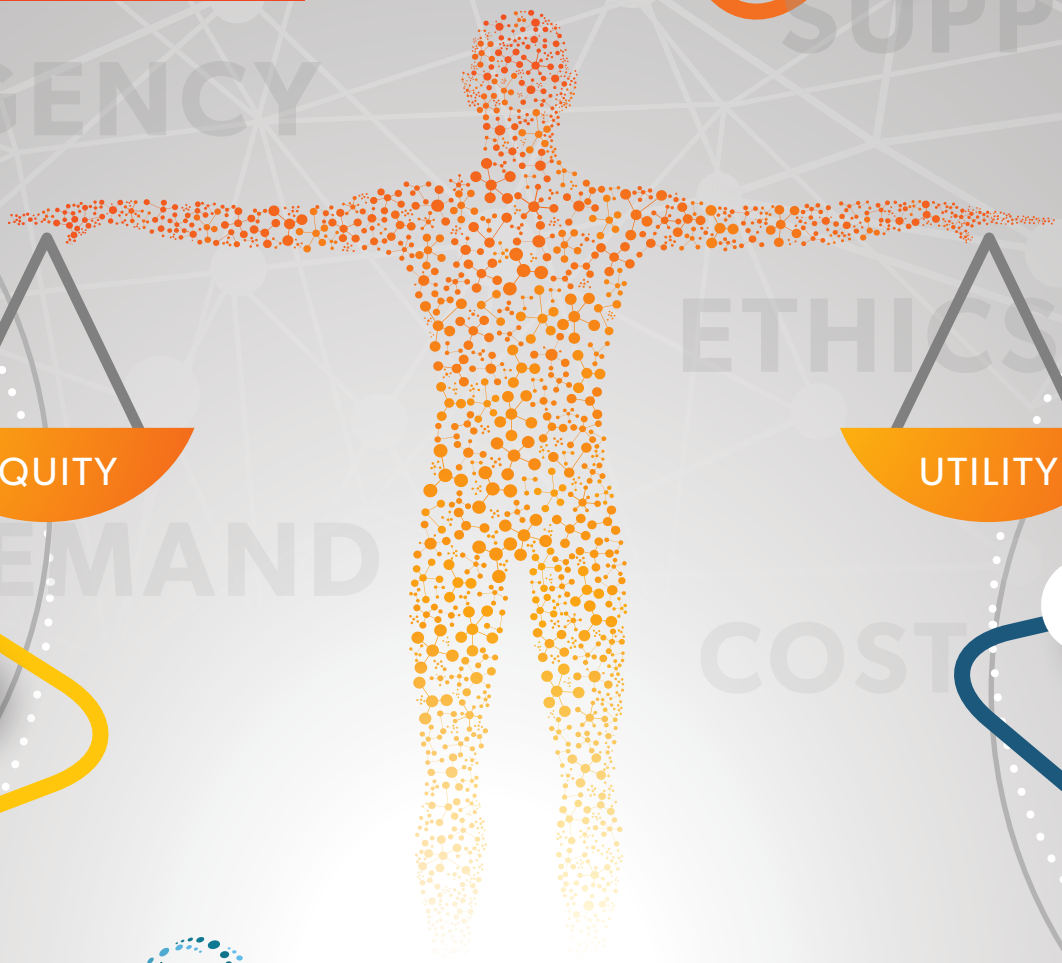
AST | AMERICAN SOCIETY OF TRANSPLANTATION

PROGRAM



CEOT

CUTTING EDGE OF TRANSPLANTATION

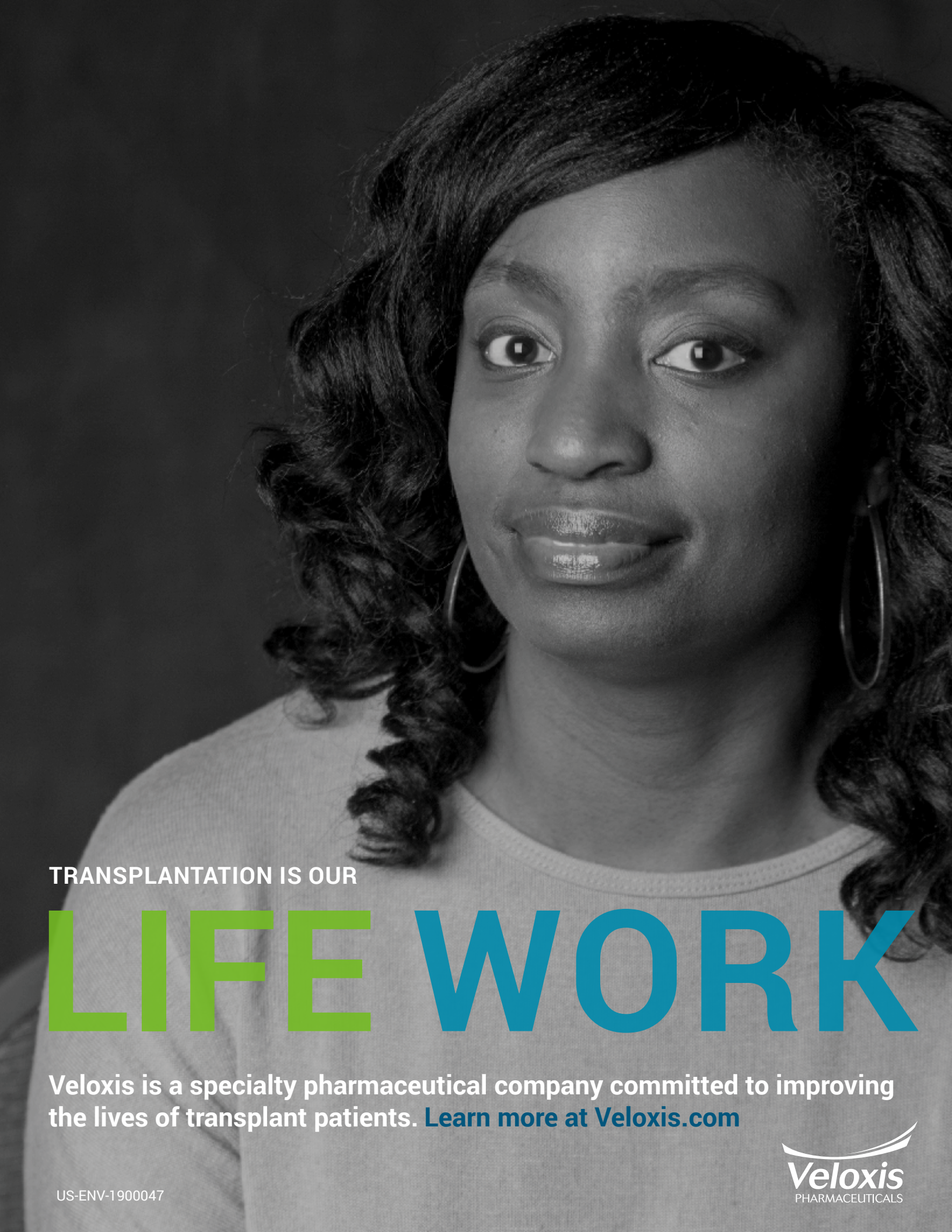
TRANSPLANT SUMMIT 2020

BALANCING EQUITY AND UTILITY IN THE FACE OF AN ORGAN SHORTAGE

March 5–7, 2020 | Arizona Biltmore | Phoenix, AZ

Name: _____

For more information, visit **www.myAST.org/meetings**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GENERAL INFORMATION

Registration and Badge Pick-Up

Location: Frank Lloyd Wright Foyer

Wednesday. . . . . 5:00 pm – 7:00 pm
Thursday . . . . . 8:00 am – 6:00 pm
Friday . . . . . 7:30 am – 4:30 pm
Saturday . . . . . 7:30 am – 3:00 pm

Exhibits (Posters and Industry Displays)

Location: Frank Lloyd Wright Foyer and Salon G-J

Thursday . . . . . 3:30 pm – 4:00 pm
6:00 pm – 7:30 pm
Friday . . . . . 4:30 pm – 6:00 pm

Meals and Receptions Included

Breakfast: Friday and Saturday

A continental breakfast will be provided by the AST during the Product Theaters on Friday and Saturday morning from 7:30 AM – 8:30 AM. Please join us in the Gold Room located in the Main Building, near Guest Check-In.

Lunch: Thursday through Saturday

Lunch will be provided by the AST during the luncheon symposia.

Dinner: Thursday Evening

Dinner will be provided by the AST during the dinner symposia.

Receptions

Thursday 6:00 PM – 7:30 PM, Poster Walk 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 4:30 PM – 6:00 PM, Closing Reception

Conclude your CEoT experience with your colleagues by winding down in the Citrus Pavilion located in the Main Building.

**Breaks will also be provided throughout the meeting. Please visit the hotel concierge or the AST registration desk for dining suggestions on Friday evening.*

Wi-Fi

Network Name: AZB Meetings
Password: ast2020

Name Badge

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

2020 CEOT MEETING SUPPORTERS

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THURSDAY, MARCH 5

12:30PM – 1:45 PM **Satellite Lunch Symposium Presented by One Lambda Inc., A Thermo Fisher Scientific Brand†**
Frank Lloyd Wright Salon EF
This is not an official function of the CEoT meeting and is not endorsed by the AST.

1:45 PM **Cutting Edge of Transplantation Welcome Remarks**
Frank Lloyd Wright Salon EF
Michelle Josephson, MD and Josh Levitsky, MD, MS

2:00 PM – 3:30 PM **Session 1 — Setting the Stage: Equity, Utility, NOTA and the OPTN Final Rule. How OPTN Policy Development Works… and How it Doesn't***
Frank Lloyd Wright Salon EF
Moderators: Ken Newell, MD, PhD and Dave Foley, MD, FACS, FAST, FASSLD

2:00 PM Ethics of Allocating a Scarce Resource: OPTN Legal and Regulatory Framework
Glenn Cohen, JD

2:20 PM History of OPTN Policymaking and Current Structure
Maryl Johnson, MD

2:40 PM What Has Happened the Last Five Years to Undermine the Public-Private Partnership
Stuart Sweet, MD, PhD

3:00 PM Panel discussion

3:30 PM – 4:00 PM **Break**

4:00 PM – 6:00 PM **Session 2 — Equity**
Select One of Four Sessions*

OPTION 1 **Liver: Is Sickest First the Right Approach?**
Conference Center - Flagstaff
Moderator: David Goldberg, MD, MSCE

4:00 PM How to Define Success of a Liver Transplant
Carl Berg, MD, FAASLD

4:20 PM Sickest First Priority Should Continue
Jack Lake, MD

4:40 PM Focus on Utility: Maximizing Long-Term Survival
Jorge Reyes, MD

5 :00 PM Survival Benefit: Optimal Balance of Sickness and Utility
David Goldberg, MD, MSCE

5:20 PM Should We Continue to Prioritize SLK Over KTA Recipients
Sumeet Asrani, MD, MSc

5:40 PM Panel Discussion

OPTION 2 **Kidney: Equity in Kidney Transplantation: Past, Present, and Future**
Frank Lloyd Wright Salon EF
Moderators: John Gill, MD, MS, FAST and Jesse Schold, PhD

4:00 PM Defining Equity — How are Disparities and Equity Defined in Transplantation?
Darren Stewart, MS

CONTINUED ON NEXT PAGE ⇢

*Continuing education credit offered. See separate packet.
†No continuing education credit offered.

THURSDAY, MARCH 5 *SESSION 2 — EQUITY (CONT'D.)*

OPTION 2 *Kidney (Continued)*

4:20 PM How Have Allocation Policies Addressed Disparities in Transplantation and Where Do Opportunities Still Lie?
Jayme Locke, MD, MPH, FACS, FAST

4:40 PM Effect of Hep C Treatments on Access to Transplantation and Equity to HEP-C + and - Candidates
Bonnie Lonze, MD, PhD

5:00 PM Organ Offers and Utilization — Would Greater Transparency Improve Equity?
Sumit Mohan, MD, MPH

5:20 PM Interventions to Attenuate Inequities in Access to Transplantation
Jim Rodrigue, PhD, FAST

5:40 PM Panel Discussion

OPTION 3 **Heart: In Pursuit of Equity in Heart Transplantation — Charting a Narrow Path**
Frank Lloyd Wright Salon AB
Moderators: Jon Kobashigawa, MD and Shelley Hall, MD

4:00 PM Update on the New Heart Allocation Policy — Is It Performing as Expected?
Maryl Johnson, MD

4:20 PM Broader Sharing in Heart Allocation — Where Do We Draw the Line?
David Vega, MD

4:40 PM Regulatory Impact on Donor Acceptance — Incentivizing Innovation
Maryjane Farr, MD

CONTINUED ⇢

THURSDAY, MARCH 5 *SESSION 2 — EQUITY (CONT'D.)*

OPTION 3 *Heart (Continued)*

5:00 PM Impact of Ex-Vivo Perfusion and DCD Donors — Expanding Access
Jignesh Patel, MD, PhD

5:20 PM Beyond Geography — Novel Ideas and Challenges in Organ Allocation
Kiran Khush, MD, MAS

5:40 PM Panel Discussion

OPTION 4 **Lung: Equity in Lung Allocation — Myth or Reality?**
Frank Lloyd Wright Salon CD
Moderators: Maryam Valapour, MD, MPP and Jeff Edelman, MD

4:00 PM Update on Lung Allocation — What Do the Numbers Tell Us About Equity?
Stuart Sweet, MD, PhD

4:20 PM Refurbishing Centers in Lung Donation — Is It the future?
Marcelo Cypel, MD

4:40 PM Are Centers Really Equal? — The Regulatory Impact on Donor Lung Acceptance
Gundeep Dhillion, MD, MPH

5:00 PM Beyond the LAS: Looking at Combined Endpoints to Evaluate Urgency for Lung Transplantation
Erika Lease, MD, FCCP

5:20 PM Lung allocation challenges — Sensitized candidates and Multi-organ candidates
Debbie Levine, MD

5:40 PM Panel Discussion

**Continuing education credit offered. See separate packet.*
†No continuing education credit offered.

THURSDAY, MARCH 5 *(CONT'D.)*

6:00 PM — **Poster Walk & Welcome Reception**
Frank Lloyd Wright Foyer and Salon G

7:30 PM – 8:45 PM — **Satellite Dinner Symposium Presented by Natera†**
Frank Lloyd Wright Salon EF
This is not an official function of the CEoT meeting and is not endorsed by the AST.

FRIDAY, MARCH 6

7:30 AM – 8:30 AM — **Product Theater**
Gold Room

8:45 AM – 10:45 AM — **Session 3 — Utility**
Select One of Four Sessions*

OPTION 1 — **Liver: Optimizing Donor and Recipient Matching**
Conference Center - Flagstaff
Moderator: Dave Foley, MD, FACS, FAST, FASSLD

8:45 AM — Age Matching of Donors and Recipients — Lessons from KAS and Opportunities in Liver
John Friedewald, MD, FAST

9:05 AM — Allocation of Livers from Pediatric Donors — Should Pediatric Patients Have Priority
John Bucuvalas, MD

9:25 AM — Donor and Recipient Age Matching in Liver Transplant — Can We Do It and How to Operationalize
Dave Foley, MD, FACS, FAST, FASSLD

CONTINUED ⇢

FRIDAY, MARCH 6 *SESSION 3 — UTILITY (CONT'D.)*

OPTION 1 — *Liver (Continued)*

9:45 AM — Using High Risk Donor Livers in Lower Risk Candidates — Practice vs. Policy
Neehar Parikh, MD, MS

10:05 AM — LDLT for Higher Risk Recipients — Who Decides What Benefit is Acceptable, What Should the Recipient be Told, and What if the Graft Fails
Mark Cattral, MD

10:25 AM — Panel Discussion

OPTION 2 — **Kidney: Do We Really Understand Organ Utilization and Are We Using the Right Metrics?**
Frank Lloyd Wright Salon EF
Moderator: Bob Metzger, MD

8:45 AM — Current State of Organ Utilization Enhancement Efforts
Martha Pavlakis, MD

9:15 AM — Utilization Metrics
Nicole Turgeon, MD

9:45 AM — Novel Approaches to Organ Utilization and Allocation
Sommer Gentry, PhD

10:15 AM — Panel Discussion

**Continuing education credit offered. See separate packet.*
†No continuing education credit offered.

FRIDAY, MARCH 6 *SESSION 3 — UTILITY (CONT'D.)*

OPTION 3

Heart: Utility in Heart Transplantation — Balancing Risk and Reward
Frank Lloyd Wright Salon AB
Moderators: Maryjane Farr, MD and Maryl Johnson, MD

8:45 AM	Defining an Extended Criteria Donor Heart in the Current Era *Jon Kobashigawa, MD*
9:05 AM	Utilizing Hep-C Donor Hearts — What are the True Financial and Clinical Costs? *Kelly Schlendorf, MD, MHS*
9:25 AM	Do MCS Patients Require Special Donor Consideration? *Francisco Arabia, MD, MBA*
9:45 AM	Matching Recipient and Donor Risk — Do Two "Bads" Ever Equal a "Good"? *Shelley Hall, MD*
10:05 AM	Alternatives to Organ Donation — Can We Ever Solve the Donor Shortage? *David Vega, MD*
10:25 AM	Panel Discussion

FRIDAY, MARCH 6 *SESSION 3 — UTILITY (CONT'D.)*

OPTION 4

Lung: Utility in Lung Transplantation
Frank Lloyd Wright Salon CD
Moderators: Debbie Levine, MD and Matt Hartwig, MD

8:45 AM	Utility and the High-Risk Lung Candidate *Jeff Edelman, MD*
9:05 AM	Working with What We Have — Optimizing Donor Lungs and Extended Criteria *Keith Wille, MD*
9:25 AM	The Future of Lung Donation — The Impact of Ex Vivo and DCD *Matt Hartwig, MD*
9:45 AM	Matching Recipient and Donor Risk *Marie Budev, DO, MPH, FCCP*
10:05 AM	Case Study in Lung Allocation and Donor Selection *Joshua Malo, MD*
10:25 AM	Panel Discussion

10:45 AM – 11:00 AM **Break**

11:00 AM – 12:00 PM **Keynote Speaker**
Frank Lloyd Wright Salon EF
Glenn Cohen, JD
Harvard Law School

12:15 PM – 1:30 PM **Satellite Lunch Symposium Presented by CareDx†**
Frank Lloyd Wright Salon EF
This is not an official function of the CEoT meeting and is not endorsed by the AST.

