



**MEETING DATES: NOVEMBER 6-9, 2019**  
**EXHIBITION DATES: NOVEMBER 7-8, 2019**

**JW MARRIOTT MARCO ISLAND BEACH RESORT  
MARCO ISLAND, FL**



# SPECIAL THANKS

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Special Thanks to STSA  
66th Annual Meeting Corporate Supporters

## SILVER

Ethicon

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BD Surgery

## OTHER

Edwards Lifesciences

# FUTURE MEETINGS

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## **November 4-7, 2020**

Universal Orlando™ Loews Royal Pacific Resort  
*Orlando, FL*

## **November 3-6, 2021**

Loews Atlanta Hotel  
*Atlanta, GA*

## **November 9-12, 2022**

Fort Lauderdale Marriott Harbor Beach Resort & Spa  
*Fort Lauderdale, FL*

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# 2019 STSA OFFICERS AND COUNCIL

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## **President**

**D**Jeffrey P. Jacobs  
*Saint Petersburg, FL*

## **President-Elect**

**D**Vinod H. Thourani  
*Washington, DC*

## **Vice President**

**D**Alan M. Speir  
*Falls Church, VA*

## **Secretary/Treasurer**

**D**Shanda H. Blackmon  
*Rochester, MN*

## **Council Chair**

**D**Kevin D. Accola,  
*Orlando, FL*

## **Past President**

**D**David R. Jones  
*New York, NY*

## **Councilors**

**D**Faisal G. Bakaeen  
*Cleveland, OH*

Melanie A. Edwards  
*St. Louis, MO*

T. Brett Reece  
*Aurora, CO*

## **Continuing Medical Education Director**

**D**Scott A. LeMaire  
*Houston, TX*

## **Historian**

John W. Hammon  
*Winston-Salem, NC*

## **Editor**

G. Alexander Patterson  
*St. Louis, MO*

## **D Relationship Disclosure**

Refer to the Relationship Disclosure Index on page 320 for a listing of all disclosure information pertaining to 2019 STSA Officers and Council Members.

# 2019 STSA COMMITTEE MEMBERS

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## **Program Committee**

Joseph A. Dearani (Co-Chair)

Daniela Molena (Co-Chair)

**D**Jeffrey P. Jacobs

**D**Kevin D. Accola

Vinay Badhwar

**D**Shanda H. Blackmon

Harold M. Burkhart

J. Michael DiMaio

**D**David R. Jones

Christine L. Lau

**D**Scott A. LeMaire

**D**Ourania Preventza

**D**Alan M. Speir

James D. St. Louis

**D**Vinod H. Thourani

Stephen C. Yang

Rochester, MN

New York, NY

Saint Petersburg, FL

Orlando, FL

Morgantown, WV

Rochester, MN

Oklahoma City, OK

Plano, TX

New York, NY

Charlottesville, VA

Houston, TX

Houston, TX

Falls Church, VA

Kansas City, MO

Washington, DC

Baltimore, MD

## **Membership Committee**

Andrew J. Lodge (Chair)

James J. Gangemi

W. Brent Keeling

Hugh M. van Gelder

Durham, NC

Charlottesville, VA

Atlanta, GA

St. Petersburg, FL

## **Postgraduate Committee**

**D**Matthew J. Bott (Co-Chair)

Ahmet Kilic (Co-Chair)

**D**Kevin D. Accola

**D**Gorav Ailawadi

Mark I. Block

**D**Jeffrey P. Jacobs

Damien J. LaPar

**D**Scott A. LeMaire

Todd K. Rosengart

**D**Alan M. Speir

**D**Vinod H. Thourani

New York, NY

Columbus, OH

Orlando, FL

Charlottesville, VA

Hollywood, FL

Saint Petersburg, FL

New York, NY

Houston, TX

Houston, TX

Falls Church, VA

Washington, DC

## **Finance Committee**

Mark S. Slaughter (Chair)

