scores—A Single Center Experience

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**ABSTRACT:** Re-do lung transplant (LTx) is a treatment option for post-transplant allograft dysfunction refractory to available medical treatments; however, it is associated with poor survival and multiple postoperative complications including prolonged hospital stays, greater need for tracheostomy, longer ventilator weaning, recurrent hospital admissions, and longer rehabilitation compared with primary LTx, underscoring the need to identify prognostic factors in recipient selection.

Several studies have reported poor survival and higher pulmonary complications with re-do LTx [1, 2, 3], hence ethical and logistical issues have been raised about allocating scarce donor organs for re-transplantation. Several studies have been published in an attempt to address this issue by establishing that the Karnofsky Performance Status (KPS) and Lung Allocation Score (LAS) prior to re-do LTx can predict poor postoperative outcomes and survival in re-do LTx recipients. As a higher volume LTx center catering to higher risk recipients, we have observed that most patients with a low KPS score who received re-do LTx had higher mortality and fared worse than those with a low KPS who underwent primary LTx. In this study, we aimed to describe our center's experience with re-do LTx by evaluating the ability of KPS or LAS, or both, prior to re-do LTx to predict postoperative mortality and pulmonary complications and help improve scarce organ allocation." After receiving IRB approval, we conducted a single-center retrospective review of all adults who underwent re-do LTx between 2015 and 2020. The hospital's electronic medical records system was used to retrieve patient data, which was then used to assess patient outcomes until 2022. The KPS and LAS prior to re-do LTx was compared to length of hospital stay, number of postoperative readmissions for



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pulmonary complications including infection, need for postoperative tracheostomy with prolonged recovery, and length of postoperative physical rehabilitation potential. A Cox regression model was fit to evaluate survival in re-do LTx recipients with low and intermediate KPS scores and high LAS prior to re-transplantation. From 2015 to 2020, we assessed 25 re-do LTx patients from our database and followed them for postoperative pulmonary complications and mortality until 2022. Most patients at our center required re-do LTx due to primary graft failure or recurrent acute cellular rejection leading to graft failure with rapid progression to graft dysfunction. KPS was divided into 3 groups: 10-40% (low score, most frail), 50-70% (intermediate status), 80-100% (best functional status). The mean LAS was 70.1% in the low KPS category and 53% in the intermediate KPS category. None of our patients scored between 80% and 100% on the KPS scale prior to re-transplantation. In all re-do LTx patients, the mortality rate was 48%. Re-do LTx postoperative pulmonary complications and mortality were higher in those with a KPS score of 10-40% (75% and 50%, respectively) than in those with an intermediate score of 50-70% (70% and 47%, respectively) with reproducible results in the high LAS group (77.8% and 55.5%, respectively). We also discovered that 83% of our patients who underwent re-do transplantation for primary graft failure within 1-2 years of their primary LTx had a lower KPS and higher LAS with poor postoperative outcomes and survival, thus correlating poor functional status and higher LAS score (sicker)

with worse outcomes, adding to the risk profile of these recipients. Despite having a cohort of only 25 patients, our results show that a lower functional status prior to re-do LTx, higher LAS score depicting the degree of sickness, and time from primary LTx are strong predictors of poor outcomes after re-do LTx. Furthermore, we are now including additional frailty scoring with the Short Physical Performance Battery as a part of our pre-lung transplant evaluation prior to the multi-disciplinary board decision to move forward with listing if the candidate is deemed suitable for a re-do LTx.

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**KEYWORDS:** Re-do lung transplant; lung allocation score; Karnofsky Performance Status

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## Satellite Lunch Symposium Sponsored by Natera

### Monitoring Kidney Transplant Recipients: Donor-derived Cell-free DNA (dd-cfDNA) and DSA Can Help Improve Prediction of ABMR

Saturday, February 25 | 1:00-2:15 PM | Westin Kierland Hotel, Trailblazers A/B



**Milagros Samaniego-Picota, MD**  
Henry Ford Health



**Tarek Alhamad, MD, MS, FACP, FASN**  
Washington University School of Medicine



**Emilio Poggio, MD**  
Cleveland Clinic



**Yasir Qazi, MD**  
Keck Medicine of USC

Principal investigators of the Trifecta Study will share results that demonstrate how donor-derived cfDNA (dd-cfDNA) can optimize the utility of DSA in predicting ABMR. Case studies will showcase how physicians incorporate Prospera™, a dd-cfDNA transplant rejection assessment and Renasight™, a kidney gene panel, into routine practice to improve the management of kidney transplant patients.

#### Session Objectives:

- Review the latest data on how dd-cfDNA can optimize the utility of DSA in predicting ABMR.
- Gain insight into how transplant nephrologists are utilizing both fraction and estimated amount of dd-cfDNA for routinely monitoring their kidney transplant patients.
- Learn how genetic testing for chronic kidney disease can impact the success of kidney transplants.

This is not an official function of the CEoT meeting and is not endorsed by the AST. Lunch will be provided by AST.

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