**Continuing education credit offered. See separate packet.*
†No continuing education credit offered.

FRIDAY, MARCH 6 *(CONT'D.)*

1:30 PM – 1:45 PM **Break**

1:45 PM – 3:15 PM **Session 4 — Shark Tank: Improving OPTN Policy Development — What's Your Perspective?***
Frank Lloyd Wright Salon EF
Moderators: Rich Formica, MD, FAST and Bob Montgomery, MD, D.Phil, FACS

1:45 PM The OPTN Perspective: Keep the Status Quo
Carl Berg, MD, FAASLD

2:05 PM The Government Perspective: Give HRSA More Control
Ginny McBride, RN, MPH

2:25 PM The Patient Perspective: Change the Composition of the OPTN
Molly McCarthy

2:45 PM The Donation and Transplant Community Perspective: Let Our Voice be Heard
David Goldberg, MD, MSCE

3:05 PM Panel Discussion

3:15 PM – 3:30 PM **Break**

3:30 PM – 4:30 PM **Measuring for Progress in Kidney Transplantation: Pre-Meeting Metrics Summary**
Frank Lloyd Wright Salon EF

SATURDAY, MARCH 7

7:30 AM – 8:30 AM **Product Theater**
Gold Room

8:45 AM – 10:45 AM **Session 5 — Case Studies: Navigating Equity and Utility in the Real World***
Select One of Two Sessions

OPTION 1 **Liver and Kidney (Abdominal) Case Studies**
Frank Lloyd Wright Salon EF
Moderators: Vineeta Kumar, MD and Josh Levitsky, MD, MS

8:30 AM – 8:50 AM Roy Bloom, MD and Vishnu Potluri, MD

8:50 AM – 9:10 AM David Goldberg, MD, MSCE and Nadim Mahmud, MD

9:10 AM – 9:30 AM Martha Pavlakis, MD, FAST, FASN and Aditya Pawar, MD

9:30 AM – 9:50 AM Jack Lake, MD and Nikhil Kapila, MBBS

10:10 AM – 10:20 AM Doug Anderson, MD and Cozette Kale, MD

10:20 AM – 10:45 AM Discussion

OPTION 2 **Heart and Lung (Thoracic) Case Studies**
Frank Lloyd Wright Salon AB
Moderators: Shelly Hall, MD and Carli Lehr, MD, MS

8:45 AM – 9:05 AM Shelley Hall, MD and Ahmed Seliem, MD

9:05 AM – 9:25 AM Carli Lehr, MD, MS and Sumir Pandit, MD, MBA

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†No continuing education credit offered.

SATURDAY, MARCH 7 *SESSION 5 (CONT'D.)*

OPTION 2 *Heart and Lung (Thoracic) Case Studies (Continued)*

9:25 AM – 9:45 AM Francisco Arabia, MD and Phil Chou, MD

9:45 AM – 10:05 AM Deborah Levine, MD and Aaron Vose, MD

10:05 AM – 10:45 AM Discussion

10:45 AM – 11:15 AM **AST Innovation Award Presentation**
Frank Lloyd Wright Salon EF
This award was created to showcase a project or program that exemplifies the spirit of innovation on which transplantation was founded. Join us to honor the recipient, and hear a brief presentation on the program's successful, outside-the-box approach that earned it the Innovation Award.

11:15 AM – 12:45 PM **Session 6 — Multiorgan Transplantation: Trying to Find the Sweet Spot in the Quest for Best-Use Organs***
Frank Lloyd Wright Salon EF
Moderators: Jon Kobashigawa, MD and Roy Bloom, MD

11:15 AM Ethical Considerations of Multi- VS Single-Organ Transplantation- Who, When, How?
Peter Reese, MD

11:35 AM Liberalizing the Safety Net and Encouraging Sequential Living Donation — Alternative to Simultaneous Multi-Organ Transplantation
Alex Wiseman, MD, FAST

SATURDAY, MARCH 7 *SESSION 6 (CONT'D.)*

11:55 AM Standardizing Selection Criteria for Simultaneous Multi-Organ Transplantation
Betsy Verna, MD, MS

12:15 PM Panel Discussion

12:45 PM – 1:00 PM **Break to Get Lunch**

1:00 PM – 2:15 PM **Satellite Lunch Symposium***
Frank Lloyd Wright Salon EF
This activity is supported by an educational grant from CSL Behring.

2:15 PM – 4:15 PM **Session 7 — Balancing it All — Challenges, Moving Points and Opportunities for the Future of Organ Donation and Transplantation***
Frank Lloyd Wright Salon EF
Moderators: John Gill, MD, MS, FAST and Vineeta Kumar, MD

2:15 PM The Executive Order — What Proportion of New Incident ESKD Cases Should be Treated with Dialysis Versus Transplantation
Benjamin Hippen, MD, FASN, FAST

2:45 PM Future of Policies to Increase Deceased Donations — Opt Out and Reciprocity Based Strategies
Alex Glazier, JD, MPH

3:15 PM Research in Deceased Donors — Advancing Science While Maintaining Public Trust
Sandy Feng, MD, PhD

3:45 PM Panel Discussion

4:15 PM **Summary of Meeting/ Closing Remarks**

4:30PM **Closing Reception**
Citrus Pavilion

**Continuing education credit offered. See separate packet.*
†No continuing education credit offered.

DINE 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, MARCH 5

Lunch Symposium*
12:30 PM – 1:45 PM
Frank Lloyd Wright Ballroom
Sponsored by OneLambda

Dinner Symposium*
7:30 PM – 8:45 PM
Frank Lloyd Wright Ballroom
Sponsored by Natera

FRIDAY, MARCH 6

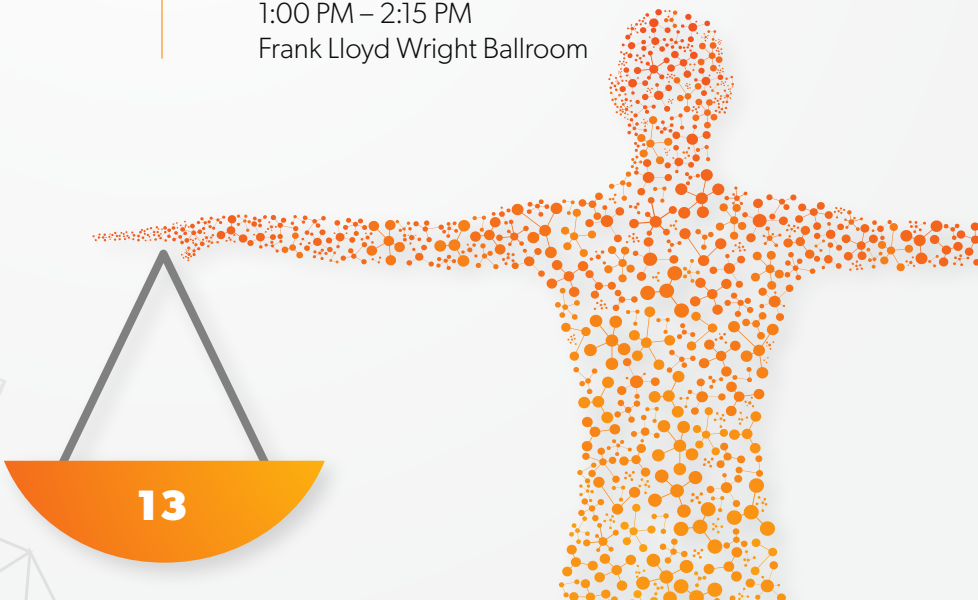
Breakfast Product Theater*
7:30 AM – 8:30 AM
Gold Room
Sponsored by Veloxis

Lunch Symposium*
12:15 PM – 1:30 PM
Frank Lloyd Wright Ballroom
Sponsored by CareDx

SATURDAY, MARCH 7

Breakfast Product Theater*
7:30 AM – 8:30 AM
Gold Room
Sponsored by Natera

Lunch Symposium**
1:00 PM – 2:15 PM
Frank Lloyd Wright Ballroom



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MAR
5
-THU-
12:30 - 1:45 PM

Confident Patient Care: The Clinical Utility and Applications of MMDx

CEOT 2020 Satellite Symposium

Frank Lloyd Wright Ballroom - Salon EF

MODERATOR

Philip F. Halloran, MD, PhD
Alberta Transplant Applied Genomics Centre | Edmonton, Alberta Canada

PRESENTERS

Using Molecular Diagnostics to Guide Therapy in Kidney Transplants: Are we there yet?
Gaurav Gupta, MD
Associate Professor, Transplant Nephrologist
Virginia Commonwealth University | Richmond, VA

Insights into the use of the Molecular Microscope
Jon A. Kobashigawa MD
DSL/Thomas D. Gordon Professor of Medicine
Director, Advanced Heart Disease Section
Director, Heart Transplant Program
Associate Director, Smidt Heart Institute
Associate Director, Comprehensive Transplant Center
Cedars-Sinai Medical Center | Los Angeles, CA

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

CEoT Dinner Symposium, *Sponsored by Natera, Inc.*

Cancer and Transplantation: Issues to Consider

Cancer complicates the evaluation and management of donors and recipients participating in organ transplantation. Understanding these problems and reducing excess cancer risks represents responsible care. In this symposium, oncology issues will be considered and novel methods and personalization under study will be discussed.

Thursday, March 5 @ 7:30pm
Arizona Biltmore

Join us for the Welcome Reception, and the Dinner Symposium to follow

Learning Objectives:

- Describe the epidemiology, surveillance and candidacy considerations on donation and transplant after cancer
- Discuss the diagnostic and therapeutic options for cancer after transplant
- Understand how cell-free DNA can be used to manage renal allograft patients with cancer

This is not an official function of the CEoT Meeting, and is not endorsed by AST.

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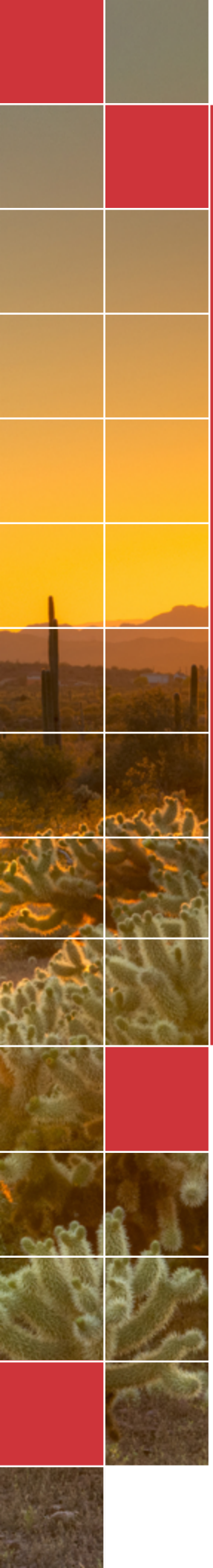

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Lunch Symposium Sponsored by CareDx*

FRIDAY MARCH 6

12:15 pm – 1:30 pm
Arizona Biltmore
Frank Lloyd Ball Room
2400 E Missouri Ave
Phoenix, AZ 85016

Evolving the Care Paradigm with AlloSure and KidneyCare – New Insights and New Studies

The CareDx Lunch Symposium will present new data on how AlloSure differentiates patients with ambiguous rejections and launch the KIRA immuno-optimization trial

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

Optimizing Long-term Care for Renal Transplant Recipients

Friday, March 6, 2020 • 7:30 AM – 8:30 AM MST

Arizona Biltmore
Gold Room
Phoenix, Arizona

Aneesha A. Shetty, MD
Assistant Professor of Medicine (Nephrology and Hypertension)
and Surgery (Organ Transplantation)
Northwestern Medicine, Feinberg School of Medicine
Chicago, Illinois

PRE-REGISTRATION DETAILS

Please register here: https://veloxisceotproducttheater.splashthat.com

PROGRAM DESCRIPTION

The aim of this program is to engage renal care specialists in a dynamic case-based discussion of long-term care in kidney transplantation. A leading expert will explore evolving treatment paradigms, which may help inform care optimization, including strategies for long-term immunosuppressive therapy.

This is a promotional event. CE/CME credit will not be available for this session.

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 promotional educational activity 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.

Thank you for your cooperation.

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

Veloxis PHARMACEUTICALS

Join us for our Product Theater

Prospera: the latest in cell-free DNA and transplant rejection

Dr. Phil Gauthier
Medical Director of Organ Transplantation at Natera, Inc.

Saturday, March 7 @ 7:30am
Arizona Biltmore, Gold Room
Breakfast will be served

Program Objectives:

- Describe cell-free DNA science and its application to patient care
- Explain how donor-derived cell-free DNA (dd-cfDNA) can be used in transplant rejection assessment
- Recall existing and new literature comparing dd-cfDNA testing to current standard of care in transplant rejection assessment

This is not an official function of the CEoT Meeting, and is not endorsed by AST.

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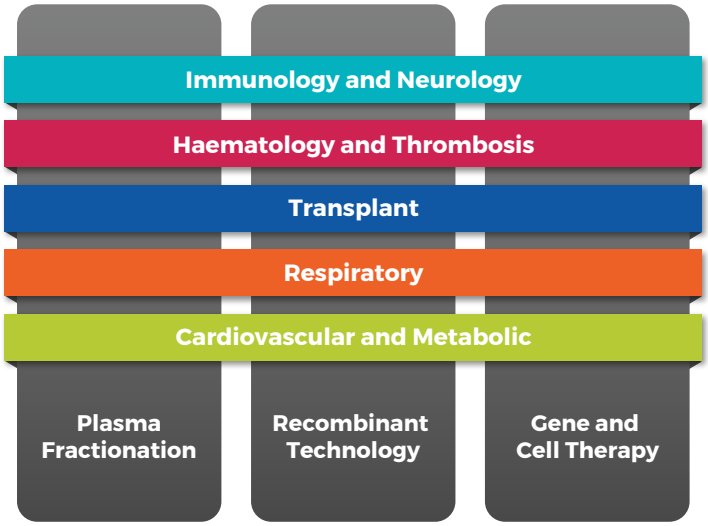

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- This medication coverage expires at 36 months unless he/she is disabled or > 65 y/o (expecting that the recipient will obtain health insurance before this expiration date).

Failure to take this immuno medication can lead to rejection and ultimately returning to dialysis, or the kidney waitlist for another transplant.

The Comprehensive Immunosuppressive Drug Coverage for Kidney Transplant Patients Act of 2019 (H.R. 5534), also known as the Immuno Bill, was introduced this past December, and would extend the 36-month time limit to provide immunosuppresive medication coverage for the lifetime of the transplanted kidney.

The American Society of Transplantation (AST) has been advocating for this change for over a decade and **needs your support** to endorse this very necessary and important legislation!

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At the time of print

ABSTRACT #: 1

TITLE: Antibiotic Use Among Deceased Organ Donors

AUTHOR(S) (FIRST NAME, LAST NAME): Judith Anesi, Ebbing Lautenbach, Jennifer Han, Dong-Heun Lee, Heather Clauss, Antonette Climaco, Richard Hasz, Esther Molnar, Darcy, Alimenti, Sharon West, Warren Bilker, Pam Tolomeo, Emily Blumberg

INSTITUTIONS (ALL): *University of Pennsylvania, University of Pennsylvania, GlaxoSmithKline, Drexel University, Temple University, Albert Einstein Medical Center, Gift of Life Donor Program, Temple University, University of Pennsylvania, Gift of Life Donor Program, University of Pennsylvania, University of Pennsylvania, University of Pennsylvania*

ABSTRACT: Background: There remains significant clinical concern about the use of donor organs that may be infected or colonized with multidrug-resistant organisms (MDROs). Despite this, antibiotic use in deceased organ donors—a primary risk factor for MDROs—has not been well described. In this study, we sought to determine antibiotic use, and its predictors, among deceased organ donors.

Methods: A retrospective cohort study was conducted at four transplant centers in Philadelphia between 1/1/2015 and 6/30/2016. All deceased organ donors who donated at least one organ to one of the centers were included. Descriptive analyses of antibiotic use among the deceased organ donors during their terminal hospitalization were performed, including quantification of antibiotic days of therapy (DOT, defined as the count of the number of individual antimicrobial agents given to a patient on each calendar day), length of therapy (LOT, defined as the number of calendar days on which the patient received therapy, regardless of the number of agents used), number of antibiotics received during the terminal hospitalization, and spectrum of antibiotic activity. We determined the proportion who received redundant antibiotics (defined as administration of antibiotics with overlapping spectrum of activity on the same calendar day). A mixed-effects negative binomial regression analysis was then performed, with a random effect for donor hospital, to determine predictors of antibiotic DOT in this population.

Results: Of 440 donors, 427 (97%) received at least one antibiotic course during their terminal hospitalization. The most common antimicrobials prescribed were: first-generation cephalosporins (337, 77%), cefepime (140, 32%), third-generation cephalosporins (125, 28%), and vancomycin (104, 24%). The median number of antibiotics received per donor was 2 (IQR 1-2, range 0-5). The median antibiotic LOT was 3 days (IQR 2-4, range 1-18); the median antibiotic DOT was 4 days (IQR 3-7, range 1-34). There were 61 donors (14%) who received redundant antibiotics. In the multivariable analysis, we found that the following factors were associated with an increase in antibiotic DOT after adjusting for donor length of stay (Table 1): number of positive donor cultures (taken during the terminal hospitalization), detection of methicillin-resistant Staphylococcus aureus on donor hospital culture, donor death due to a cardiovascular cause, donor death due to drug overdose, and the number of procedures performed on the donor during the donor's terminal hospitalization.

Conclusions: Antibiotic exposures are common among deceased organ donors during their terminal hospitalization, including a notable proportion who receive multiple redundant antibiotic courses. Given the association between antibiotic exposure and risk for MDROs, this antibiotic use is an important future target for antimicrobial stewardship.

KEYWORDS: donor management; antibiotics; multidrug-resistant organisms

ABSTRACT #: 2

TITLE: Geocode State Trend of the Prevalence of Non-alcoholic Steatohepatitis: State-level Equity and Utility

AUTHOR(S) (FIRST NAME, LAST NAME): Daniel Borja-Cacho, Hu-Hsin Chang, Mei Wang, Marcos Pozo, Daniela Ladner

INSTITUTIONS (ALL): *Northwestern University, Washington University, Washington University, Northwestern University, Northwestern University*

ABSTRACT: As the prevalence of obesity is increasing in the United States, the prevalence of metabolic syndrome, type-2 diabetes, heart and liver diseases are increasing. Obesity increases the risk of nonalcoholic fatty liver disease, leading to nonalcoholic steatohepatitis (NASH), cirrhosis, hepatocellular carcinoma, and end-stage liver disease, requiring liver transplant (LT). The increasing trend of NASH as the primary indication for LT at the national level has been studied; however, it is unknown at the state level, and whether state disparities exist is unclear. We aim to study the trend of prevalence of NASH at the state level to inform state policies in combating obesity and NASH to achieve equity and utility in LT.We used data from the U.S. Organ Procurement and Transplantation Network on adult patients (age 18 years or older) registering on LT waiting list between 2001 and 2017 and data from the Behavioral Risk Factor Surveillance System. NASH as the primary indication for LT was defined as a) NASH as the primary diagnosis; b) cryptogenic as the primary diagnosis and patient body mass index ≥35; or c) cryptogenic as the primary diagnosis and a diagnosis of diabetes. The trend of NASH as the primary indication for LT among LT patients was computed. Using patient state of residency at LT registration, the trend of prevalence of NASH as the primary indication for patients registering on LT waiting list was geocoded, along with the trend of prevalence of obesity, obesity and hypertension (obesity+hypertension), obesity+hypertension+diabetes at the state level from 2001-2017. For comparability, we used state population by year as the denominator for the prevalence estimates.NASH as the primary indication for LT among LT patients increased from 4.1% in 2001 to 16.6% in 2017 (Fig 1A). The prevalence of obesity was highest for Mississippi (25.2%), Michigan (24.0%), West Virginia (23.9%) in 2001 and for West Virginia (35.6%), Mississippi (34.6%), Alabama (33.8%) in 2017 (Fig 1B). The prevalence of obesity+hypertension was highest for Alabama (11.6%), West Virginia (11.3%), Mississippi (11.1%) in 2001 and for West Virginia (20.3%), Mississippi (20.0%), Louisiana (18.6%) in 2017. The prevalence of obesity+hypertension+diabetes was highest for Alabama (3.9%), West Virginia (3.5%), District of Columbia (3.3%) in 2001 and for West Virginia (7.3%), Mississippi (6.4%), Alabama (6.0%) in 2017. The prevalence of NASH as the primary indication for patients registering on LT waiting list was highest for Utah (6.8 in 10 million people), New York (5.5 in 10 million), and Iowa (4.6 in 10 million) in 2001 and for Alabama (89.6 in 10 million), Ohio (88.4 in 10 million), and Mississippi (87.8 in 10 million) in 2017. NASH as the primary indication for LT among LT patients continues to increase as the prevalence of obesity and obesity+hypertension(+diabetes). States in east south central and east north central regions with high prevalence of obesity and obesity-related chronic diseases suffer higher prevalence of NASH as the primary indication for patients registering on LT waiting list. To achieve, these states will benefit from strengthening policies reducing obesity epidemic more compared to the other states.