**D**Kevin D. Accola

**D**Shanda H. Blackmon

S. Adil Husain

**D**Jeffrey P. Jacobs

Richard Lee

Thoralf M. Sundt

**D**Vinod H. Thourani

Louisville, KY

Orlando, FL

Rochester, MN

Salt Lake City, UT

St. Petersburg, FL

Augusta, GA

Boston, MA

Washington, DC



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### **Continuing Medical Education Committee**

<b>D</b> Scott A. LeMaire (Director)	Houston, TX
<b>D</b> Matthew J. Bott	New York, NY
Joseph A. Dearani	Rochester, MN
Ahmet Kilic	Columbus, OH
Daniela Molena	New York, NY

### **Representative to the Board of Governors of the American College of Surgeons**

<b>D</b> Joseph B. Zwischenberger	Lexington, KY
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### **Representative to the Advisory Council for Cardiothoracic Surgery for the American College of Surgeons**

Stephen C. Yang	Baltimore, MD
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### **Representative to the STS/ACS Surgical Quality Accreditation for General Thoracic Surgery**

Richard K. Freeman	Indianapolis, IN
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### **Nominating Committee**

John H. Calhoon (Chair)	San Antonio, TX
<b>D</b> Kevin D. Accola	Orlando, FL
Andrea J. Carpenter	San Antonio, TX
<b>D</b> David R. Jones	New York, NY

### **Scholarship Committee**

Jennifer S. Nelson (Chair)	Orlando, FL
Mara B. Antonoff	Houston, TX
Thomas M. Beaver	Gainesville, FL
<b>D</b> Min Kim	Houston, TX
Anastasios Polimenakos	Augusta, GA

### **The Annals of Thoracic Surgery**

G. Alexander Patterson	St. Louis, MO
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# PROGRAM AT-A-GLANCE

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## WEDNESDAY, NOVEMBER 6, 2019

2:30 pm – 7:00 pm	<b>Registration</b> — Calusa Ballroom Foyer
6:00 pm – 7:00 pm	<b>Postgraduate Program Welcome Reception</b> — Calusa Ballroom Foyer
7:00 pm – 9:00 pm	<b>Postgraduate General Session:</b> I Wish I Could Have Done That Case Over: Complex Case Presentations and Interactive Discussions about Patients Who Required Multiple Operations — Calusa Ballroom 10-12

## THURSDAY, NOVEMBER 7, 2019

6:30 am – 5:00 pm	<b>Registration</b> — Calusa Ballroom Foyer
6:30 am – 5:00 pm	<b>Scientific e-Posters</b> — Calusa Ballroom Foyer
6:30 am	<b>Continental Breakfast</b> — Calusa Ballroom Foyer
7:00 am – 7:50 am	<b>Basic Science Forum</b> — Calusa Ballroom 8-9
7:00 am – 7:50 am	<b>Robert M. Sade Ethics Lectureship</b> <i>Painting a Vivid Picture: Persuasion versus Manipulation in the Consent Process</i> Calusa Ballroom 6
8:00 am – 10:00 am	<b>First Scientific Session</b> — Calusa Ballroom 6
10:00 am – 10:15 am	<b>Harold Urschel History Lectureship</b> — Calusa Ballroom 6 W. Randolph Chitwood, Jr., MD <i>Max Brödel: Father of American Surgical Illustration: Did He Help Make Cardiac Surgeons Famous?</i>
10:00 am – 12:00 pm	<b>Exhibits Open</b> — Calusa Ballroom 7
10:15 am – 10:30 am	<b>Break &amp; Visit Exhibits</b> — Calusa Ballroom 7
10:30 am – 10:55 am	<b>President's Invited Lecturer</b> — Calusa Ballroom 6 James A. Quintessenza, MD <i>Decision Making in Pediatric Cardiac Surgery... The Rational or Irrational Basis for Why We Do What We Do</i>
10:55 am – 11:20 am	<b>President's Invited Keynote</b> — Calusa Ballroom 6 Martin J. Elliott, MD <i>Why BE a Cardiothoracic Surgeon... Nice Work if You Can Get It: A Life of Privilege</i>
11:20 am – 12:15 pm	<b>Presidential Address</b> — Calusa Ballroom 6 Jeffrey P. Jacobs, MD "Y"
12:15 pm	<b>All Attendee Luncheon</b> — Calusa Foyer & Terrace
1:30 pm – 2:00 pm	<b>Dessert Served in the Exhibit Hall</b> — Calusa Ballroom 7
1:30 pm – 2:00 pm	<b>2019 Cardiothoracic Surgery Jeopardy Competition for North America</b> Round 1 — Calusa Ballroom 7
1:30 pm – 3:30 pm	<b>Exhibits Open</b> — Calusa Ballroom 7
2:00 pm – 3:00 pm	<b>Second Scientific Session</b> — Calusa Ballroom 6
3:00 pm – 3:30 pm	<b>Break &amp; Visit Exhibits</b> — Calusa Ballroom 7
3:00 pm – 3:30 pm	<b>2019 Cardiothoracic Surgery Jeopardy Competition for North America</b> Round 2 — Calusa Ballroom 7
3:30 pm – 5:30 pm	<b>Third Scientific Session</b> — Calusa Ballroom 6
6:00 pm – 7:00 pm	<b>Residents Reception</b> — Sunset Terrace
7:00 pm – 9:00 pm	<b>President's Mixer</b> — Tiki Beach