KEYWORDS: Non-alcoholic steatohepatitis, NASH, liver transplantation

ABSTRACT #: 3

TITLE: Effects of Residual Native Kidney Function on Renal Outcomes in Multi-Organ Transplantation

AUTHOR(S) (FIRST NAME, LAST NAME): Xingxing Cheng, Jialin Han, Margaret Stedman, Jane Tan

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

ABSTRACT: Multi-organ transplantation including the kidney as a "secondary" organ, such as simultaneous liver-kidney (SLK) and simultaneous heart-kidney (SHK) transplantation, is becoming more common. Currently, the main kidney graft metric tracked by regulatory agencies in SHK and SLK is survival free of kidney graft failure, defined as return to dialysis or needing an additional kidney transplant. This definition is problematic because SHK and SLK frequently occur with more residual native kidney function than kidney-alone transplants. We hypothesize that native kidney function accounts for a substantial portion of the kidney "graft" survival observed after SLK and SHK transplantation.Using the Scientific Registry of Transplant Recipients, we examined 1-year outcomes (by cross-tabulation) and outcomes beyond 1 year (by subdistribution hazards model, allograft failure and death as competing risk outcomes) in adult SHK and SLK recipients from 1995 through 2014. We examined the effect of pre-transplant dialysis exposure as a surrogate for residual native kidney function. Numbers are expressed as count (%) or hazard ratio [HR] (95% confidence interval). For the subdistribution hazards model, we performed multivariate adjustment for year of transplant, recipient age, sex, race, non-renal life-support, etiology of liver/heart disease, and peak calculated panel reactive antibodies.We assembled a cohort of 5432 SLK and 928 SHK recipients over the study period. Of the SLK recipients, 2013 (37%) received none, 1718 (32%) received <90 days, and 1701 (31%) received >= 90 days of dialysis prior to transplant.

Of the SHK recipients, 496 (53%) received none, 101 (11%) received <90 days, and 331 (36%) received >= 90 days of dialysis prior to transplant. At 1-year, the highest proportion of death at 1-year are in the group who received <90 days of dialysis prior to SLK and SHK (see Figure). In SHK recipients, increasing dialysis exposure prior SLK is associated with a higher proportion of death, apparent kidney graft failure, and lower estimated glomerular filtration fraction (see Figure). The trend is present in SLK recipients, but the overall effect size appears to be smaller (see Figure).

In the cohort of SHK recipients who survived to 1-year without apparent kidney graft failure (n=780), the risk of graft failure increased with dialysis exposure, from HR 1.28 (0.58-2.85) for <90 days to HR 2.23 (1.36-3.64) for >=90 days (reference: no dialysis exposure). Multivariate adjustment substantially attenuated the effect size for SHK: adjusted HR 1.16 (0.52-2.62) for <90 days to HR 1.66 (0.97-2.82) for >=90 days (reference: no dialysis exposure). In the cohort of SLK recipients who survived to 1-year without apparent kidney graft failure (n=4441), the risk of apparent kidney graft failure was not significantly associated with dialysis exposure, from HR 1.04 (0.80-1.36) for <90 days to HR 1.27 (0.99-1.63) for >=90 days (reference: no dialysis exposure). Multivariate adjustment did not alter the effect size significantly.Kidney graft survival after SHK, but not SLK, may be significantly associated with residual native kidney function, suggesting that native kidney function contributes significantly to post-SHK renal function. The current definition of kidney graft failure may therefore be a flawed metric for monitoring post-SHK kidney graft outcomes.

KEYWORDS: simultaneous liver-kidney transplant, simultaneous heart-kidney transplant, outcomes, metrics

ABSTRACT #: 4

TITLE: Wait Times in Pediatric Heart Transplant Candidates: Impact of Size and Blood Type Following the 2016 Allocation Policy Revision

AUTHOR(S) (FIRST NAME, LAST NAME): Kevin Daly, Ryan Williams, Minmin Lu, Lynn Sleeper, Simone Urbach

INSTITUTIONS (ALL): *Boston Children's Hospital, Boston Children's Hospital, Boston Children's Hospital, Boston Children's Hospital, Boston Children's Hospital*

ABSTRACT: To describe wait times for pediatric heart transplant (HT) candidates following institution of a new allocation system in March 2016.The OPTN database was queried for pediatric HT candidates listed for isolated HT between 7/2016 and 4/2019. Wait times were analyzed by listing status (1A, 1B, 2), blood type, and recipient weight. Candidates were analyzed by days spent at each listing status, classified as transplanted only in their final listing status, and censored in the analysis for any other statuses in which they spent time listed. Wait list outcomes were analyzed using a competing risk analysis and a proportional subdistribution hazards regression model was used to compare associations between predictors and outcomes.The study included 1,789 candidates listed for HT under the new allocation system. Of those, 65% underwent HT, 14% died or were removed for clinical deterioration, 8% were removed for other reasons including clinical improvement, and 13% were still waiting at the end of the study period. The majority of children were listed as status 1A at the time of HT (81%), while 16% were listed as status 1B and 2.6% were status 2 at the time of HT. Candidates <25 kg (HR 0.47, CI 0.41-0.54) at listing and blood type O (HR 0.85, CI 0.75-0.96) were less likely to undergo HT. For status 1A candidates, 57% received a HT by 3 months, 72% by 6 months, and 78% by 1 year. Median wait times differed substantially by listing status, blood type and weight (Table). For status 1B candidates, 25% received a HT by 3 months, 42% by 6 months, and 61% by 1 year. Status 2 candidates were unlikely to be transplanted, with only 8% of candidates receiving a HT within 1 year of listing.Wait times for pediatric HT candidates are highly variable, with listing status, size, and blood type contributing to wait time and likelihood of HT. Children less than 25 kg, particularly those who are blood type O, experience longer wait times and higher wait list mortality. Advanced heart failure therapies should be selected with these longer wait times in mind.

KEYWORDS: Pediatrics, Heart Transplantation, Waiting Times, Allocation Policy

ABSTRACT #: 6

TITLE: Factors Influencing Kidney Transplant Candidates' Willingness to Accept Deceased Donor Organs Subjected to Experimental Interventions: A Conjoint Analysis

AUTHOR(S) (FIRST NAME, LAST NAME): Elisa Gordon, Peter Reese, Jungwha Lee, Lakshman Krishnamurthi, Robert Veatch, Richard Knight, Paul Conway, Sue Dunn, Peter Abt

INSTITUTIONS (ALL): *Northwestern University Feinberg School of Medicine, University of Pennsylvania, Northwestern University, Northwestern University, Georgetown University, American Association of Kidney Patients, American Association of Kidney Patients, Donor Alliance, University of Pennsylvania*

ABSTRACT: Background: Deceased donor organ intervention research ("intervention research") aims to increase organ quality and quantity for transplantation by protecting against organ injury and enhancing functionality. Little is known about transplant candidates' willingness to accept these "intervention organs." We present findings from a conjoint analysis involving kidney transplant candidates at two transplant centers or who are members of the American Association of Kidney Patients and the National Kidney Foundation of Illinois.

Methods: Conjoint analysis is a research methodology that elicits patient preferences by manipulating key elements of a decision, in this case, whether to accept a kidney allograft. Candidates reviewed 12 hypothetical scenarios in which we systematically varied donor age, projected waiting time until the patient would get another organ offer, research risk to organ, and research risk to the recipient. With each scenario, the candidate either agreed to accept the intervention organ or remain on the waiting list. Candidates were contacted by phone and/or online.

Results: A total of 249 candidates were eligible and participated. Participants were mostly female (53.6%), white (56.6%), had a mean age of 54 years, and had

been on the waitlist a median of 24 months. Across all hypothetical scenarios, 92 (37.0%) would have accepted all intervention organs, 147 (59.0%) would have accepted intervention organs under some conditions, and 10 (4.0%) would have rejected intervention organs under all conditions. In multivariable logistic regression, factors independently associated with candidates' greater likelihood of accepting an intervention organ and participating in intervention research included younger donor age (age 30 vs. 60 years) (odds ratio [95% confidence interval]: 3.75 [2.87-4.93]), longer waiting time until the next organ offer (i.e., 4 years vs. 1 year) (3.58 [2.73-4.69]), and when the risk to the kidney from intervention research was low (19.59 [13.34-28.77]) or moderate (2.16 [1.61-2.90]) rather than high; (P<0.0001 for each variable). Additionally, candidate characteristics independently associated with accepting an intervention organ included being non-Black (4.90 [1.93-12.45); P<0.001), being on the waitlist for less time (0.97 [0.96-0.99]; P<0.002), and having greater trust in their transplant physician (1.03 [1.00-1.06]; P<0.03).

Conclusions: Most candidates would accept an intervention organ under most circumstances. High willingness to accept intervention organs underscores the urgent need to overcome regulatory and ethical issues preventing intervention research from being carried out. Our findings may also help centers understand which candidates are more likely to be interested in participating in organ intervention research. Transplant programs should become prepared for engaging in informed consent about intervention organs.

KEYWORDS: Deceased donor organ intervention research, Decision-making, survey

ABSTRACT #: 7

TITLE: Misconceptions and Lack of Information about VCA can Thwart the Public's Access to VCA

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ABSTRACT: Background: Vascularized Composite Allotransplantation (VCA) involves transplantation of multiple tissues (e.g., skin, muscle, bone, nerves, blood vessels, etc.) as a structural unit from a donor to a recipient. VCA organs include hands, face, larynx, abdominal wall, uterus, and penis. Little is known about the public's understanding of VCA. Prior research found that the public may be less willing to donate VCA organs compared to other solid organs, but has not examined in depth the reasons for such reticence. This qualitative study assessed the public's understanding of and informational needs about VCA.

Methods: We conducted 6 focus groups (n=41 participants) with members of the general public in two geographically distinct metropolitan cities. Focus groups assessed participants' awareness of and attitudes about VCA, information needs about VCA, willingness to be a VCA donor, and willingness to authorize VCA donation. We analyzed focus group transcriptions using thematic analysis.Results: Many participants had not heard of and were unaware of VCA prior to the focus group. Commonly shared information needs pertained to: who (deceased or living people) can donate VCA organs, which types of injuries would make patients seek VCA, and the success rate. Participants expressed varying attitudes toward VCA, with some being more comfortable donating organs such as kidneys than VCA organs given their "ick factor," while others felt more comfortable with donating hands than the face, uterus, or penis. Commonly shared concerns

included: uncertainty over holding an open casket funeral for VCA donors missing a face or hand, uncertainty over whether family members will be comfortable authorizing a VCA donation, and fear that VCA will lead to the creation of "Frankenstein" or "cyborg" bodies that push the boundaries of "normality." A major theme was that it would take time for VCA to become "normalized" for the public to feel comfortable with it.

Conclusions: The public lacked knowledge and held misconceptions about VCA. Misconceptions can present barriers to VCA donation, which may limit patients' access to VCA. Public education is needed to address information needs and concerns so that the public is better prepared to become donors or authorize donation.

KEYWORDS: psychosocial, deceased donation, VCA, public perceptions, qualitative research

ABSTRACT #: 8

TITLE: Left To Right Approach for Porta Dissection in Recipient Hepatectomy in Living Donor Liver Transplantation. How We Do it.

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INSTITUTIONS (ALL): *Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences*

ABSTRACT: Background: To highlight the impotence of Left to right approach in recipient hepatectomy we recommend left to right approach as key hole and best technique to prepare a good graft bed and to minimize the anastomosis complication and reduces anhepatic phase in recipient implantation.

Method: In this study we used left portal vein ligation approach for good length of artery bile duct and portal vein with minimizing anhepatic Phase.

Results: we performed 70 Recipient Hepatectomies. All 69 patients went uneventful and single case showed an arterial dissection which was managed by saphenous graft with CHA and RHA and showed good recovery.

Conclusion: This technique can be recommended for better results in porta dissection. We recommend left to right approach as key hole and best technique to prepare a good graft bed and to minimize the anastomosis complication and reduces anhepatic phase in recipient implantation.

KEYWORDS: Left to right Aproach, High Hilar Dissection, Tunnel Techniquel technique

ABSTRACT #: 9

TITLE: Calculated Panel Reactive Antibody Values Increase For Kidney Transplant Candidates With HLA-DQA1 And HLA-DPB1 Unacceptable Antigens

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ABSTRACT: Calculated panel-reactive antibody (CPRA) is the official metric of sensitization used by the United Network for Organ Sharing (UNOS) for kidney allocation. CPRA includes unacceptable antigens (UA) at the HLA-A, -C, -B, -DRB1, and -DQB1 loci but does not include the HLA-DQA1 or -DPB1 loci. We sought to determine the effect of including HLA-DQA1 and -DPB1 locus UA on CPRA values for sensitized kidney transplant candidates.A cohort of kidney transplant candidates added to the wait list from the introduction of the new kidney allocation system 2014-12-04 through

2018-12-31 with >= 1 UA was obtained from UNOS (n=63,151). A CPRA calculator including all 11 HLA loci was developed using HLA typing collected by the National Marrow Donor Program. For each candidate, the CPRA value computed using the NMDP 11 locus calculator

(11L-CPRA) was compared to the value computed using the current UNOS 5 locus calculator (5L-CPRA). The maximum 5L-CPRA value during listing was used for each candidate. The prototype 11-locus NMDP CPRA calculator is available at http://transplanttoolbox.org.In candidates with any UA, 12.0% had HLA-DQA1, 13.4% had HLA-DPB1, and 3.3% had both loci. In candidates with HLA-DQA1 and/or -DPB1 UA,

the median 5L-CPRA was 71.1%, which increased to 82.7% with the additional loci. The median increase in CPRA was 1.8% (IQR 0.0 - 12.5) and 7,526 (56%) candidates had an increase >= 1%. Based on the 11L-CPRA value, 5,968 (45%) candidates moved to a higher CPRA category and 7,440 (55%) did not change categories (FIGURE).The addition of the HLA-DQA1 or -DPB1 loci leads to an increase in CPRA for many candidates with these UA, which in turn leads to a significant reclassification of allocation priority by CPRA category. We anticipate that implementation of a more comprehensive CPRA metric that includes HLA-DQA1 and -DPB1 would improve equity in allocation for candidates with UA at these loci.

KEYWORDS: HLA, CPRA, Equity

ABSTRACT #: 10

TITLE: Economic Burden and Treatment Patterns of Cytomegalovirus Management Following Solid Organ Transplant

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INSTITUTIONS (ALL): *Shire, a Takeda company, Analysis Group, Inc., Analysis Group, Inc., Analysis Group, Inc., Johns Hopkins University, Shire, a Takeda company, Analysis Group, Inc.*

ABSTRACT: Background: Cytomegalovirus (CMV) infection/disease is associated with considerable morbidity and mortality among solid organ transplantation (SOT) recipients. SOT recipients diagnosed with CMV infection/disease often require complex treatment and management. Current anti-CMV agents are associated with toxicities (such as myelosuppression and/or nephrotoxicity) and, in some cases, resistance. This complicates CMV management and sometimes necessitates the use of multiple anti-CMV treatment courses. Real-world evidence on anti-CMV treatment patterns, healthcare resource utilization (HRU), and healthcare costs associated with the treatment of CMV infection among transplant recipients is limited. Such data would provide valuable insights into the current management of CMV infection/disease. This study aimed to describe treatment patterns, HRU, and healthcare costs in SOT recipients who received anti-CMV treatment.

Methods: This retrospective, longitudinal cohort study used data from the US commercial claims database PharMetrics Plus™ from 2013 to 2017. SOT recipients diagnosed with CMV and with a subsequent prescription claim for an anti-CMV treatment following transplant were included. The index date was defined as the first prescription claim date following CMV diagnosis on or after the first (index) transplant. Patients were required to be ≥12 years and have ≥6 months' continuous enrolment at the index date. The 6-month period before the index date defined the baseline period; the observation period was defined as any time following the index date. Patients with procedure codes for hematopoietic stem cell transplant or diagnosis codes for HIV were excluded. Treatment patterns were analyzed using descriptive statistics and stratified by the number of antiviral treatment course(s) patients received during the observation period. The end of an antiviral treatment course was defined as the start of a gap in treatment (7 days; 21 days for cidofovir) or initiation of another antiviral. HRU and healthcare costs were reported per patient per month (PPPM) to account for varying observation period lengths and analyzed using descriptive statistics.

Results: Of 899 SOT recipients receiving treatment for CMV after the index date, 614 (68.3%) had claims for anti-CMV treatment during the baseline period. During

the observation period 427 (47.5%) patients received only 1 course of anti-CMV treatment, 214 (23.8%) received 2 courses, and 250 (27.8%) received ≥3 courses of therapy. Eight (<1%) patients received ≥1 'complex' course(s) of therapy (ie, a period with overlapping continuous treatment of more than one type of antiviral, unless the combination was valganciclovir and ganciclovir). The mean (median) time from post-transplant CMV diagnosis to initiation of the first course of treatment was 22.1 (11.0) days; the mean (median) time from index transplant to the first course of CMV antivirals was 164.1 (132.0) days (Table). The median time between the end of a previous course to the start of a next course of CMV antiviral (ie, end of a course to initiation of the next course) ranged from 22.0 to 27.5 days. Valganciclovir was the treatment used most commonly across all courses, being used by 84.4% of patients during their first course of treatment and ≥90% during subsequent courses (Table). Ganciclovir was the second most commonly used antiviral across all courses (3.6–9.1% of patients). Overlapping or back-to-back ganciclovir/valganciclovir was used by 0.8% to 5.5% of patients across all courses. Foscarnet was used by ≤2% of patients as their 2nd, 3rd, or 4th course, and cidofovir by <1% of patients in the first three courses of antivirals. During the observation period, patients who received a higher number of courses or ≥1 complex course(s) of antivirals incurred a greater number of all-cause visits PPPM (mean [median]: 1 course, 5.54 [3.79]; 2 courses, 6.28 [4.10]; ≥3 courses, 6.52 [4.75]); ≥1 complex course[s], 8.93 [8.23]). Most visits were outpatient visits (1 course: 5.13 [3.56] visits PPPM; 2 courses: 5.42 [3.74]; ≥3 courses: 5.85 [4.26]; ≥1 complex course[s]: 8.56 [7.25]). Mean and median number of stays/visits PPPM for each treatment course subgroup were all <1 for inpatient and emergency room. During the baseline period, patients incurred a mean (SD) [median] of $902 ($1,028) [$636] in costs PPPM for antiviral pharmacy claims. Total all-cause healthcare costs over the observation period PPPM were greater among patients who received a higher number of courses or ≥1 complex course(s) of antivirals versus those who received 1 course of a single agent (Figure): mean (SD) [median] for those receiving 1 course: $7,990 ($8,619) [$5,182]; 2 courses: $9,444 ($9,508) [$5,694]; ≥3 courses: $11,172 ($9,417) [$8,367]; patients with ≥1 complex course(s): $12,171 ($6,910) [$12,593].

Conclusion: This retrospective US medical claims data analysis found that about half of SOT recipients receiving anti-CMV treatment required multiple courses of antivirals during the observation period. Additionally, those requiring multiple courses of anti-CMV treatment had higher HRU and costs than those who required only one course. Management of CMV infection/disease in the transplant patient population is challenging, particularly considering that use of current treatment options is limited by toxicities and drug resistance. Such toxicities and/or resistance may require more courses of treatment, contributing to an increased economic burden.

KEYWORDS: Treatment patterns, Healthcare resource utilization, Antivirals, Cytomegalovirus, Solid organ transplantation

ABSTRACT #: 11

TITLE: Assessing Geographic Disparities in Wait-Listing for Kidney Transplantation in the USA

AUTHOR(S) (FIRST NAME, LAST NAME): Julien Hogan, Katie Ross, Rachel Patzer

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

ABSTRACT: A major limitation to current metrics for evaluating geographic disparities in kidney transplantation is that they only consider patients already on the waiting list. Indeed, substantial research has shown variation in access to early steps of the kidney transplant process, such as transplant referral and waitlisting (WL). In this study, we used recently developed transplant referral regions (TRR) to assess WL rates based on ESRD patients' residence.We included all prevalent ESRD patients from USRDS between 2012 and 2016. Patients were assigned

to a TRR based on their zipcode. We estimated annual WL rates by dividing the number of observed WL events by the number of prevalent patients-months at risk within each TRR. Similarly, we estimated intra-TRR WL rates by restricting the numerator to patients WL in a center included in their TRR of residence. Finally, we used a Poisson regression model adjusted for known predictors of access to transplantation (age, sex, race, BMI, primary disease, comorbidities…) to estimate the expected number of WL by TRR and identify TRRs with higher or lower WL rates than expected.1,129,700 prevalent ESRD patients were identified between 2012 and 2016. Among them, 279,020 patients experienced 379,548 WL events. Crude annual WL rates by TRR are presented in Figure 1. The median WL rate decreased from 6.27 WL/100 ESRD patient year in 2012 to 4.79 in 2016 with a drop following the implementation of KAS in 2014. Intra-TRR WL rates were lower but followed the same trend from 4.5 WL/100 ESRD patient year in 2012 to 3.24 in 2016. Figure 2 presents the ratio of the observed WL events over the expected for each TRR, so that a ratio lower than one identify TRR with lower than expected WL rates. These results will allow ESRD patients to know based on their place of residence whether they live in an area of high or low WL rate, whether these WL events happen mostly inside or outside their TRR and whether this WL rate is higher or lower than expected based on patients' case-mix within the TRR. For health policy makers, this may help identify areas with impaired access to the kidney transplant waiting list as suggested either by a low WL rate or by important discrepancies between overall and intra-TRR WL rates.

KEYWORDS: waitlisting, kidney transplant, disparities

ABSTRACT #: 12

TITLE: Developing New Metrics to Evaluate Wait Listing Practices for Kidney Transplant Centers in the USA

AUTHOR(S) (FIRST NAME, LAST NAME): Julien Hogan, Katie Ross, Sudeshna Paul, Rachel Patzer

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ABSTRACT: A major limitation to current metrics for evaluating kidney transplant centers is that they only consider the outcomes of patients already on the waiting list. These outcomes are highly dependent on the characteristics of the wait listed patients and the implementation of these metrics to evaluate transplant centers has resulted in modification in wait listing practices. There is a need to develop new metrics on earlier steps in the transplant process. However, the development of such metrics is challenging. There is currently no consensual method to assign dialysis patients to a specific transplant center. Moreover, the lack of data on patients' referral to transplant centers jeopardize our ability to differentiate dialysis centers' practices on referral from transplant centers' wait listing practices. We used ESRD Network 6 referral data and recently developed transplant referral regions as catchment areas to assess kidney transplant centers' WL rates in our region.We included the 9 kidney transplant centers from UNOS Network 6 (Georgia, North Carolina, South Carolina) for which date of referral and transplant center have been systematically collected since 2012 and estimated the annual WL rate for each center among prevalent referred patients residing in the center's transplant referral region (TRR) in 2016. Then, we estimated the WL rate for each center among prevalent ESRD patient in 2016 by assigning patients to a transplant center based or their TRR of residence and compared these two metrics. In the TRR with multiple centers, transplant centers were assigned the same proportion of ESRD patients than the observed proportion of referred patients within the TRR.Among the 9 transplant centers from Network 6, median WL rates among referred patients was 8.52 WL/100 referred patient year ranging from 3.51 to 11.56 WL/100 referred patients year. When considering prevalent ESRD patients, median WL rates was 2.62 WL/100 ESRD patient year ranging from 1.54 to 4.81WL/100 ESRD patient year. There was a strong correlation between WL rates among referred and WL among ESRD patients (Figure 1, r=0.86).

This study underlines the importance to collect data on early steps during the transplant process in order to accurately evaluate transplant centers for pre-transplant access. Until referral data are broadly available, due to the high correlation of WL rates among referred and ESRD patients, WL rates among ESRD patients living in transplant centers' TRR may be used to identify centers with lower than expected waiting list rates for patients in their TRR.

KEYWORDS: waitlisting, kidney transplantation, center practices, metrics

ABSTRACT #: 13

TITLE: Increasing Referral for Kidney Transplant Evaluation Among End-Stage Renal Disease (ESRD) Patients

AUTHOR(S) (FIRST NAME, LAST NAME): Julien Hogan, Meredith Dixon, Elizabeth Walker, Rachel Patzer

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ABSTRACT: It is unknown the proportion of dialysis patients who are candidates for kidney transplantation (kTx), but previous studies suggest that some good candidates are not referred to a transplant center by their dialysis facility provider. This study aims to determine what percentage of non-referred dialysis patients would have been good candidates for kTx and should have been referred.We defined "good transplant candidates" as patients that were waitlisted (WL) within 2 years of referral. From our RADIANT cohort including all referred patients in UNOS Network 6 (GA, NC, SC), we included patients referred within one year of dialysis initiation between 2012 and 2014 and built a propensity score (PS) of WL at 2 years using logistic regression based on patients' medical characteristics only.

We applied our score to non-referred ESRD patients to estimate the number of "good transplant candidates" that were not referred and compared the characteristics of referred vs. non-referred "good candidates".Among 6,870 referred patients, median PS in non-waitlisted patients was 0.27 (0.17-0.36) vs. 0.36 (0.28-0.51) in waitlisted patients. A cut-off of 0.51 had a PPV of 63% for WL. In our cohort of 14,411 non-referred patients, the median PS was 0.21 (0.13-0.32), and 870 patients (6.04%) had a score greater than 0.51. Compared to waitlisted patients, patients who were not referred despite a score greater than 0.51 were more likely to have glomerular diseases and to be treated with peritoneal dialysis.We confirm that some "good transplant candidates" as defined by a high probability of wait listing are not referred for transplant evaluation one year after dialysis start. In our network in the Southeast, at least 6% of non-referred patients were good Tx candidates From a transplant center perspective, timely referral of these patients could result of an additional 290 patients to evaluate in our region, which represent a 13% increase based on actual referral numbers.

KEYWORDS: kidney transplant, referral

ABSTRACT #: 14

TITLE: Waitlist-Conditioned Transplant Rate Is Not An Appropriate Metric For Benchmarking Access To Kidney Transplantation

AUTHOR(S) (FIRST NAME, LAST NAME): Alixandra Kale, Douglas Anderson, Haiyan Qu, Paul MacLennan, Margaux Mustian, Rhiannon Reed, Babak Orandi, Brittany Shelton, Vineeta Kumar, Jayme Locke, Michael Hanaway

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ABSTRACT: Transplant rate is used as a primary metric of center performance as reported by the SRTR. However, the calculation of transplant rate can be heavily influenced by center waitlisting practices and local population health, and therefore may not accurately represent how well a center is serving its local population.Using USRDS and UNOS data, the population of transplant-eligible adults (age 18-74) for each state was calculated by applying a standard set of criteria (Table 1) to all adult patients on dialysis in 2014. Eligibility-conditioned transplant rates were calculated for each state by dividing the number of adult transplants performed in 2014 by the eligible population. These rates were compared to waitlist-conditioned transplant rates calculated by dividing the number of adult transplants by the waitlisted adult population.State level eligibility-conditioned transplant rates ranged from 1.55 to 6.24 transplants per 100 eligible adults (mean 3.38, SD 1.10). State level waitlist-conditioned ranged from 7.41 to 28.28 transplants per waitlisted adults (mean 14.17, SD 4.77). State performance compared to the mean varied depending on which metric was used, suggesting an effect of center waitlisting practices (Figure 1).Recent proposed changes to allocation of deceased donor kidneys have focused on improving equitable access to transplantation and reducing variability in transplant rates. Our data suggest that waitlisting practices have an effect on reported transplant rates, calling into question whether this is an appropriate metric to be used when benchmarking access to kidney transplantation.

KEYWORDS: Waitlists; Kidney transplantation

ABSTRACT #: 15

TITLE: Higher State-Level Demand for Renal Transplantation is Associated with Lower Deceased Donor Kidney Transplantation Rate

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ABSTRACT: Geographic disparities in deceased donor kidney transplantation (DDKT) persist despite increased allocation system oversight and complexity. The association between poor population health and fewer kidney donors likely exacerbates inequity in transplant supply created by current allocation practices. Here we re-examine the DDKT supply/demand relationship on a state level. We hypothesized that recent transplant rates did not equitably meet the demands of states with high end stage renal disease (ESRD) burdens.This retrospective study utilized the U.S. Renal Data System to estimate the 2014 period prevalence of adult, transplant-eligible ESRD patients, according to our institution's standard eligibility criteria. Period prevalence per million adult state population was calculated. Transplant rate was defined as number of adult DDKTs in 2014 per 100 eligible ESRD population. Spearman's rho correlation was used to evaluate ranked, state-level period prevalence of eligible ESRD patients and transplant rate.364,358 transplant-eligible ESRD patients were included. Period prevalence of transplant-eligible ESRD patients ranged from 3,528 patients per million (PMP) in Washington, D.C., to 627 PMP in Vermont (mean=1,477, SD=592). Transplant rates ranged from 6.24 in Iowa to 1.55 in Arkansas (mean=3.38, SD=1.10). The ranked, state-level period prevalence of eligible ESRD PMP was strongly, negatively correlated with ranked, state transplant rate (Figure 1; r= -0.814, p<0.001).Higher demand for kidney transplantation is associated with lower supply of DDKT, suggesting that current geographic inequities will not improve and may intensify. A national allocation system could alleviate geographic disparities and maintain an equitable supply/demand ratio throughout the country.

KEYWORDS: Geographic disparity; Organ allocation; Transplant rate; ESRD burden

ABSTRACT #: 16

TITLE: Geographic Distribution of End-Stage Renal Disease in the US: The First Description of an "ESRD Belt."

AUTHOR(S) (FIRST NAME, LAST NAME): Alixandra Kale, Rhiannon Reed, Haiyan Qu, Paul MacLennan, Margaux Mustian, Douglas Anderson, Babak Orandi, Brittany Shelton, Vineeta Kumar, Michael Hanaway, Jayme Locke

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ABSTRACT: Previous research has demonstrated that population health is associated with organ supply and transplantation; this is particularly true in the southeastern United States, which comprises the majority of the Stroke Belt. End-stage renal disease (ESRD) is a known risk factor for stroke, but the presence of an "ESRD belt" has not previously been described.This cross-sectional study used 2016 United States Renal Data System data to estimate ESRD period prevalence in 2014. Patients on dialysis 18-74 years of age were included and aggregated to the state level based on permanent residence. ESRD prevalence per million adult population was estimated using 2014 US Census data. Point prevalence of stroke history was obtained from the CDC Behavioral Risk Factor Surveillance System. States were classified by location in the Stroke Belt, and Spearman's correlation coefficient was used to assess the relationship between ESRD prevalence and history of stroke.450,828 patients with ESRD were included in our analyses. There was wide geographic variation in ESRD period prevalence per million adult population (Figure 1), with increased burden concentrated in the southeast. Of the ten states with the highest ESRD prevalence, five were located in the Stroke Belt (Figure 2). Prevalence of ESRD was significantly positively correlated with history of stroke at the state level (Spearman's rho: 0.65147, $p < 0.001$).These findings of overlapping disease underscore the need to consider disease burden in conversations regarding organ supply and allocation, to ensure equitable access to transplantation and prevention of future comorbidity.

KEYWORDS: ERSD burden; Organ allocation; Kidney transplantation

ABSTRACT #: 17

TITLE: Patient and Allograft Outcomes in Septuagenarians Kidney Transplant Recipients – A Single Center Experience

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ABSTRACT: According to the US Renal Data System (USRDS) 2019 Annual Data Report, there were almost 750,000 individuals living with End Stage Kidney Disease (ESKD) in the United States on December 31, 2017. Of them, more than 40% were of age 65 years old and above.

United Network for Organ Sharing (UNOS) data reports that 21% of kidney transplantations in 2018, were performed in patients 65 years old and above. However, many transplant centers across the US still have an age cut off when considering patients ESKD for transplantation eligibility. The aim of this study was to examine transplant outcomes in septuagenarians at the time of kidney transplantation.

We retrospectively reviewed the electronical medical records of all patients aged 60 and above, who underwent a kidney transplantation in our center between 1/2013-8/2019. These patients were then divided by their age at time of kidney transplantation, into an "60-70" cohort, and an "above 70" cohort. Recipient demographic data was reviewed, and Chi square test was used to compare categorical variables. We used Wilcoxon rank sum test to compare continuous variables. Patients with simultaneous liver-kidney or heart-kidney transplantations were excluded from the data search. In the study period, of over 6.5 years, 202 pts aged 60-70, and 88 pts above 70 years old, underwent a kidney transplantation in our center. Recipient demographics were comparable between both groups, as shown in Table 1. Anti-thymocyte globulin and basiliximab were used for induction in the "60-70", and the "above 70" age groups respectively, per center protocol. Mean last serum creatinine was 1.64mg/dL versus 1.51mg/dL, in the "60-70" versus "above 70", respectively (p=0.1108), at a follow up interval of 39.3 vs 35.7 months respectively (p=0.2111). We noted 20 deaths, and 7 graft losses in the "60-70" group vs 12 deaths, and 4 graft losses in the "above 70" group (p=0.3263). In a sub-analysis, of there were 6 deaths and 3 allograft failures in 54 patients in the 71-75 years old group at a median follow up of 36.6 months, vs 6 deaths and one failure in 34 patients above 75 years old at 35.4 months median follow up (p for all comparisons = NS). As the world population continues to age, so does the ESKD population. Kidney transplantation is known to be the best form of renal replacement therapy. Despite this, in 2017 only about 2% of ESKD patients 65 years of age or older benefited from a kidney transplant. This is partly because only a fraction of elderly patients get placed on the waiting list.

Our study demonstrates comparable patient and allograft outcomes for the above 70 age group, versus the 60-70 age group. These findings emphasize the importance of considering patients' biological age, co-morbidities, and frailty, when assessing their candidacy for kidney transplantation, rather than strict chronological age.

KEYWORDS: Kidney transplantation, elderly recipients, age, septuagenarians

ABSTRACT #: 18

TITLE: Is There a Signal that Epogen has a Protective Effect in Heart Transplantation?

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ABSTRACT: Background: Erythropoietin (Epogen) is often given to patients with renal failure for chronic anemia. Epogen has been reported to have immunomodulatory properties, but it has not been well established whether Epogen affects rejection post-transplant. We sought to assess whether the use of Epogen has a protective effect on rejection.

Methods: Between 2010 and 2016, we assessed 25 dialysis dependent heart transplant patients. These patients were divided into those who were on Epogen (n=20) and those who were not (n=5). Outcomes included 3-year post-transplant subsequent survival, subsequent freedom from cardiac allograft vasculopathy (CAV, as defined by stenosis ≥ 30% by angiography), non-fatal major adverse cardiac events (NF-MACE: myocardial infarction, new congestive heart failure, percutaneous coronary intervention, implantable cardioverter defibrillator/pacemaker implant, stroke), and 1-year subsequent freedom from rejection including any-treated rejection (ATR), acute cellular rejection (ACR), and antibody-mediated rejection (AMR).

Results: Patients on Epogen have a significantly higher 3-year survival than those not on Epogen. Both groups have comparable subsequent 3-year freedom from CAV, freedom from NF-MACE, and 1-year freedom from ATR and ACR as patients not on Epogen.

Conclusion: There may be a signal that Epogen may have a protective effect for survival after heart transplant but numbers are small. Larger numbers are needed to confirm these findings.

KEYWORDS: Heart transplantation, Erythropoietin, Renal Failure, Anemia, Immunomodulation

ABSTRACT #: 19

TITLE: Does Lower Low-Density Lipoprotein Cholesterol Improve Outcome after Heart Transplantation?

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ABSTRACT: Background: Low-density lipoprotein (LDL) cholesterol has been demonstrated to adversely affect patients with underlying coronary artery disease. In heart transplantation (HTx), LDL cholesterol rises due to corticosteroids and the calcineurin inhibitors. From two randomized trials in HTx, it has been demonstrated that statins can lower LDL but also have an immunomodulatory effect by decreasing severe rejection and cardiac allograft vasculopathy (CAV) thus improving survival. It is not been established whether lowering LDL cholesterol to <70 mg/dL can result in improved HTx outcomes.

Methods: Between 2010-2016, we assessed 109 HTx patients and assessed their LDL cholesterol at 1-year post-transplant. All patients were on statin therapy and patients were divided into quintiles based on their cholesterol levels. The groups were then compared for subsequent 3-year outcomes, including survival, freedom from CAV (as defined by stenosis ≥30%), freedom from non-fatal major adverse cardiac events (NF-MACE, defined as myocardial infarction, percutaneous coronary intervention/angioplasty, new congestive heart failure, pacemaker/implantable cardioverter-defibrillator placement, and stroke), and 1-year subsequent rejection including any treated rejection (ATR), acute cellular rejection (ACR), and antibody mediated rejection (AMR). PCSK9 was not used in this study.

Results: Patients in the lowest quintile of LDL cholesterol did not appear to have significantly improved outcomes compared to the other quintiles.

Conclusion: Lower levels of LDL cholesterol at 1-year post-transplant do not appear to have beneficial outcomes although all patients were on statin therapy. Pushing cholesterol levels lower may not be indicated. Larger studies are warranted to confirm these results.

KEYWORDS: Heart Transplantation, Cholesterol, Coronary Artery Disease, Statins

ABSTRACT #: 20

TITLE: Has the New Heart Transplant Donor Allocation Policy Affected Immediate Post-Transplant Care and Outcomes? A Single Center Perspective.

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ABSTRACT: Background: The new UNOS donor heart allocation policy began in October 2018 and prioritized the sickest patients on the heart transplant waitlist. Patients on ECMO and on temporary assist devices now have priority over those less sick patients who are on intravenous inotropes. As a consequence of transplanting sicker patients, post-transplant care and outcomes may be affected. We sought to address this question in our large single-center study.

Methods: We assessed 116 patients undergoing heart transplantation in the six months prior to October 2018 who were transplanted under status 1A n=46 compared to patients transplanted the following six months as status 1,2 or 3 n=70. Endpoints for comparison in both groups include perioperative mortality, days in the ICU, overall hospital stays and 6-month survival, and the need for transient hemodialysis.

Results: We saw an increase in the total number of transplants done from 46 prior to the change to 70 after the allocation change. However, the proportion of patient done under urgent status did not change 78.3% vs. 80%. We did however observe an increase in ECMO (0% to 10%) and IABP utilization (11% to 17%). Despite the increase in device use outcome measures didn't show any difference in one year survival 100% pre vs. 92.7% post p=0.1. No statistical differences in ICU LOS, hospital LOS and need for dialysis were observed.

Conclusion: We observed that the total proportion of urgent transplant didn't vary after the change however the use of temporary devices especially ECMO increased post change. This change didn't not however result in a negative effect of survival or ICU and hospital LOS. More time and a larger patient population is required to fully determine the impact of the new allocation changes on temporary device use and outcome but as of now there doesn't seem to be a negative effect of the increase temporary device use in our large single center institution.