## FRIDAY, NOVEMBER 8, 2019

6:30 am – 4:45 pm	<b>Registration</b> — Calusa Ballroom Foyer
6:30 am – 5:00 pm	<b>Scientific e-Posters</b> — Calusa Ballroom Foyer
6:30 am	<b>Continental Breakfast</b> — Calusa Ballroom Foyer
7:00 am – 8:30 am	<b>Fourth Scientific Session A — Simultaneous Subspecialty Breakout Sessions</b> Adult Cardiac Breakout — Calusa Ballroom 6 Thoracic Breakout — Calusa Ballroom 10-12 Congenital Breakout — Calusa Ballroom 8-9
7:45 am – 12:00 pm	<b>Exhibits Open</b> — Calusa Ballroom 7

8:30 am – 9:00 am	<b>Break &amp; Visit Exhibits</b> — Calusa Ballroom 7
9:00 am – 10:00 am	<b>Fourth Scientific Session B — Rapid Fire Abstract Presentations Simultaneous Subspecialty Breakout Sessions</b> Adult Cardiac Breakout — Calusa Ballroom 6 Thoracic Breakout — Calusa Ballroom 10-12 Congenital Breakout — Calusa Ballroom 8-9
10:00 am – 10:30 am	<b>Break &amp; Visit Exhibits</b> — Calusa Ballroom 7
10:00 am – 10:30 am	<b>2019 Cardiothoracic Surgery Jeopardy Competition for North America</b> Final Round — Calusa Ballroom 7
10:30 am – 12:00 pm	<b>DIVERSITY, HISTORY, and ADVOCACY</b> — Calusa Ballroom 6
10:30 am – 10:50 am	<b>DIVERSITY: Kent Trinkle Education Lectureship</b> <i>Education and Diversity in Cardiothoracic Surgery</i> Robert S.D. Higgins, MD
10:50 am – 11:20 am	<b>HISTORY: Medical Illustration in the Era of Cardiac Surgery</b> Constantine Mavroudis, MD
11:20 am – 12:00 pm	<b>ADVOCACY: Why Professional Advocacy is Important to Me</b> 11:20 am – 11:35 am Keith S. Naunheim, MD 11:35 am – 11:50 am John E. Mayer, Jr., MD 11:50 am – 12:00 pm Open Discussion
12:00 pm	<b>Lunch on Own</b> <i>A variety of on-property dining options are available for lunch:</i> <i>Tesoro: Coastal Mediterranean, located on fifth floor of Lanai Tower</i> <i>Quinn's: Casual American, located on the beach outside the Lanai Tower</i> <i>400 Pazzi's: Casual Italian, located in the Islands Tower</i> <i>Café San Marco: Grab 'n Go, located in the main concourse</i> <i>10K Alley: Elevated Bar Food, located on fifth floor of Lanai Tower</i> <i>Kane Tiki Bar &amp; Grill: Balinese inspired, located near the Tiki Pool</i> <i>Resort maps, restaurant hours and descriptions are available at Registration.</i>
12:45 pm – 3:30 pm	<b>Early Practitioners Luncheon</b> — Calusa Ballroom 3
1:00 pm – 1:30 pm	<b>Exhibits Open</b> — Calusa Ballroom 7