KEYWORDS: Heart transplantation, UNOS heart allocation, Urgency status

ABSTRACT #: 21

TITLE: Glomerular Filtration Rate at 1-Year Predicts Subsequent Need for Hemodialysis Following Heart Transplantation

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ABSTRACT: Background: Renal insufficiency following heart transplantation is common. Some patients undergo heart transplantation with reduced GFR but not low enough to require combined heart and kidney transplantation. It is not been firmly established whether GFR at 1-year predicts which patients will lead to chronic kidney dialysis within 5 years of follow-up.

Methods: Between 2010 and 2014, we assessed 287 heart transplant patients and assessed their GFR at 1 year after heart transplantation. Patients were divided into quintiles by GFR. These quintiles were then assessed for the development of chronic kidney dialysis (defined as more than 1 month of continuous hemodialysis) within 5 years after transplant.

Result: Patients in the lowest GFR quintile (<36cc/min) had significantly lower freedom from chronic dialysis within 5-years.

Conclusion: GFR <36 cc/min at one year post-transplant predicts risk for subsequent chronic kidney dialysis. These patients should be considered for renal sparing immunosuppression protocols.

KEYWORDS: Heart Transplantation, Renal Insufficiency, Glomerular Filtration Rate

ABSTRACT #: 22

TITLE: Does Angiotensin-Converting-Enzyme Inhibition (ACEi) for Blood Pressure Control have Effects on the Development of Cardiac Allograft Vasculopathy after Heart Transplantation?

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ABSTRACT: Background: The use of ACEi for hypertensive control after heart transplantation is common. However, ACEi can sometimes lead to renal insufficiency and hyperkalemia which are made worse by the need of CNI's after heart transplantation. There have been some reports that the use of ACEi may also have immunomodulatory factors. It has not been substantiated whether ACEi can decrease cardiac allograft vasculopathy (CAV) at 5 years after heart transplantation.

Methods: Between 2010 and 2014, assessed 54 heart transplantation patients who were placed on ACEi for hypertension and maintained ACEifor the ensuing 5 years after heart transplantation. These patients were compared to patients who were not on ACEi but rather calcium channel blockers (n=51) for hypertensive control and were maintained on a calcium channel blocker for the ensuing 5 years post-transplantation. Outcomes included 5-year freedom from CAV and non-fatal major adverse cardiac events (NF-MACE: myocardial infarction, percutaneous coronary intervention/angioplasty, new congestive heart failure, pacemaker/implantable cardioverter-defibrillator placement, stroke) and 1-year freedom from rejection (any treated rejection (ATR), acute cellular rejection (ACR), antibody mediated rejection (AMR)).

Results: There were no significant differences between patients on ACEi and patients on calcium channel blockers in 5-year freedom from CAV, freedom from NF-MACE, and 1-year freedom from rejection.

Conclusion: ACEi does not appear to have an outcome benefit compared to calcium channel blockers. A larger number of patients and further follow-up is necessary to confirm these findings.

KEYWORDS: Heart Transplantation, Angiotension-Converting-Enzyme Inhibition (ACEi), Cardiac Allograft Vasculopathy

ABSTRACT #: 23

TITLE: Effects of Donor Heavy Alcohol Use on Post-Heart Transplant Outcomes: Time to Abstain?

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ABSTRACT: Background: Donors with a history of heavy alcohol use have been suspected to possibly harbor a subclinical alcoholic cardiomyopathy with limited cardiac reserve. This problem can manifest after the donor heart is transplanted resulting in graft failure. We sought to investigate this possibility by reviewing our patients who underwent heart transplant with a heart from a donor with heavy alcohol use.

Methods: Between 2010 and 2018, we assessed 158 heart transplant patients who received a donor with a history of heavy alcohol use (defined as 2+ drinks/day). These patients were compared to a control group of patients who received a donor without a history of heavy alcohol use (n=671). 1 year outcomes included survival, freedom from cardiac allograft vasculopathy (CAV), freedom from non-fatal major adverse cardiac events (NF-MACE: myocardial infarction, percutaneous coronary intervention/angioplasty, new congestive heart failure, pacemaker/implantable cardioverter-defibrillator placement, stroke), and freedom from rejection (any treated rejection (ATR), acute cellular rejection (ACR), antibody mediated rejection (AMR)). The incidence of severe primary graft dysfunction (PGD) was also recorded.

Results: The donor heavy alcohol group compared to control had a trend for increased incidence of severe PGD. There were no significant differences between the two groups in survival, freedom from CAV, freedom from NF-MACE, and freedom from all rejections.

Conclusion: A donor history of heavy alcohol use may be a risk factor for severe PGD and should be accepted with caution. However, larger numbers of patients and more detailed alcohol history are needed to confirm this observation.

KEYWORDS: Heart transplantation, donor alcohol use, primary graft dysfunction

ABSTRACT #: 24

TITLE: Does Brain Death Related to Underlying Donor Disease Correlate with Adverse Outcomes after Heart Transplant?

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ABSTRACT: Background: Donation after brain death is the primary method by which donor hearts become available within the United States. It has been previously postulated that the method by which a donor reaches brain death may have an impact on the quality of the donor organ. Previous studies examining this have been mixed but have generally focused on traumatic vs non-traumatic deaths. In this study we sought to examine outcomes in recipients stratified by donor brain death related to underlying donor disease vs brain death that was independent of any underlying donor disease (including trauma, suicide, drug overdose, and others).

Methods: Patients who underwent orthotopic heart transplantation (OHT) from 2010-2019 at a large-volume center were evaluated. In total 966 patients were identified, and these were stratified by etiology of donor

brain death. Endpoints included severe primary graft dysfunction (PGD), 1-year survival, freedom from rejection (any, acute cellular, and antibody-mediated), freedom from cardiac allograft vasculopathy, and freedom from non-fatal major adverse cardiac events (NF-MACE).

Results: Of the 966 patients identified, 830 were suitable for analysis (136 had missing data). When stratified by donor brain death etiology, recipients of a donor who died due to donor-related disease fared worse in terms of survival than their counterparts who received donors who died from donor-independent processes (88.1% vs 93.1%, p=0.02). Additionally, these patients also had a higher rate of coronary artery vasculopathy (6.8% vs 3.9%, p=0.05). Rejection was similar between groups.

Conclusion: The etiology of donor brain death appears to have an impact on the ultimate outcomes following OHT, with donors succumbing to injuries related to external factors such as trauma, drug overdose, or suicide faring better than donors that succumb to intrinsic disease processes. While outcomes are still in the acceptable range for both groups, transplant centers should take this into account when selecting donor organs.

KEYWORDS: Heart transplantation, donor brain death

ABSTRACT #: 25

TITLE: Outcomes of Hearts Transplanted From ≥60 year-old Donors

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ABSTRACT: Background: Older donor hearts ≥60 years old have been reported to have less than optimal outcome after heart transplantation. However, careful selection of these donor heart may result in acceptable outcomes. We sought to assess the outcome of our patients receiving these older donor hearts.

Methods: Between 2010 and 2016, we assessed 641 heart transplant patients and divided them into two groups based on if the heart donor was ≥60 and older (n=11) or <60 years old (n=630). Endpoints included 3-year survival, freedom from the development of cardiac allograft vasculopathy (CAV, as defined by stenosis ≥ 30% by angiography), freedom from non-fatal major adverse cardiac events (NF-MACE: myocardial infarction, new congestive heart failure, percutaneous coronary intervention, implantable cardioverter defibrillator/ pacemaker implant, stroke), and 1-year freedom from rejection (any treated rejection (ATR), acute cellular rejection (ACR), antibody-mediated rejection (AMR)).

Results: There were no significant differences between heart transplant patients with donor hearts ≥60 years old and those <60 years old in all 3-year and 1-year outcomes.

Conclusion: Older donor hearts ≥60 years old appear to have acceptable outcomes. Larger numbers and longer follow-up are necessary to confirm these findings and assess long-term complications such as CAV.

KEYWORDS: Heart transplantation, older donor hearts

ABSTRACT #: 26

TITLE: The New UNOS Heart Allocation Changes Significantly Changed the Landscape of Heart Transplantation

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ABSTRACT: Background: October 2018 saw a change in the UNOS heart allocation which prioritized the sickest patients especially those of temporary devices. The main driver of the change was to reduce waitlist mortality. We aim to examine whether the new allocation benefits come at a cost of reduced post-transplant survival.

Methods: A retrospective UNOS database review of all heart transplants performed between April 2018 and April 2019 (n=3431). These patients divided according to their allocation status and whether they were done prior (n=2143) or after the allocation change (n=1288). Proportion of patients in each status and the rate of temporary device use were assessed. 6-month survival in each status was also analyzed.

Results: The proportion of patient listed in the urgent status of 1,2 or 3 was 77% which is a significant increase compared to the 69% for status 1A patients. We observed a significant reduction in Status 4 listing compared to status 1B 19% vs. 27%. ECMO use significantly increased from 1% in the old system to 5% in the new system with no differences in survival 76% vs. 79%. No significant changes in Impella utilization were observed however survival was reduced from 98% in the old system to 77% in the new p=0.006. IABP utilization significantly increased in the new allocation system from 8% to 23% utilization with no significant changes in survival.

Conclusion: Under the new allocation we have seen a significant rise in the ECMO and IABP utilization resulting in an increase in the proportion of status 1,2 and 3 compared to status 1A group but was associated with a significant reduction in the status 4 patients (former status 1B). While this new allocation prioritizes a reduction in wait times and mortality, we have observed that this is associated with higher transplant mortality in status 1,2,3 and 4 patients. Finally, more time and data is required to determine if the new allocation results in reduced waitlist mortality at the cost of lower post-transplant survival.

KEYWORDS: Heart Transplantation, UNOS heart allocation, Urgency status, Mortality

ABSTRACT #: 27

TITLE: The Forgotten Hepatitis B Donor in Heart Transplantation

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ABSTRACT: Background: In the past, Hepatitis B donors have been declined in patients who have not been vaccinated by the Hepatitis B vaccine. There is concern that these donors would transmit Hepatitis B to the recipient if they are not vaccinated. There is treatment available for these Hepatitis B infections, however, it has not been established as to its efficacy in patients on immunosuppression. In addition, hepatitis viruses have been reported to affect the endothelium of vital organs. Hepatitis B may injure the endothelium of the coronary vascular tree and could potentially result in a greater development of cardiac allograft vasculopathy (CAV) after heart transplantation. Therefore, we sought to assess this possibility by examining our patients who received Hepatitis B donors.

Methods: Between 2010 and 2016 we assessed 24 heart transplant patients who received a Hepatitis B donor. All of the recipients had received a Hepatitis B vaccine prior to transplantation. Endpoints include 3-year survival, 3-year freedom from CAV, 3-year freedom from non-fatal major adverse cardiac events (NF-MACE), and freedom from first year rejection, including any treated rejection (ATR), acute cellular rejection (ACR), and antibody-mediated rejection (AMR). These study patients were compared with 600 patients without Hepatitis B donors in a contemporaneous era.

Results: 3-year survival, freedom from NF-MACE, and freedom from first year rejection were similar between the Hepatitis B and Control groups. There is numerically a lower incidence of freedom from CAV in the Hepatitis B group compared to the control, but this was not statistically significant.

Conclusion: Hepatitis B donors appear to have acceptable outcome compared to non-Hepatitis B donors after heart transplantation. Larger numbers of Hepatitis B donors will be needed to assess risk for increased CAV development.

KEYWORDS: Heart transplantation, Hepatitis B

ABSTRACT #: 28

TITLE: The Use of Cardiac Magnetic Resonance Imaging (MRI) to Predict Outcome after Heart Transplantation

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ABSTRACT: Background: Heart transplant patients are known to develop cardiac rejection and cardiac allograft vasculopathy (CAV) after heart surgery. The severity of these rejection episodes and the detection of rejection has not been adequate with the endomyocardial biopsy. In fact, biopsy negative rejection is seen in approximately 5% of our patient population. The use of cardiac MRI has been found to detect myocardial edema or fibrosis. However, it has not been established what these cardiac MRI abnormalities represent and whether they can predict the development of CAV by angiography or clinical outcomes.

Methods: Between 2011 and 2018, we assessed 26 heart transplant patients who underwent cardiac MRI imaging due to clinical indications. In most cases, cardiac function was decreased or endomyocardial biopsy was either negative or ambiguous for rejection. Patients with abnormal cardiac MRI findings of myocardial edema or fibrosis were compared to patients without findings of myocardial edema or fibrosis. These patients were followed for 1 year after the imaging was performed. Patients from each group were assessed for 1-year subsequent (from MRI scan) survival, 1-year subsequent freedom from CAV, 1-year subsequent freedom from NF-MACE, and the presence of left ventricular dysfunction defined as left ventricular ejection fraction (LVEF) <40%.

Results: There is a numerically lower survival in patients with myocardial edema or fibrosis on cardiac MRI. Cardiac dysfunction with LVEF <40% was more prevalent in the abnormal cardiac MRI group compared to the control.

Conclusion: Cardiac MRI findings of myocardial edema or fibrosis appear to be associated with LV dysfunction and possibly lower survival compared to controls. Larger studies are needed to confirm the use of cardiac MRI in this patient population.

KEYWORDS: Heart Transplantation, Cardiac Magnetic Resonance Imaging

ABSTRACT #: 29

TITLE: A Retrospective Review of the New UNOS Heart Transplant Donor Allocation Policy Affect on Urgent Status Listing and Outcomes in Status 1, 2, and 3 Listing Compared to the Old Status 1A

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ABSTRACT: Background: Starting October 2018 a new UNOS heart allocation system began and prioritized the sickest patients on the heart transplant waitlist. Patients on temporary mechanical support got higher priority compared to those on inotropic support. As a consequence of transplanting sicker patients, post-transplant care may be affected. We sought to address this question.

Methods: A retrospective review of all transplants in the UNOS database between April 2018 and April 2019 were assessed who were categorized as urgent status n=2475. In the six months prior to October 2018 patients who were transplanted under status 1A(n=1480) were assessed for specific endpoints. These patients were compared to urgent status 1, 2, and 3 undergoing heart transplant after the policy change in October 2018 (n=995). Status 1, 2, and 3 correlate to the old status 1A with the difference being that sicker patients are being transplanted in the new allocation policy. Endpoints for comparison in both groups include 6 month mortality.

Results: We observed an increase in the proportion of patients listed for urgent status after the allocation change compared to prior (69% vs 77%). We saw an increase in ECMO (1% to 5%) and IABP utilization (8% to 23%). Waitlist time decreased significantly from 215 days vs. 172 days p=0.0039. Survival comparison between the old status 1A listing and the new status 1,2 and 3 listing showed a significant reduction in survival from 93.3% to 85.8% p=0.0002. No statistical differences in ICU LOS, hospital LOS and need for dialysis were observed.

Conclusion: The new donor heart allocation policy appears to select sicker patients undergoing heart transplant with shorter waitlist times. However, despite shorter wait times, survival was reduced in urgent status patient under the new allocation system. Whether, this increased mortality is as a result of sicker patients being transplanted or other factors remains to be determined. Larger patient populations and longer follow up is needed to determine whether the new allocation system reduces wait times at a cost of survival.

KEYWORDS: Heart transplantation, UNOS heart allocation, Urgency status

ABSTRACT #: 30

TITLE: Identifying Risk Severity Using Wuhan Chart in Deceased Donor Kidney Transplantation

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ABSTRACT: AIM and Objective: To find etiological risk factors for deceased donor kidney transplantation.

Materials and Methods: From January 2009 to December 2015, a total of 130 individuals underwent deceased donor (DBD-48, DCD-82) kidney transplantation. Any complication post transplantation within one year was noted and deceased donor re-studied to determine the probable identifiable risk factors. When reevaluating the donor from the data centre, certain factors identifiable factors like; age of

donor, cause of donor death, drugs received (catecholamine, vasopressin), Creatinine > 3mg/dl, duration of anuria, duration of low BB, WIT, and TIT etc were related to more complications, therefore major focused during our study.

Results: Out of 130 cases, 56 cases reported complications like DGF, ureterocele, hydronephrosis, urinary leakage, hematoma, embolisation, chest infection, sepsis even death. Upon reevaluating the recipient and donor, we found that the following are the common risk factors for post transplantation complications in deceased donors: Patients age > 60 , death related to CVS was associated with complications, serum creatinine >3mg/dl & drugs administered prior to retrieval(prolong morbidity) is a definite risk for DGF, anuria and SBP(<60 mm of hg) for more than 24 hours increases chances of delay in graft function. Warm ischemia time (WIT) of >20 mns along with higher total ischemic time (TIT) increases risk for delay function (DGF) non-functioning of graft (PNG). We propose a chart (Wuhan Chart, see Figure 1) to evaluate the risk severity scale, greater than 7 always have an increased risk factor than with less than 7.

Conclusion: In the future, deceased donor transplantation will serve as a major organ pool. Identifying risk factors and taking extra precaution will definitely help to minimize complications. Thus, identification of possible risk factors will help to minimize complications and make transplant successful by prolonging graft and patient survival. The WUHAN CHART (Risk Severity Scale) will help to identify common risk factors.

KEYWORDS: deceased donation, kidney transplantation

ABSTRACT #: 31

TITLE: The Impact of a Positive Crossmatch on KAS Patients and Organs

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ABSTRACT: The Impact of a Positive Crossmatch on KAS Patients and Organs

Purpose: To evaluate the potential effects of offer refusals due to positive crossmatch (+XM) on both patients and re-allocated organs with special focus on waitlist outcomes, organ cold ischemia times (CIT), and discarded kidney rates.

Methods: Organ Procurement and Transplantation Network (OPTN) deceased donor kidney transplant (DDKT) waitlist data from 2015-2018 were assessed for patient and kidney outcomes after a positive crossmatch. Waitlist registrants were stratified into 27 cPRA groups. Post +XM waitlist registrants were evaluated for their current waitlist status (as of 10/11/2019). Kidneys reallocated after a positive crossmatch were evaluated for discard rates and changes in CIT to new recipients.

Results: Kidney match runs over the time period resulted in 17,741 +XM refusals, of which 3,989(22.5%) had a cPRA of ≥99.5%.

Waitlist Outcomes after a +XM: Among all waitlisted kidney transplant candidates with a first time +XM refusal (n=9,317) during 2015-2018, 45% (n=4,142) received a DDKT, 26.1% (n=2,428) were currently listed as still waiting, and 25.9% (n=2,415) were removed from the waitlist for either death, too sick, or other, as of 10/11/2019.

Patients with +XM refusals and a cPRA ≥99.9% (n=511) 30% (n=152) received a DDKT and 39% (n=197) were still waiting. Furthermore, by combining the outcomes of those removed from waitlist (death, too sick, or other) 31% (n=157) ended up delisted after a +XM refusal.

Kidneys Refused for a +XM Among kidneys reallocated (n=930) after an offer was accepted and later refused due to a +XM, 84 (9%) were discarded while the remainder 846 (91%) were allocated to a different recipient.

CIT was increased in kidneys transplanted in another waitlist registrant after a +XM compared to kidneys placed with original acceptor. The median CIT increase for local,

regional and nationally reallocated kidneys after a +XM were 7.2, 6.3, and 6.2 hours respectively.

Conclusion: Reallocating kidneys due to +XM affects organ allocation by significantly increasing CIT and resulting in the discard of approximately 25 kidneys annually. Patients were affected with longer waiting times and a significant number ending up dying or being delisted. Furthermore, markedly fewer patients with cPRA ≥99.9 experiencing a +XM refusal received a transplant (30%) compared to other +XM refusal waitlist patients (45%). Technologies and therapies to reduce +XM refusals could potentially have a positive impact on patients and allocation.