1:30 pm – 2:30 pm	<b>Break &amp; Visit Exhibits</b> — Calusa Ballroom 7 <b>Fourth Scientific Session C — Simultaneous Subspecialty Breakout Sessions</b> Adult Cardiac Breakout — Calusa Ballroom 6 Thoracic Breakout — Calusa Ballroom 10-12 Adult Congenital Breakout — Calusa Ballroom 8-9 ECMO/Transplant Breakout — Calusa Ballroom 4
2:30 pm – 3:00 pm	<b>Break &amp; Visit Exhibits</b> — Calusa Ballroom 7
3:00 pm – 4:00 pm	<b>Fifth Scientific Session</b> — Calusa Ballroom 6 3:00 pm – 3:30 pm <b>Update on Maintenance of Certification of the American Board of Thoracic Surgery</b> Joe B. Putnam, Jr., MD and Stephen C. Yang, MD 3:30 pm – 4:00 pm <b>General Session — Abstract Presentations</b>
4:00 pm – 4:45 pm	<b>STSA Annual Business Meeting</b> STSA Members Only — Calusa Ballroom 6 <i>*All new STSA Members are required to attend.</i>
7:00 pm – 10:00 pm	<b>Dinner Gala</b> — Calusa Ballroom 6
<b>SATURDAY, NOVEMBER 9, 2019</b>	
7:00 am – 10:00 am	<b>Registration</b> — Calusa Ballroom Foyer
6:45 am	<b>Continental Breakfast</b> — Calusa Ballroom Foyer
7:00 am – 7:50 am	<b>STS Coding Workshop</b> — Calusa Ballroom 6
8:00 am – 10:00 am	<b>Postgraduate General Session: CHARITY, INNOVATION, and QUALITY</b> — Calusa Ballroom 6
10:00 am	<b>Program Adjourns</b>

# SCHEDULE OF ACTIVITIES

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## WEDNESDAY, NOVEMBER 6

**Postgraduate Program Welcome Reception** — *Calusa Ballroom Foyer*

**Time:** 6:00 pm – 7:00 pm

Join fellow STSA meeting attendees for a casual welcome reception to kick off the first STSA Postgraduate Program General Session. An informal dinner and refreshments will be held in the Calusa Ballroom Foyer just outside of the session room.

## THURSDAY, NOVEMBER 7

**Spouse/Guest Hospitality Suite** — *Cape Romano (5th Floor)*

**Time:** 8:30 am – 11:00 am

STSA is providing a complimentary hospitality room for spouses and guests to mingle and make plans for exploring Marco Island.

**All Attendee Luncheon** — *Calusa Foyer & Terrace*

**Time:** 12:15 pm (Followed by dessert in the Exhibit Hall)

**Cost:** Complimentary

**Residents Reception** — *Sunset Terrace*

**Time:** 6:00 pm – 7:00 pm

Residents, fellows, and medical students attending the meeting are invited to join STSA leaders for this hour-long networking event. Spouses and guests are welcome.

**President's Mixer** — *Tiki Beach (weather permitting)*

**Time:** 7:00 pm – 9:00 pm

**Cost:** Complimentary

*Attendees receive two tickets with registration. Additional tickets may be purchased for \$25.00. Visit the registration desk for details.*

Gather with fellow meeting attendees for an evening of networking and fun.

## FRIDAY, NOVEMBER 8

**Spouse/Guest Hospitality Suite** — *Cape Romano (5th Floor)*

**Time:** 8:30 am – 11:00 am

*STSA is providing a complimentary hospitality room for spouses and guests to mingle and make plans for exploring Marco Island.*

### Dinner Gala

**Reception:** 7:00 pm - 7:30 pm – *Calusa Ballroom Foyer*

**Dinner:** 7:30 pm - 10:00 pm – *Calusa Ballroom 6*

**Cost:** \$125.00 per adult / \$40.00 per child (ages 12 and younger)

Join fellow meeting attendees and their families for the traditional Dinner Gala, complete with a cocktail reception, dinner, and awards. Due to popular demand, a local band will return and provide music entertainment throughout the evening. Although not required, black tie or cocktail attire is welcome. Attendees are encouraged to dress comfortably and enjoy an evening of networking among colleagues, friends and families.

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## SATURDAY, NOVEMBER 9

**Spouse/Guest Hospitality Suite** — *Cape Romano (5th Floor)*

**Time:** 8:30 am – 10:00 am

STSA is providing a complimentary hospitality room for spouses and guests to mingle and make plans for exploring Marco Island.

## ONSITE FITNESS & RECREATION

### Individual Golf Play

**Cost:** Starting at \$119.00 (Price includes greens fees, golf cart, practice balls and shuttle to and from resort.)

The JW Marriott Marco Island Beach Resort offers two private championship courses, The Rookery at Marco, and Hammock Bay Golf & Country Club. Both courses are a short drive away via complimentary resort shuttle. Visit the resort's website for additional detail and to reserve a tee time.

### Resort Excursions And Local Activities

The JW Marriott Marco Island Beach Resort features a long list of exciting and rejuvenating on-property activities. On arrival, guests will be provided with a Paradise Planner outlining the week's activity schedule, as well as available excursions and dining options. The resort is situated directly on the beach, and offers two swimming pools, a splash park, full service spa, two fitness centers, two private championship golf courses, a state-of-the-art gaming emporium, numerous watersports and excursions that depart directly from the resort. Browse the resort's Recreation Guide for full details and reservation information.

### Tiki Tribe

**Hours:** 10:00 am – 3:00 pm Daily

**Cost:** \$70.00 plus tax per child

The JW Marriott Marco Island Beach Resort offers a supervised children's program for ages 5–12, complete with a variety of stimulating activities. Visit the resort's website for additional details and reservations.

**This service is limited, please make reservations in advance.**

### Childcare Services

The JW Marriott Marco Island Beach Resort recommends the following childcare provider:

Nanny Poppinz

(239) 690-6495

<https://www.nannypoppinz.com/>

# CONTINUING MEDICAL EDUCATION (CME) OVERVIEW

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## DISCUSSION OF PAPERS

Each session has a limited amount of time reserved for discussion. Please review the program outline carefully to determine if you have a particular interest in some of the topics, then be prepared to discuss them at the meeting. If you wish, you may request a copy of the manuscript in advance of the meeting by contacting the author directly.

**Assigned discussants are limited to two minutes and two questions.**

## PRESENTATION AND PUBLICATION

Authors of oral presentations are required to submit a manuscript for consideration for publication in *The Annals of Thoracic Surgery* before noon on Saturday, November 9, 2019. Authors of manuscripts accepted as scientific posters are encouraged to submit a manuscript to *The Annals*, but it is not required. Manuscripts must be submitted via *The Annals* online manuscript submission system at [www.editorialmanager.com/annals/default.aspx](http://www.editorialmanager.com/annals/default.aspx). A paper copy of the manuscript will not be accepted for consideration. Primary authors and co-authors that are delinquent in submitting their manuscript to *The Annals* on time will not have abstracts considered by the Program Committee of the STSA for two (2) subsequent meetings.