KEYWORDS: desensitization allocation discard cold ischemia time

ABSTRACT #: 32

TITLE: Long-term Outcomes of Sensitized and Crossmatch-Positive Kidney Transplanted Patients after Desensitization with Imlifidase

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ABSTRACT: More than 30% of patients waiting for a kidney transplant are sensitized (i.e. have pre-formed anti-HLA IgG antibodies). The presence of donor specific antibodies (DSA) at the time of transplantation can be associated with poor outcomes and if present at a sufficient strength can result in immediate hyperacute rejection. The level of sensitization is analysed prior to transplantation, and presence of DSA generating a positive crossmatch is considered a contraindication to transplantation. Patients with a wide breadth of high titre HLA antibodies producing a high calculated panel-reactive antibody (cPRA) value, are referred to as 'highly sensitized' and considered highly unlikely to be transplanted since the chance of finding an immunologically HLA-compatible donor is low.

Different desensitization strategies have been developed, however mainly focusing on living-donor HLA-incompatible kidney transplantations since these strategies typically require multiple treatments occurring over days to weeks to reduce DSA to a level at which transplantation can be safe. Data from living donor transplantations demonstrate that successful desensitization of patients having DSA, followed by transplantation, is associated with both short- and long-term survival benefits compared to staying on dialysis. Transplantation of highly sensitized patients with an HLA-incompatible kidney from a deceased donor is even more limited since no approved or effective desensitization strategy with rapid effect is available in clinical practice. Currently, highly sensitized patients without a compatible living donor are placed on the waiting-list and stay there for many years risking being delisted due to worsened comorbidity or death.

Imlifidase (IdeS) is a recombinant cysteine protease derived from Streptococcus pyogenes that rapidly cleaves IgG in the lower hinge region to a F(ab')2 fragment and a dimeric Fc fragment. The ability to cleave all IgG, including DSA, within few hours of administration, has enabled patients with a positive crossmatch to a deceased donor to be transplanted without lengthy pre-transplantation treatments. Imlifidase has been used in several clinical trials to desensitize the patients, all of whom had high-strength DSA resulting in a positive

crossmatch to their donor. The patients received imlifidase for desensitization and underwent transplantation within 24 hours of administration. Here we report the extended follow-up of patients following imlifidase-enabled kidney transplantation.Between 2014 and 2017, 46 sensitized patients, 34 of whom were highly sensitized with a cPRA >95%, were included in the 13-HMedIdeS-02, 13-HMedIdeS-03, 14-HMedIdeS-04 and 15-HMedIdeS-06 trials and transplanted subsequent to imlifidase treatment and followed at the annual routine visits to the clinic (17-HMedIdeS-14 trial). 39 of the 46 patients showed positive crossmatch to the allocated kidney, which after treatment and desensitization with imlifidase was converted to negative, thus enabling transplantation. 32 of the 39 crossmatch positive patients were allocated a kidney from a deceased donor. Information about overall and graft survival, kidney function, and rejection episodes were recorded. Rejection episodes were evaluated according to the 2017 Banff criteria.

Since the data collection was initiated after the end of the original studies, some patients have data for later but not for earlier time points. However, graft and overall survival is assumed at earlier timepoints if 'Yes' at a later time-point. For some patients, data on renal function was retrieved retrospectively from medical records.43 (93%) of the 46 transplanted patients had a functioning graft after 6 months. 3 graft losses occurred in the crossmatch positive group leaving 36 (92%) of these 39 patients with a functioning graft at 6 months. No further graft losses occurred up to 2 years after transplantation. 2-year death-censored graft survival was 24 of 27 patients (89%), and overall graft survival was 24 of 30 patients (80%).

Three deaths have been reported, all in the crossmatch positive population, and occurring in the period 7 12 months after transplantation, resulting in a 1-year survival rate of 29 (91%) of the 32 patients with available data. None of the death was regarded as having any relationship with malfunction of the kidney or the imlifidase treatment, and no death has subsequently been recorded.

Kidney function assessments showed that 28 (87%) of the 32 patients with data, and 23 (88%) of the 26 crossmatch positive patients with data, had a functioning kidney at 6 months.

Evaluation according to Banff 2017 of the rejection episodes that were reported showed that 15 of the 39 crossmatch positive patients (38%) had an AMR episode during the first 6 months after transplantation and 1 additional case of AMR occurred between 6 months and 1 year after transplantation. No additional AMR has been identified in any patient in the period 1 to 2 years after transplantation.These data show that the general long-term outcome of kidney transplantation for this highly sensitized and crossmatch-positive population is good and comparable to data reported in the literature with other desensitization methods. More specifically, due to the rapid activity, efficiency, and specificity of imlifidase, desensitization can be extended to populations in which desensitization was not previously a viable option (recipients of deceased donor organs and patients with high titre DSA). This would allow highly sensitized patients who are unlikely to find an HLA compatible donor access to deceased donor organs, reducing the mortality and time on the waiting list.

KEYWORDS: Imlifidase, IdeS, kidney transplantation, crossmatch conversion, desensitization

ABSTRACT #: 33

TITLE: Impact of an OPO Surgeon on Utilization of Pediatric Livers

AUTHOR(S) (FIRST NAME, LAST NAME): Malcolm MacConmara, Jeffrey Reese, Cyrus Feizpour, Steven Hanish, Parsia Vagefi, Christine Hwang

INSTITUTIONS (ALL): *University of Texas Southwestern, Southwest Transplant Alliance, University of Texas Southwestern Medical Center, University of Texas Southwestern Medical Center, University of Texas Southwestern Medical Center, University of Texas Southwestern Medical Center*

ABSTRACT: Organ Procurement Organizations (OPO) have begun employing organ procurement surgeons in order to enhance donor processes and reduce organ discard. We have examined the effect of the OPO surgeon on utilization and placement of pediatric liver allografts. OPO data were obtained for all pediatric (<18 years) procurements that were performed between 2010-2017 with and without an OPO surgeon present. Analysis was performed to see if presence of a donor surgeon impacted the utilization of pediatric livers. Donor and recipient demographic data were examined. A p-value of <0.05 was considered significant.

361 pediatric procurements were completed during the study period; 93 with and 268 without an OPO surgeon. Pediatric donors were younger (9.1 vs. 11.5 years, $p < 0.05$), had a higher terminal aspartate transaminase (126 vs. 91 units/L, $p < 0.05$), longer distance to travel to the recipient center (301 vs. 215 miles, $p < 0.05$), but a shorter cold ischemic time (6.4 vs. 6.9 hours, $p < 0.05$) when the OPO surgeon was present at the procurement. Recipients were significantly younger (24 vs. 35 years, $p < 0.05$), trended towards a lower MELD/PELD score (16 vs. 19, $p = 0.059$) and were less likely to have a diagnosis of hepatocellular carcinoma (12% vs. 34%, $p < 0.05$) with an OPO donor surgeon present. There were significantly more nationally shared livers with an OPO surgeon (28% vs. 9%) and no difference in the liver discard rate (7% vs. 5%, p = NS). Presence of an OPO surgeon significantly increased the percentage of pediatric livers being transplanted into a pediatric recipient (59% vs. 38%, $p < 0.05$).Presence of an OPO surgeon has altered organ utilization and leads to increased transplantation of pediatric livers in pediatric recipients and expansion of the geographical share of pediatric livers. The OPO surgeon appears to be a beneficial factor for pediatric patients awaiting liver transplantation.

KEYWORDS: Pediatric transplantation, Liver allocation, Liver utilization

ABSTRACT #: 34

TITLE: Improving Equity by using an 11 HLA Loci cPRA Calculator for Assigning Unacceptable Antigens: Impact on cPRA and Organ-Allocation Points in Kidney Transplant Candidates

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INSTITUTIONS (ALL): *Northwestern University, Northwestern University, Cedars-Sinai Heart Institute, Tulane University, Northwestern University*

ABSTRACT: Calculated panel reactive antibodies (cPRA) is used by the United Network for Organ Sharing (UNOS) to quantify the degree of HLA sensitization and assign priority in organ allocation. The current calculator was last updated in 2013 and relies on HLA frequencies as well as ethnic frequencies derived from donors used during 1/1/2007-12/31/2008. While there were updates to the unacceptable antigen (UA) list, there were no changes to the frequencies, and thus cPRA still draws its calculations mostly from low-resolution antigen assignment, as well as disregarding the DQA, DPA, and DPB loci. We calculated cPRA using data for 11-loci high-resolution genotype frequencies from the National Marrow Donor Program (NMDP; Allelic cPRA), with similar ethnic distribution to US kidney donors. Using a cohort of 902 consecutive active waitlist patients at our center, we compared the "Allelic cPRA" with the standard UNOS cPRA and analyzed the observed differences. We further used these calculations to determine changes to assigned allocation points using the current New KAS UNOS sliding scale for priority points.Allelic cPRAs were calculated using the following link: http://transplanttoolbox.org/nmdp_cpra/

Antibody specificities from single antigen bead assays for 902 consecutive active waitlist transplant candidates at our center were used to compute UNOS and Allelic cPRA values. For the purposes of this study, all positively

reacting beads from the most recent single antigen bead assay were considered UAs. These were entered into the UNOS calculator at antigen-level, and into the Allelic calculator at two-field allele-level, with DQ and DP entered as alpha/beta combinations. Allocation points were determined based on the current UNOS KAS sliding scale. Because HLA-DP is not currently considered when calculating PRA or in assigning allocation points, we performed all calculations with inclusion or exclusion of DP UA in the Allelic calculator, to assess the specific contribution of HLA-DP antibodies.435/902 patients exhibited no HLA antibodies, and thus were not impacted by changing calculators. The remaining 467 were grouped by their UNOS cPRA value — 1-19%, 20-49%, 50-79%, 80-94%, 95-97%, 98%, 99%, or 100%. As can be seen in Figure 1, 22/467 sensitized patients exhibited an increase to a higher category in their Allelic cPRA compared with the UNOS cPRA value. 212/467 demonstrated a decrease to a lower cPRA category. Importantly, 28% (27/97) of patients assigned to the 100% UNOS cPRA group dropped to a lower cPRA group using the Allelic calculator, with 17 patients dropping to the 99% cPRA category and 10 patients dropping to 98% cPRA or below. Similarly, 72% (18/25) of patients originally assigned to the 99% UNOS cPRA group dropped to lower cPRA groups. The overall impact of using the Allelic cPRA calculator for all 11 loci is presented in Figure 2.

Despite the addition of more loci in the allelic cPRA calculator, we found that cPRA values decreased for 369/467 (79%) of patients. We suspect that this is likely due to allelic assignment of UA, and further suspect that the conversion of DQ UA to alpha/beta combinations is a key contributing factor. To determine whether a specific locus was responsible for this observation, we reanalyzed the cPRA of the 45 patients who dropped from either the 100% or 99% cPRA groups, using the Allelic calculator with antigen level UA, and replacing the UA to allelic determination on a per-locus basis. The resulting decrease in cPRA was then compared across the loci for each patient. As can be seen in Figure 3, changing HLA-DQ assignment to allele-level alpha-beta frequencies led to the largest drop in cPRA for 49% (22/45) of patients, followed by HLA-DR 33% (15/45). This suggests that allelic assignment of UA, and further conversion of DQ UA to alpha/beta combinations is a key contributor to the cPRA decrease.

To isolate the role of HLA-DP in the overall changes, we calculated the difference in cPRA and allocation points using the Allelic calculator with the inclusion or exclusion of HLA-DP UA, as seen in Figure 4. From this data, it is clear that the patient populations that experience the highest increase in cPRA due to the addition of HLA-DP UA are the less sensitized patients. Yet, the impact on allocation points is clearly more dramatic for patients that slide up the scale into the very high cPRA range (99% and 100%).

Our data demonstrate that capturing UA using allele level information has a significant impact on calculation of cPRA. Moreover, given the sliding scale of allocation points in the new KAS, patients are either receiving or being denied priority in an unfair, unequitable, manner. The current frequency database is archaic and has not been updated for over a decade. Currently, UAs can indeed be entered into UNET at the allele level, blocking the patient from being offered a donor against which they have DSA; however, due to the old nature of frequencies collected — the patients are not able to receive the corresponding allocation points.

UNOS should consider utilizing available resources (such as the vast NMDP database) to derive ethnic comparable database until further information is collected on kidney donor HLA high resolution typing.

KEYWORDS: cPRA, Allocation, cPRA calculator, Unacceptable Antigens, HLA Antibodies

ABSTRACT #: 35

TITLE: Anticipated Outcomes of Using Ex-Vivo Lung Perfusion (EVLP) Organs

AUTHOR(S) (FIRST NAME, LAST NAME): Jorge Mallea, Kristen Ryland, James Moriarty, Launia White, Bijan Borah, James Naessens

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

ABSTRACT: Purpose: We assessed the cost savings generated by additional organ availability due to utilizing ex-vivo lung perfusion organs in comparison to existing lung transplantation practice. By increasing organ availability and transplanting at lower lung allocation score (LAS), healthcare costs could be reduced.

Method: We developed a Markov model using Monte Carlo microsimulation to obtain cost estimates for 6, 12, 36, and 60-month timeframes for patients starting from the time of listing for lung transplantation. We included two arms, one for usual lung transplantation practice and an intervention arm allowing for 50% increased organ availability with acceptance of EVLP organ donation. Health states were stratified by four LAS categories: <40, ≥40 to <60, ≥60 to <80, and ≥80. Patients were allowed to move between LAS categories prior to transplantation. Model parameters, such as probabilities and costs, were obtained from existing literature on lung transplantation and internal lung transplant registries, supplemented by additional cost data from our practice. We simulated 100,000 hypothetical patients, with the model representing the average adult patient listed for a first lung transplant. Costs were valued in 2018 US Dollars. Future costs were discounted at 3% annually.

Results: Mean costs of EVLP after 6 months is $143,997 compared with standard of care cost of $113,859, after 12 months is $190,081 compared with standard of care cost of $163,759, after 36 months is $229,514 compared with standard of care $216,430, and after 60 months is $225,339 compared with standard of care cost of $218,386. The use of EVLP organs increases the transplant rates and decreases the mortality in the transplant list (10.1% in the EVLP group vs 14.1% in the standard group). There was a trend towards longer survival time after transplant in the EVLP group vs standard of care (mean of 45.7 vs 45.2 months respectively). Time spent awaiting transplantation was reduced in the EVLP group at each time point compared with standard of care. There was a higher cost using EVLP organs compared to standard of care, but decreases over time. The cost difference was minimal at LAS scores 60 to <80 and ≥80 at the 36 and 60-month time point.

Conclusions: Use of EVLP organs for transplantation is expected to increase transplant rates; reduce time on the wait-list and wait-list mortality; and might increase survival time after transplant. The cost of using EVLP lungs is higher compared with existing lung transplantation practices. The difference of costs is minimal at higher LAS.

KEYWORDS: EVLP, cost, lung

ABSTRACT #: 36

TITLE: Impact of Race and Gender on Wait-List Mortality in Heart Transplantation

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INSTITUTIONS (ALL): *Houston Methodist hospital, Houston Methodist hospital, Houston Methodist hospital, Houston Methodist hospital, Houston Methodist Hospital*

ABSTRACT: Demographic disparities have shown to play an important role in outcomes post heart transplantation such as lower survival rate for Black patients when compared to other ethnic groups or higher allograft rejection rates in women compared to men . Although multiple studies have shown the outcome of these differences on survival post heart transplantation, no studies have reviewed these factors or their impact on the wait-list mortality.32, 460 patients age 18 years or older registered on UNOS heart transplantation list from 01/2009 through 2/2018 were included in our study. Patients who were on re-transplanted, on multiple listing, removed from the list on error or had multi-organ transplant were excluded. Differences between groups were compared using the Chi-square or Fisher's exact

tests for categorical variables and unpaired t-test or Kruskal Wallis tests as appropriate. Differences between groups were compared using the log-rank test. (Figure 1).

Although Black patients compared to White individuals were less likely to be seen on the heart transplant list (22.7 % vs. 65.1 %, P<0.001) once the variable was adjusted for heart failure incidence and racial population prevalence, there was no significant racial disparity.

Men were more likely than Women to be listed for heart transplantation (74% vs. 26% , P <0.001) and Male gender was associated with increased wait-list mortality (P: 0.04).

Patients with age 60 years or older were more likely than younger patients to die within one year from listing for heart transplant (39 % vs. 36 %, HR 1.19, P<0.001). There was statistically significant mortality difference between Non-Black and Black patients listed for the heart transplantation with Non-Black having less favorable outcome on the transplant list (P: 0.049). (Table 1)

Gender disparity was statistically significant among patients listed for heart transplantation with women less likely to be listed and men more likely to die on the transplant list.

Interestingly there was no significant racial difference between Non-Black and Black population listed for heart transplantation once adjusted for heart failure incidence and population prevalence .There was at least similar if not slightly higher survival in Black population on the heart transplant waiting list when compared to their Non-Black counterparts.

KEYWORDS: Disparity in heart transplantation

ABSTRACT #: 37

TITLE: The Impact of the 2014 Kidney Allocation System on Waitlisting Rates at the Dialysis Facility Level

AUTHOR(S) (FIRST NAME, LAST NAME): Taylor Melanson, Jennifer Gander, Rachel Patzer

INSTITUTIONS (ALL): *Emory University, Kaiser Permanente Georgia, Emory University*

ABSTRACT: Background: The new Kidney Allocation System (KAS) was implemented in 2014 and it is not fully understood how its changes may have impacted dialysis facility waitlisting rates.

Methods: We used Dialysis Facility Report data from 2011 to 2017 to study waitlisting rates at dialysis facilities in the US, using waitlisting counts in the numerator, and the total number of ESRD patients in a facility as the denominator. We examined changes in waitlisting rates over by year at the facility, regional, and national level, and report national trends in waitlisting pre- and post-KAS. Facilities were stratified based on waitlisting rate in 2011 and then we examined whether each facility moved into a higher or lower quartile or stayed in the same quartile in 2017 .

Results: Among n=3,392 dialysis facilities, the average change in dialysis facility waitlisting rates from 2011 to 2017 was -4.74 percentage points (range -54.4% to 42.3%). Average change in dialysis facility waitlisting rates from 2011 to 2014 was -0.57 percentage points while the average change in dialysis facility waitlisting rates from 2014 to 2017 was -4.17 percentage points. Half of facilities in the 2011 lowest quartile remained in the lowest quartile in 2017; 45% of facilities in the top 2011 quartile dropped into a lower quartile. The middle 2 quartiles were fairly evenly split between worsening, improving, and not changing.

Conclusions: Average waitlisting rates have been declining since implementation of KAS. There is wide variability in the change at the dialysis facility level. That facilities frequently switched quartiles from 2011 to 2017 results suggest that the factors that make a facility high-performing may not be stable over time. The declines in facility waitlisting post-KAS suggests that the new allocation rules may be discouraging patients and/or providers from getting ESRD patients waitlisted.