## ACCREDITATION STATEMENT

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of The Society of Thoracic Surgeons and The Southern Thoracic Surgical Association. The Society of Thoracic Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

## DESIGNATION STATEMENT

The Society of Thoracic Surgeons designates this live activity for a maximum of 17.50 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

## STSA CME MISSION

The continuing medical education mission of the Southern Thoracic Surgical Association is to design and deliver high-quality, practical, innovative, and scientifically rigorous educational programming at its Annual Meeting in the areas of cardiovascular, thoracic, and congenital heart surgery, as well as ethics and professionalism, leadership, and practice management.

Such educational programming is meant to advance the overall competence of cardiovascular, thoracic, and congenital heart surgeons, and ultimately to help them improve their patient outcomes and promote patient safety.

Continuing medical education activities are presented in a variety of formats at an STSA Annual Meeting; these include [but are not limited to] presentations of peer-reviewed scientific abstracts, updates on relevant scientific research, didactic presentations, debates, video presentations, and sub-specialty-specific breakout sessions. All educational sessions include the opportunity for questions, answers and discussion to further support the educational needs of the meeting attendees and the program learning objectives.

STSA educational activities are developed and provided with the intent of confirming an existing knowledge base, imparting new knowledge, enhancing competence in the content areas covered, and addressing identified professional practice gaps. The expected results include participants' reporting greater confidence in their clinical care skills and a willingness to change their behavior or adapt new strategies as appropriate.

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## ELECTRONIC CME EVALUATION

The STSA 66th Annual Meeting evaluation and CME credit claim process is electronic. Registrants who wish to receive CME credit for sessions they attend will be required to complete the electronic evaluation for the session. This is the only way physicians can earn CME credit for their attendance. Using the electronic evaluation system, registrants can complete the meeting evaluation, claim CME credit, and print CME certificates. Certificates of Attendance are also available for non-physician attendees.

The electronic evaluation provides attendees the opportunity to offer feedback to the STSA Council and Program Committee regarding content offered, including information about applicability of the content to current practice, quality of the material presented, and recommendations for future programming. This information is invaluable in the planning of future STSA educational programs.

In addition to being useful for program planning, program evaluation and future needs assessment are important components of the requirements that the STS must meet to maintain accreditation through the Accreditation Council for Continuing Medical Education (ACCME). It is by meeting the requirements set forth by the ACCME that the STS is able to award CME credit for educational programming.

The electronic evaluation can be completed by meeting registrants onsite at computer kiosks located in the **Calusa Ballroom Foyer**.

Attendees can also access evaluations by visiting the online evaluation website through personal computers or handheld devices at <https://www.xcdsystem.com/stsa/credits/index.cfm?ID=umMG9nO>. In order to make this process more convenient for attendees, the meeting evaluations will be available online through Friday, December 6, 2019.

Attendees can login with the e-mail address they used to register for the meeting, to submit an abstract to the STSA 66th Annual Meeting or the e-mail address used to claim CME credit for past STSA Annual Meetings.

If you have not used the STSA CME credit site in the past, the password is your e-mail address. However, if you have used the credit site before, you may have previously set a different password. Please use that new password to access the site. You may also login by resetting your password or obtaining a login link which can be sent directly to your e-mail address

This process will allow STSA to maintain an electronic record of CME earned by physicians. Files will be maintained for a minimum of six years. Any questions regarding this procedure should be directed to STSA Headquarters at (312) 202-5892 or via e-mail at [stsa@stsa.org](mailto:stsa@stsa.org).

## STSA POLICY REGARDING DISCLOSURE

The Southern Thoracic Surgical Association will seek thorough financial and commercial disclosure information, according to ACCME requirements and recommendations, from all presenters, discussants, and moderators participating in an STSA Annual Meeting. Failure or refusal to provide disclosure information automatically disqualifies participation. All disclosure information will be communicated to the learners through appropriate means, including but not limited to the Annual Meeting Program Book.

STSA leadership, planning committee members, and staff will also provide disclosure information to be kept on file and communicated to meeting attendees through the STSA Annual Meeting Program Book.