KEYWORDS: Waitlisting, Kidney Allocation System, Kidney Transplant, Dialysis Facilities

ABSTRACT #: 38

TITLE: Analytical Stability and Performance of QiSant, a Novel Urine Assay for Early Detection of Kidney Transplant Rejection

AUTHOR(S) (FIRST NAME, LAST NAME): Niamh Nolan, Donna Hongo, Katherine Valdivieso, Phoebe Katzenbach, Josh Yang, Todd Whitson, Lucy Lu, Rekha Mani, Reuben, Sarwal, Minnie Sarwal

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ABSTRACT: Current blood tests using cfDNA to evaluate the risk of kidney transplant rejection show deficits of rejection detection sensitivity, specificity or detection of TCMR, that diminish their clinical utility. We present the urine QiSant™ test, developed at NephroSant, (a spinout of IP from the Regents, University of California), as a multi-marker algorithm, that includes 5 customized urine biomarker assays (cfDNA, Clusterin, Creatinine, CXCL10 and Protein), and provides a quantitative scaled Q-Score, for the non-invasive, accurate, early detection of both TCMR and ABMR, providing clinical improvements to address the shortcomings of existing blood-based tests. We also present analytical and pre-analytical stability data in urine on the five biomarkers, that's essential for maintaining the clinical value of the test score during shipment of patient specimens.

Analytical performance of the five assays were assessed for sensitivity, specificity and reproducibility as per CLIA recommended guidelines. 189 kidney transplant patient urine samples with paired biopsy confirmed allograft status of acute rejection or no-acute rejection were included. Urine samples were collected from these patients from 1 to 487 days post-transplant. Pre-analytical studies included testing of all biomarkers across multiple time-points and temperatures using custom preservatives designed to maintain stability of relevant cellular components in urine. Sequential series of models were developed using generalized linear mixed effect models. Following the model comparison and feature selection, we developed an algorithm and a Q-Score for assessing the performance of the minimal set of urinary biomarkers on allograft rejection status. We utilized the samples with rejection and no-rejection status and split the samples into training set (n=100) and testing set (n=42) by random selection procedure.

The trained model was then cross- validated on the entire dataset which included AR, NR and other injuries like preAR, BKVN, CAN/STA and CAN/bAR. Random Forest modeling was used to identify the relationship between the biomarkers for detecting the kidney injury status. Also, this information was used to obtain a predictive score, scaled from 0-100, predictive of kidney allograft rejection. Cross validation and bootstrapping techniques were used to evaluate the performance of the model. AUC, sensitivity and specificity were calculated for the resulting model.

The analytical sensitivity, specificity and reproducibility showed acceptable performance across all five assays contributing to the Q-Score. Pre-analytical stability was confirmed across the required shipping time and temperature in the transportation of patient specimens from kidney transplant centers to the clinical lab for testing. There was clear separation in Q-Scores between patients with acute rejection and non-rejection, with an observed sensitivity of 93.3%, 99.1% specificity and 97.89% accuracy.

The QiSant urine test generates a quantitative, scaled Q-Score that provides an accurate, non-invasive immune monitoring tool that can accurately and reliably monitor kidney transplant patients' rejection status, and identifies both clinical and sub-clinical rejection, and biopsy confirmed TCMR and ABMR rejections. Additional studies are underway to evaluate the clinical utility of QiSant test for for serial graft surveillance, for proactive management of sub-clinical graft rejection, with the aim to prolong graft survival.

KEYWORDS: kidney transplant, rejection, monitoring

ABSTRACT #: 39

TITLE: Reducing Kidney Waitlist Times with Shared Data among Dialysis, Nephrology, and Transplant Providers

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

INSTITUTIONS (ALL): *University of Iowa*

ABSTRACT: Potential kidney transplant candidate referrals and evaluations are made subjectively with limited information resulting in unfair access barriers for patients. Enhancing transparency, regulation, and bi-directional communication among kidney failure patients and providers may improve access, reduce the overall cost of care, and improve patients' quality of life.A Plan-Do-Study-Act performance improvement methodology was utilized to design and implement a dedicated software application (app) for the referral and evaluation of potential kidney transplant candidates. The app was utilized by dialysis, nephrology, and transplant care providers, kidney failure patients, and patient support networks. The app was implemented across the ESRD Network of the Ohio River Valley (Network 9) and all aforementioned consenting participants from Indiana, Ohio, and Kentucky for a period of one year.We anticipate early/breaking results in time for the upcoming AST 2020.We anticipate early/breaking results in time for the upcoming AST 2020.

KEYWORDS: Kidney Transplant; Kidney Failure; Waitlist; Quality; Regulatory

ABSTRACT #: 40

TITLE: Report of Organ Offers Linked with Instant Messaging Data Provides a Basis for Quality Improvement

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

INSTITUTIONS (ALL): *University of Iowa*

ABSTRACT: Thousands of viable organs are discarded every year with incorrect or inappropriate reasons for declination. One limitation on the accessibility of organ transplantation is the time-sensitive, onerous, and disorganized determination of donor/recipient match quality. Misconstrued decline reasons are not helpful when analyzing retrospectively or constructing quality improvement programs for transplant centers and organ procurement organizations.A Plan-Do-Study-Act performance improvement methodology was utilized to design and implement a dedicated mobile communication application (app). Procurement and transplant teams in Iowa and the D.C. area analyzed critical time points in the organ offer, procurement, and transplant processes on a monthly basis while implementing the app. The report of organ offers was supplemented with the documentation of real-time communication. Teams reported enhanced quality of their monthly retrospective review of the report of organ offers when supplemented with real-time documentation. Transplant and procurement directors reported that they received a detailed, unbiased, and factual account of what had transpired during each organ offer. Teams highlighted that having real-time documentation was particularly useful for organ offers that were declined inappropriately or transplanted with complications.The transplant administrators substantiated the need for center-wide organ acceptance standards and processes. The extra delineation resulted in increased buy-in from clinical teams. This study is ongoing.

KEYWORDS: Organ Offer; Kidney Transplant; Kidney Failure; Quality Improvement; Regulatory

ABSTRACT #: 41

TITLE: Optimize Waitlist Times for Transplant Candidates with Algorithmically Personalized Recommendations from Inverse Classification

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

INSTITUTIONS (ALL): *University of Iowa*

ABSTRACT: Many organ transplant candidates die while waiting or have substantial wait times. Significant disparities in access to organ transplantation persist despite continuous and progressive allocation changes. There is a need for personalized recommendations for transplant candidates to optimize their time on the waitlist and reduce mortality.We performed an inverse classification analysis on the UNOS STAR Files data containing transplant candidates from 2010 - 2018 in the USA. We assigned an estimated effort function mapped to changes in each of the candidate variables. Candidate variables were modeled as predictors for wait time until transplant or death. We ranked each variable by their corresponding impact on the wait time to transplant. We analyzed the impact of multiple effort totals for candidates distributed optimally among their variables.According to this model, we expect to find a list of variables that most significantly impact wait time (e.g. BMI or location) and estimate the effort associated with each unit change in those variables. Thus we will determine how much change effort a candidate must account for to make a meaningful optimization in waiting time.Based upon the results of this experiment and a specific candidate, we may be able to recommend certain changes to diet, lifestyle, medication, waitlist location, etc. that may optimally reduce that candidate's wait time before they are transplanted according to this model.

KEYWORDS: Kidney Transplant; Kidney Failure; Waitlist; Organ Allocation; Optimization; Quality Improvement; Regulatory

ABSTRACT #: 42

TITLE: Mobile Application for Communication Increases the Efficiency of Organ Procurement and Transplantation

AUTHOR(S) (FIRST NAME, LAST NAME): Eric Pahl, Robert Emergy, Michael Noce, Suzanne Conrad, Nicole Patterson, Brynn Timm

INSTITUTIONS (ALL): *University of Iowa, University of Virginia, Relational Coordination Analytics, Iowa Donor Network, Iowa Methodist Transplant Center, University of Iowa*

ABSTRACT: Donor organ recovery is a complex process involving organ procurement organizations and multiple surgical teams from various transplant centers. According to the Organ Preservation Alliance, one in three deaths in the US might be prevented by an organ transplant. Lack of real-time communication results in many hours of preventable delay between procurement and transplant teams resulting in a high volume of organ waste, clinical frustration, and critical delays.A Plan-Do-Study-Act performance improvement methodology was utilized to design and implement a dedicated mobile communication application (app). Critical time points in the organ offer, procurement, and transplant processes were analyzed from the report of organ offers, and relation coordination metrics were also measured. Members of procurement and transplant teams in Iowa were interviewed and the app was implemented to replace phone calls, emails, faxes, and text messages during a year-long study of deceased donor kidney offers.Teams reported substantial increases in clinical productivity and case progress awareness. Additionally, we observed a noticeable reduction in phone calls. The relational coordination data indicated a higher relationship and communication quality score with the app. The report of organ offer data revealed a 35% increase in organs transplanted and a 50% reduction in time from initial organ offer to transplant during the use of the app.The use of a dedicated communication app reduces clinical frustration and delays during the coordination of organ offer, procurement, and transplant processes. Technologies that improve communication have the potential to improve organ utilization.

KEYWORDS: Kidney Transplant; Kidney Failure; Organ Procurement; Quality Improvement; Regulatory

ABSTRACT #: 43

TITLE: A Randomized Clinical Trial of Real-time Decision Support During the Evaluation of Abdominal Organ Offers

AUTHOR(S) (FIRST NAME, LAST NAME): Eric Pahl, Robert Emergy

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

ABSTRACT: Organ transplantation is a cost and clinically effective treatment for patients suffering from end-stage organ failure. According to the Organ Preservation Alliance, one in three deaths in the US might be prevented by an organ transplant. One limitation on organ transplantation is the onerous and disorganized assessment of an organ offer to determine donor/recipient match quality. Real-time clinical decision support (CDS) with artificial intelligence may significantly increase access, increase quality, and reduce the time and cost of organ transplantation.Procurement and transplant team members utilized a dedicated mobile application for communicating during the organ offer process. The study was conducted with a year-long, three-arm, open-label, randomized clinical trial at 12 leading transplant centers in the USA. The mobile application was enhanced with two different implementations of CDS, static and dynamic. Static CDS consisted of a prediction environment that was unchanged throughout the trial; it predicted survival benefit for each patient in the match sequence and the national and center-specific organ offer acceptance rates.Dynamic CDS was initially a replication of the static CDS environment but the dynamic CDS was modified continuously throughout the trial based on user feedback. The clinical trial was randomized by each incoming organ with a KDPI > 25% into one of three arms: control (no CDS), static CDS, or dynamic CDS.The investigating team has received early indications of satisfaction and perceived enhancement of medical decisions from directors and surgical leaders at participating centers. This study is ongoing.

KEYWORDS: Organ Allocation; Organ Transplant; Organ Failure; Clinical Decision Support; Static CDS; Dynamic CDS

ABSTRACT #: 44

TITLE: Evaluation of a Direct-to-Digital Histology Method for Rapid Evaluation of Kidney Transplant Biopsies

AUTHOR(S) (FIRST NAME, LAST NAME): Sudhir Perincheri, Ethan Marin, Divyanshu Malhotra, William Asch, Richard Formica, Richard Torres

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

ABSTRACT: Discard rates for potential deceased donor kidney transplants remain high in the United States despite high-demand. Many organ discards are attributable to histological assessment of procurement kidney biopsies that can be negatively impacted by technical factors such as frozen section artifacts. To better optimize organ allocation, there is a need to develop standardized methods for histological assessment of procurement biopsies that minimize technical artifacts, and are amenable to remote expert interpretation and digital image analysis. Multiphoton microscopy (MPM) obtains optical rather than physical sections from fluorescently-stained uncut, unembedded kidney biopsies to digitally recreate physical H&E slides without frozen section artifacts. Here we describe an initial clinical validation study of MPM for primary histologic evaluation of intact kidney biopsies potentially enabling practical direct-to-digital application in the assessment of procurement biopsies.Kidney transplant core biopsies were procured from consented individuals. Sample preparation was done using a previously-described two-step process involving a combined alcohol dehydration/staining step followed by clearing for refractive index matching. Images were obtained by a prototype multiphoton microscope system designed for fast image capture at high resolution and depth. Visualization software (Stackstreamer) developed for the efficient histologic review of multi-level image

stacks was used for histomorphologic evaluation. Subsequently embedded and physically sectioned slides were visualized under wide-field microscopy for comparative evaluation.MPM images show the full range of morphologic findings virtually indistinguishable from physical, paraffin-embedded tissue slices. The images obtained are free of artifacts typically seen with frozen sections. Kidney specimens imaged on the same day of biopsy have primary diagnostic images available within ~3 hours of time of biopsy, faster than standard paraffin processing.MPM can potentially be used in standardized evaluation of procurement kidney biopsies limiting wasteful discard of potentially transplantable kidneys. It eliminates frozen section artifact while simultaneously making digital images available for remote expert evaluation and digital analysis.

KEYWORDS: Procurement biopsy, multi photon microscopy, digital pathology

ABSTRACT #: 45

TITLE: Temporal Trends in Virtual Crossmatch use for Deceased Donor Kidney Transplantation in the United States

AUTHOR(S) (FIRST NAME, LAST NAME): Chethan Puttarajappa, Dana Jorgensen, Sundaram Hariharan, Amit Tevar, Adriana Zeevi, Sumit Mohan

INSTITUTIONS (ALL): *University of Pittsburgh, University of Pittsburgh Medical Center, University of Pittsburgh Medical Center, University of Pittsburgh Medical Center, University of Pittsburgh Medical Center, Columbia University Medical Center*

ABSTRACT: Virtual crossmatch (VXM) can accurately predict results of a physical crossmatch (PXM). VXM is an alternative to PXM that can potentially reduce organ discards by shortening the cold ischemia time and avoiding late organ offer declines that result from a positive PXM. There is limited data on VXM use in the United States (US) and its impact on outcomes, particularly after the implementation of the new kidney allocation system (KAS) which increased transplantation of highly sensitized patients.Using Scientific Registry of Transplant Recipients data for deceased donor kidney transplants (DDKT) performed in the US between 2010 and 2018, we compared trends in VXM use before and after KAS implementation. VXM was defined as transplantation without the use of a prospective PXM. Variation among the united network for organ sharing (UNOS) regions, and factors associated with VXM use pre-and post-KAS were examined. Adjusted Cox proportional hazards models were used to study differences in acute rejection (AR), all cause graft failure (ACGL) and mortality among patients transplanted following a VXM rather than a PXM.VXM use increased over time with a significant increase post-KAS (10.5% v 7.2%, p<0.001) including a higher proportion of patients with calculated panel reactive antibody (cPRA) > 98 post-KAS (10.9 % v 1.4 %; p <0.001). There was wide variation in VXM use among the 9 UNOS regions both pre-and post-KAS (range: pre-KAS 0-26.2%; post-KAS 0-35.1%). VXM was used more frequently with imported kidneys (34 % v 24.7%; p <0.001), older donors (mean 39.3 v 38.1 years; p <0.001) and higher donor creatinine (1.4 v 1.2 mg/dL; p <0.001). Recipients in VXM group were older (53.3 v 52.8 years; p =0.008), had longer pre-transplant dialysis (60 v 50 months; p<0.001) and longer time on waitlist (30 v 27 months; p <0.001). After adjusting for kidney donor profile index and import kidneys, cold ischemia time was slightly shorter for VXM (18.0 v 18.5 hours; p<0.001). Delayed graft function rates were higher among VXM patients (37.9% v 25.7%; p <0.01) with an adjusted hazard ratio (HR) of 1.13 (CI 1.04-1.22; p <0.01). On multivariable Cox models, there were no difference in rates of acute rejection (HR 0.98, CI 0.81-1.18; p =0.8), all cause graft loss (HR 1.0, CI 0.92-1.1; p=0.9) and patient mortality (HR 0.96, CI 0.86-1.06; p=0.4) for VXM compared to PXM.Virtual crossmatch use for deceased donor kidney transplantation is increasing in the United States including in patients with high cPRA. Patient and transplant survival for virtual crossmatch was similar to that of physical crossmatch.

KEYWORDS: Virtual Crossmatch, Deceased Donor Kidney Transplantation

ABSTRACT #: 46

TITLE: Outcomes of Thoracic Transplantation From Hepatitis C Positive Donors to Hepatitis C Negative Recipients: Single-Center Experience

AUTHOR(S) (FIRST NAME, LAST NAME): Kristen Ryland, Surakit Pungpapong, David Erasmus, Parag Patel, Si Pham, Jorge Mallea

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

ABSTRACT: A shortage of organs exists for cardiothoracic transplantation. Previously discarded organs infected with hepatitis C are increasingly being used with the advent of new effective therapies for cure, expanding the donor pool. We review our experience transplanting hearts and lungs from hepatitis C positive donors to hepatitis C negative recipients.This is a retrospective chart review of all hepatitis C negative thoracic transplant recipients who received organs from hepatitis C positive donors beginning in June 2019 to present. Descriptive statistics were used to report continuous variables.Eight hepatitis C - patients received hepatitis C NAT + organs for thoracic transplant (4 heart and 4 lung). Median Lung Allocation Score was 70.24. Three heart recipients were status 2 and 1 was status 6. Median time from listing to transplant was 13.5 days for lung recipients and 28 days for heart recipients. All recipients became viremic within a median of 2 days. Four patients received glecaprevir/pibrentasvir (G/P) for 12 weeks, and 1 received G/P for 8 weeks. Three patients were treated with sofosbuvir/velpatasvir (SOF/VEL) for 12 weeks. Time from transplantation to start of medication was a median of 35.5 days, and insurance covered treatment for all cases. Mean peak viral load prior to initiation of treatment was 29,000,000 IU/mL. To date, 4 of the 8 patients have completed therapy, and 5 patients have developed antibodies to hepatitis C. All patients that completed therapy had HCV RNA undetected at the end of therapy. There were no reported adverse events related to DAA use.Using hepatitis C positive organ donors in hepatitis C negative recipients in thoracic transplants greatly shortened the median waitlist time compared with standard of care and did not result in short-term adverse patient or graft outcomes at our center. DAA therapy effectively reduced viremia and was covered by insurance in all cases. A multicenter trial to assess the long term effects of these types of organs in thoracic transplant recipients is warranted.

KEYWORDS: hepatitis C, lung transplant, heart transplant, thoracic transplant, DAA

ABSTRACT #: 47

TITLE: Machine Learning for Predicting Long-Term Renal Allograft Survival: A Scoping Review

AUTHOR(S) (FIRST NAME, LAST NAME): Nigar Sekercioglu, Rui Fu, Joseph Kim, Nicholas Mitsakakis

INSTITUTIONS (ALL): *McMaster University, University of Toronto, University of Toronto, University of Toronto*

ABSTRACT: Background: Risk prediction models can help to improve outcomes of kidney transplantation by optimizing allocation and management. Supervised machine learning (ML) is a class of algorithms that "learn" from existing input-output pairs, which is gaining popularity in pattern recognition for classification and prediction problems. In this scoping review, we examined the use of supervised ML algorithms for the prediction of long-term allograft survival in kidney transplant recipients.

Methods: Data sources included PubMed, CINAHL and the Institute for Electrical and Electronics Engineers Xplore libraries from inception to November 2019. We screened titles and abstracts and potentially eligible full text reports to select studies, and subsequently abstracted the data. Included studies described the development and validation of a prediction model for chronic kidney

allograft dysfunction in humans using ML algorithms. We excluded abstracts without full text, studies that used unsupervised ML algorithms (such as cluster analysis), and studies on pharmacokinetics, dose optimization and genomics. We recorded discrimination performance of the models, including sensitivity, specificity and area under receiver operating curve (AUC), as well as reliability markers of risk prediction, including the Pearson's r and Hosmer-Lemeshow test.

Results: Eleven studies were identified that evaluated supervised ML algorithms in predicting long-term allograft survival after kidney transplantation. Seven studies were set in the United States. The mean sample size was 33,351 with a range from 80 to 163,199.

Three studies implemented more than one ML methods. Decision trees were the most commonly used method (n=6), followed by artificial neural networks (ANN) (n=4) and Bayesian belief networks (n=2). Ensemble methods, including boosting trees and a combination of random forest and Cox proportional hazards models were also implemented. A range of software was employed, including WEKA (n=3), FasterAnalytics ML software (n=1), and Tunnel Boring Machines (n=1).

Three studies used a single random split of the data into train and test parts while seven studies used cross-validation for resampling. One study employed external validation by chronological split of the data into training and test parts. Two studies used external data without giving details about the source.

The AUC was the most common measure of discrimination (n=7), followed by sensitivity (n=5) and specificity (n=4). Only one study reported the Harrell's concordance index measuring discriminative power when survival data was modelled. Model calibration examining the reliability in risk prediction was performed using either the Pearson's r or the Hosmer-Lemeshow test in four studies.

We identified fifteen comparisons between classical approaches (i.e., regression) and ML methods. One study showed that logistic regression had comparable performance to ANN, while another study demonstrated that ANN performed better in terms of sensitivity, specificity and accuracy, as compared to a Cox proportional hazards model. In another study, logistic regression and classification trees were both found to achieve better prediction in terms of AUC when compared to ANNs.

Conclusions: Published papers predicting allograft survival in kidney transplant recipients using ML techniques suffer from serious shortcomings in methodology, transparency, and reporting. While some studies suggested that ML might generate better predictive outcomes compared to conventional regressions in terms of discrimination performance, most studies did not adequately report the calibration of ML algorithms. Hence, we conclude that the utility of replacing existing models with ML in clinical prediction and decision-making for the management of kidney transplant recipients has not been established. Furthermore, there is a need to establish reporting guidelines for ML studies in nephrology research.

KEYWORDS: Chronic Kidney Allograft Dysfunction, Supervised Machine Learning, Risk Prediction

ABSTRACT #: 48

TITLE: Transplant Center-level Variation is the Top Factor Associated with Unintended Disparities in Access to Lung Transplants Among WL Candidates

AUTHOR(S) (FIRST NAME, LAST NAME): Darren Stewart, Stuart Sweet, Erika Lease, Rebecca Goff

INSTITUTIONS (ALL): *United Network for Organ Sharing, Washington University School of Medicine, University of Washington, UNOS*

ABSTRACT: The OPTN developed a novel methodology in 2016 to monitor equity in access to deceased donor kidney transplants (Tx) among waitlisted (WL) candidates.

The methodology has been extended to liver and lung transplantation. For all organs, the methodology has consistently shown donor service area (DSA) of listing to be the factor most independently associated with disparities. To better reflect disparities faced by WL candidates, the methodology is being refined to parse out center- from DSA-level variation. We present results from lung equity in access modeling incorporating both center and DSA effects to highlight factors associated with unintended disparities in access to lung transplantation among WL candidates.Poisson tx rate regression with 17 candidate factors, including random DSA and nested center effects, was applied to a period-prevalent cohort (2018-Sep 2019) of active lung WL registrations using OPTN data. Overall disparity was quantified as the Winsorized standard deviation (SDw) of log(Tx rate) among registrations, after "discounting" for policy-intended variation (e.g., lung allocation score (LAS), pediatric priority) by holding such factors constant. To isolate each factor's association with disparities, factor-specific SDw's were obtained after holding all other factors constant. Random DSA and center Empirical Bayes ("shrunken") estimates were expressed as Tx incidence rate ratios (IRRs).Using the baseline model with random DSA effects but without transplant center effects, the overall disparity metric (SDw) was 0.61, with DSA clearly the factor most associated with disparities (SDw = 0.45; Figure 1). Adding center effects increased the overall disparity metric 13% (SDw 0.61 --> 0.69). Tx center was found to be the factor most associated with unintended disparities in access (SDw=0.38). However, after accounting for center effects, substantial DSA effects remained (SDw=0.26; Figure 2). The open circles in Figure 3 result from combining each center's effect with their DSA-specific effect ("net IRR"). Centers in DSAs with above average IRR tended to have above average net IRR, and vice versa. After parsing out center effects, DSA IRRs ranged from 0.61 to 2.21, a 3.6-fold difference in transplant access. However, substantial heterogeneity in center-level IRRs was found even within the same DSA. For example, a 2.8-fold difference in risk-adjusted transplant rate was found among the three lung programs in MIOP; similarly, a 3.8-fold difference was found among the three CAOP programs. (Figure 3)Among waitlisted lung candidates, transplant center was found to be the top driver of lung access disparities. But even after extracting center effects, disparities associated with candidates' listing DSA remain, despite patients after November 2017 no longer receiving priority for being listed in the same DSA as the donor. This could be at least partially explained by the fact that more lung transplants are staying within a 250 nautical mile radius after policy implementation (77%, based on one year monitoring report) compared to previously (65%). Further work is needed to better understand the root of both center-level (which may be driven by acceptance practice variation) and DSA-level disparities (which may relate to geographic variation in lung donor supply to demand), to identify policies and practices that may reduce access disparities. The OPTN's plan of adapting lung allocation policy to a continuous distribution framework aims to efficiently allocate lungs to patients most in need by removing rigid policy boundaries, but reducing center-level disparities in access may require other interventions.

KEYWORDS: equity, transplant rate, disparities, geography

ABSTRACT #: 49

TITLE: Post-Kidney Transplantation Systolic Hypertension and Obesity: Analysis of Longitudinal Data

AUTHOR(S) (FIRST NAME, LAST NAME): Ekamol Tantisattamo, Natnicha Leelaviwat, Chawit Lopimpisuth, Possawat Vutthikraivit, Natchaya Polpichai, Sakditad Saowapa

INSTITUTIONS (ALL): *Division of Nephrology, Hypertension and Kidney Transplantation, University of California Irvine, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Faculty of Medicine Siriraj Hospital, Mahidol University, Phramongkutklao College of Medicine, Mahidol University, Faculty of Medicine Songklanagarin Hospital, Prince of Songkla University, Faculty of Medicine Ramathibodi Hospital, Mahidol University*

ABSTRACT: Obesity is associated with hypertension (HTN) in population-based analysis; however, this relationship in individual level is unclear.Presence of systolic HTN (SHTN) defined as blood pressure of >130 mmHg among 105 renal transplant recipients (RTR) were examined in a longitudinal data analysis with generalized estimated equation (GEE) by comparing between non-obese and obese groups (body mass index; BMI ≥25 kg/m2). Subject-specific models (Random intercept) were also utilized to examine association between time post-kidney transplantation (KT) and SHTN.Mean±SD age was 54.3±11.6 years and 64 patients (61%) was female. Up to 67% were obese. Mean BMI of non-obese and obese groups were 21.4±2.4 and 31.0±4.4 kg/m2, respectively. Association between STHN and time after KT in population average by using GEE revealed that non-obese group has 0.19% higher the odds of having SHTN for every 1 more week longer after kidney KT (OR 1.0019; 95%CI 0.9861,1.0181); whereas, obese group has 0.1% lower the odds of having STHN than those with 1 week less duration post-KT(OR 0.9990). However, compared to non-obese group, obese group had 2.01 times higher the odds of having SHTN(OR 2.0113; 95%CI 1.0220, 3.9583)(Figure1). By using subject-specific models, a non-obese individual had 0.14% higher the odds of having SHTN for every 1 week increase in their time after kidney transplantation(OR 1.0014; 95%CI 0.9800, 1.0232). For obese individual, the odds of having SHTN became decrease by 0.2% for every 1 week increase in an individual's time post-KT (OR 0.9980).Obese population have significant trend to have SHTN compared to non-obese population. However, non-obese population appear to have SHTN overtime after KT; whereas, obese population trends to have lower risk of SHTN. These correlations exist in individual level. Since SHTN is associated with poor transplant outcomes, it should be controlled especially in non-obese patients.

KEYWORDS: kidney transplantation, longitudinal analysis, obesity, systolic hypertension

ABSTRACT #: 50

TITLE: Nudging to Accept

AUTHOR(S) (FIRST NAME, LAST NAME): Sait Tunc, Burhaneddin Sandikci, Bekir Tanriover

INSTITUTIONS (ALL): *Virginia Tech, University of Chicago Booth School of Business, University of Texas Southwestern Medical Center*

ABSTRACT: Organ transplantation is life-saving, which is limited by the scarcity of donor organs. Despite the growing need for donor organs, those procured for transplantation are frequently declined by patients/physicians and discarded in large volumes. In 2016, more than 14% of organs recovered for transplantation are discarded, with highest rates for kidney (20%) and pancreas (24%). Our analysis of the U.S. kidney data reveals high variation in discard rate as a function of the Kidney Donor Profile Index (KDPI): average discard rate is 11.9% for kidneys perceived as standard (i.e., KDPI < 85%), while it is 57.1% for kidneys perceived as marginal (i.e., KDPI ≥ 85%). Transplanting lesser quality organs are typically associated with higher rates of graft failure and concomitantly with higher rates of returns to the waitlist. However, marginal organs, albeit having worse outcomes than standard organs, are shown as viable alternatives for patients dying while waiting for a transplant and associated with superior outcomes compared to being on dialysis for kidney transplant candidates. We study ways to increase utilization of organs recovered for transplantation, and therefore, alleviate the burden of organ wastage. Recognizing that the fear of being in need of a repeat transplant may drive more conservative behavior towards marginal organs, we propose a novel incentive mechanism that would nudge less conservative behavior, and therefore, reduce organ wastage without enforcing offer acceptance. We study this mechanism theoretically for a generic organ using well-established techniques (namely, queueing theory) from the operations research literature and analyze its effect over the organ utilization as well as the overall quality-adjusted life expectancy (QALE) of candidates, which is composed of pre- and

post-transplant periods, acknowledging that quality of life improves after transplantation. We also demonstrate its effects for the U.S. kidney transplantation system using a realistic simulation model. The mechanism is simple yet theoretically rich, and therefore, it is easily implementable for any organ type. In our illustration for the U.S. kidney transplantation system, the incentive mechanism credits previously accumulated waiting time back to candidates, who have accepted a pre-defined set of kidneys (e.g., marginal kidneys with KDPI>85%) in their first attempts and return to the waitlist for re-transplantation following a graft failure. We have developed a new simulation model for the allocation of deceased donors in the U.S to assess and compare the impact of our proposed mechanisms, which was not feasible via the Kidney Pancreas Simulated Allocation Model (KPSAM) executable made available to the public. Following a similar approach to KPSAM, key events in our simulation, such as arrivals of organs and patients, as well as status updates for candidates are linked to the 2018 UNOS STAR database obtained from OPTN. Our model implements the most recent UNOS deceased-donor kidney allocation policy. It utilizes the graft and waitlist survival and offer acceptance models provided by SRTR, and is calibrated and validated against the national data. We simulate the U.S. kidney waiting list for a 3-year period from January 2015 to January 2018, and report several statistics after 100 independent replications of the simulation.Our queueing theoretic analysis of the proposed mechanism showed an increase in organ utilization, while also improving candidates' overall utility from transplantation, measured by their aggregate QALE. Our simulation results suggest that preserving the waiting time previously accumulated by returning candidates helps significantly reduce kidney discard rate. Depending on the strength of the population's response to the mechanism, discard rate could be as low as 5.4% (strong response), 9.5% (moderate response), or 15.7% (weak response), which translates to 1746, 1148, or 241 more transplants per year, respectively. As a result of the lower discard rates (transplanting more kidneys), up to 90 candidates can be saved from dying in the waitlist, and the overall size of the waitlist can be reduced by 4%. The average time until transplantation remains almost the same with our mechanism, and it is only about a week shorter under the strong response scenario as a result of shorter waiting times experienced by prioritized relistings. Moreover, average KDPI of transplanted kidneys slightly increased, but overall the post transplant graft survival at one-year remains stable around 94.8% versus 95.0% for baseline among all transplants, and 91.24% versus 91.30% among marginal kidneys (KDPI>85%). We find that the optimal KDPI score cutoff, defining the set of incentivized kidneys, is around 85%, which coincides with the generally accepted definition of marginal kidneys in medical community.Our proposed incentive mechanism provides an easily implementable means to achieve higher organ utilization and lower organ discard, concomitantly increasing the number of transplants and decreasing the waitlist mortality, while maintaining the overall post-transplant graft survival. Since offer acceptance is voluntary, any waiting list candidate can take advantage of the benefits of this mechanism; however, it mainly targets those that experience difficulty accessing organs for transplantation (e.g., candidates older than 50 with expected waiting times longer than 3 years). More research, particularly in the form of field research initiating limited pilot programs, is needed to gauge the accuracy of our estimates before making a system-wide change.

KEYWORDS: organ utilization, incentive mechanism, simulation, optimization

ABSTRACT #: 51

TITLE: Quo Vadis Lung Transplantation?

AUTHOR(S) (FIRST NAME, LAST NAME): Christopher Wigfield

INSTITUTIONS (ALL): *731 Consultancy LLC*

ABSTRACT: Background: Lung transplantation (LTx) has become a widespread therapeutic option but remains a high risk endeavor. Reliable individual risk evaluation is not sufficiently feasible with current clinical metrics. The

advent of genomics and Big Data has opened a new realm of precision medicine that has not been applied to donor evaluation and matching purposes. These spheres potentially hold novel approaches to optimizing assessment, allocation and outcomes in lung transplantation.

Methods: This review of published information regarding genomics in transplantation and complex information processing provides an analysis of the current trends. The study explores the emerging utility and the complexity such an initiative is facing in the near future as the demand for optimal utilization of procured lungs and improved equity in allocation is a regulatory mandate and a clinical priority to achieve outcomes more compatible with other solid organ transplants.

Results: A primarily conceptual and comparative presentation, the principles of Big Data application to LTx and the complexity of volume, velocity and variety as well as the actual value of such data sets is discussed. The promise and actual utility of genomics and the "omics" as evolving in other service lines are critically appraised in this setting. The practical and cost limitations and clinical service issues to be considered are presented.

Summary: Novel approaches are potentially available for urgently required solutions in the quest to optimize outcomes in lung transplantation. Conceptual consideration ought to include advances now emerging in other medical fields including precision medicine strategies.

KEYWORDS: Lung transplantation. Lung donors, outcomes, genomics, Big Data, Equity, Precision Medicine

ABSTRACT #: 52

TITLE: Kidney After Intestinal Transplantation vs Combined Kidney With Intestinal Transplant. A Unos Database Analysis.

AUTHOR(S) (FIRST NAME, LAST NAME): Muhammad Yaqub, Oluwafisayo Adebiyi, Asif Sharfuddin

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

ABSTRACT: There is limited data on outcomes for patients receiving an isolated kidney transplant (KAIT) after any prior Multi-organ or Isolated Intestinal transplant (IT). We compared the outcomes of such transplants with Combined Intestinal-Kidney Transplants (CIKT).The Intestinal transplant database from 1992 through Sep 2017 was cross-linked with the Kidney transplant database for all kidney transplants performed. Data were analyzed for, demographics, incidence, risk factors and outcomes after kidney transplant.

From 1990 through Sep 2017 there were a total of 2,886 Intestinal transplant recorded. Out of 190 (6.6%) Kidney transplants of which 136 (71.6%) were Combined (CIKT) and 54(28.4%) were KAIT. Median time from Intestinal Transplant to Kidney transplant was 5.6 years (Range 0.47 to 18.9). One year CIKT graft survival was 52% as compared to KAIT 87% , 5 year graft survival was 36% vs 74%. Death censored KAIT graft survival at 1 year was 98% vs 87% and 5 years 83% vs 74%. Overall unadjusted kidney graft survival was significantly lower in CIKT as compared to KAIT p=0.009.Isolated kidney transplant after any prior isolated Intestinal transplant or Multi-organ has higher kidney graft survival as compared to combined Intestinal Kidney Transplant. One common factor leading to lower graft survival may be higher Calcineurin inhibitors trough levels in Combined Intestinal-Kidney Transplants (CIKT) as compared to isolated Kidney Transplant afterwards.

KEYWORDS: Kidney transplant, Intestinal Transplant, Multi-organ

ABSTRACT #: 53

TITLE: The Effect of B Cell Depletion Therapies On Preformed Xenoantibodies In Transplant Recipient

AUTHOR(S) (FIRST NAME, LAST NAME): Szu-Tsen Yeh, Nancy Wilson, Arjang Djamali, Robert Redfield

INSTITUTIONS (ALL): *University of Wisconsin School of Medicine and Public Health, University of Wisconsin School of Medicine and Public Health, University of Wisconsin School of Medicine and Public Health, University of Wisconsin School of Medicine and Public Health*

ABSTRACT: Background: Preformed xenoantibodies are significant barriers to successful xenotransplantation. Antibody mediated rejection (ABMR) is commonly treated with Rituximab, IVIG, and steroids. The effects of these alloantibody directed therapies on preformed xenoantibodies is unknown.

Methods: We obtained plasma from kidney transplant patients with biopsy proven antibody mediated rejection (ABMR) (n=22) prior to treatment then 3 or 6 months post-treatment. Patient plasma was diluted at 1:16 or 1:64 and incubated with wildtype porcine fibroblast (CL 101) or pig fibroblast knocked out for CMAH, GGTA1, and 2 B4GalNT2 orthologs genes (H1.1). The levels of antibody binding were assessed by flow cytometry. Mean fluorescence intensity (MFI) for IgG and IgM at various time points were analyzed both paired and unpaired t tests.

Results: In this cohort, there was a general decreasing trend in IgG and IgM binding to CL101 after the initial ABMR treatments. In 15 out of 22 patients, IgG binding to CL101 decreased below baseline at 3 month (paired t test $p<0.005$ vs. baseline) and persisted at 6 month post-treatment (paired t test $p<0.05$ vs. baseline) (Fig A & B).MFIs of IgG binding to CL101 showed a significant reduction in the magnitude of samples with high levels of xenoantibody binding, suggesting that treatment was effective at reducing xenoantibodies at high levels (Fig B). Similarly, IgM binding to CL101 in 13 out of 16 patients decreased below baseline at 3 month (no sig) and persisted at 6 month post treatment (no sig) (Fig C &D). We also assessed the level of IgG and IgM binding to H1.1. Here we demonstrate that even before treatment, patients' serum showed significantly lower IgG and IgM binding to H1.1 compared to that of wildtype CL101 (n=12 for IgG and n=9 for IgM, $p<0.005$ H1.1 vs. CL101) (Fig E & F).

Conclusions: Rituximab, IVIG, and steroids may reduce preformed xenoantibodies in select patients. Our porcine cell line knocked-out of CMAH, GGTA1, and B4GalNT2 orthologs genes have significantly less xenoantibody binding.

KEYWORDS: Xenoreactive antibodies; B cells; Kidney transplantation; Rejection

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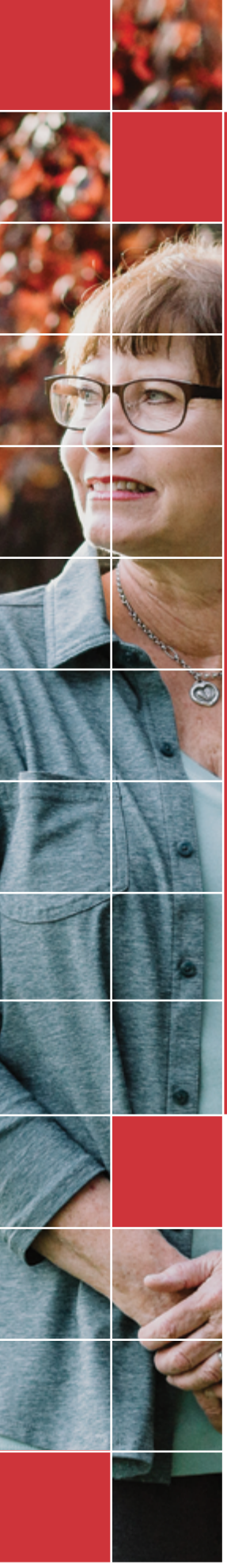

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