All abstracts and disclosure statements will be reviewed approximately three (3) weeks prior to the Annual Meeting by staff for unidentified conflicts of interest. Any such potential conflicts will be brought to the attention of the STSA President, Council

# CONTINUING MEDICAL EDUCATION (CME) OVERVIEW

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Chair, and CME Committee Chair for review and resolution. Any potential conflicts of interest must be resolved before presentation. If a conflict is deemed unresolvable, the paper cannot be presented at the Annual Meeting.

**NOTE: To avoid confusion with regard to the question of “relevance,” STSA requires that anyone in a position to control content (planners, speakers, authors, volunteer leaders, staff) must review the content they are addressing and disclose relationships with companies that have a material interest in the content being covered regardless of the division of the company for which that relationship exists. For instance, if a speaker will be referencing a product made by the X division of ABC company, but his relationship is with the Y division, he must still disclose the relationship.**

Presenting authors and meeting faculty listed with a **D** next to their names within the Schedule of Events on page 17 have indicated, in accordance with the ACCME Standards and the STS Disclosure Policy, that they have a financial or other relationship with a healthcare-related business or other entity to disclose; or their paper's content describes the use of a device, product or drug, that is not FDA approved, or the off-label use of an approved device, product or drug. Unless otherwise noted in this Program Book or by the speakers, speakers have no commercial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA approved for the purposes they are discussing.

Please refer to the Relationship Disclosure Index on page 320 for a listing of all disclosure information pertaining to Program Planners, 2019 STSA Officers, Council and Committee Members, Abstract Reviewers and STSA Staff.

## THE SOCIETY OF THORACIC SURGEONS EDUCATION DISCLOSURE POLICY

As a sponsor of continuing medical education accredited by the Accreditation Council for Continuing Medical Education (ACCME), The Society of Thoracic Surgeons requires that any individual who is in a position to control the content of an educational activity must disclose all relationships with commercial interests (including known relationships of his or her immediate family, department, and partners). The ACCME defines a commercial interest as “any entity producing, marketing, reselling, or distributing health care goods or services consumed by, or used on, patients. The ACCME does not consider providers of clinical service directly to patients to be commercial interests.” The question of whether a disclosed conflict situation could represent undue influence on the educational activity by a commercial interest or whether the disclosed information is sufficient to consider an abstract, presentation, or other educational enduring material to represent potentially biased information must be resolved prior to an individual's involvement in STS educational programming.

Required disclosures include (1) a financial interest of any amount (e.g., through ownership of stock, stock options, or bonds) (2) the receipt of any amount of cash, goods or services within the current 12-month period (e.g., through research grants, employment, consulting fees, royalties, travel, or gifts) or (3) a nonremunerative position of influence (e.g., as officer, director, trustee or public spokesperson). EXCLUDED from this disclosure requirement are blind trusts or other passive investments such as mutual funds. In the case of a financial or other relationship disclosure, the company, product/service, and specific nature of the relationship must be noted. Disclosure is mandatory for any person involved in the planning, management, presentation, and/or evaluation of STS educational activities.

Failure to disclose all relationships with commercial interests disqualifies the individual from being a planning committee member, a teacher, or an author of educational materials, and this individual cannot have any responsibility for the development,



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management, presentation, or evaluation of STS educational activities. This requirement is intended neither to imply any impropriety of such relationships nor to prejudice any individual planner, presenter or author. It is merely to identify such relationships through full disclosure, and to allow STS to assess and resolve potential influences on the educational activity prior to the planning and implementation of an educational activity. If no relationships with commercial interests exist, the individual must indicate this on the disclosure form.

Additionally, the fact that the presentation, paper, or other educational product describes (a) the use of a device, product, or drug that is not FDA approved or (b) an off-label use of an approved device, product, or drug must also be disclosed. This requirement has been adopted in response to FDA policy and case law involving medical societies, and is not intended to prohibit or inhibit independent presentation or discussion regarding the uses of devices, products, and drugs as described in (a) or (b) above.

For live presentations, all disclosures must be stated orally and on a slide at the beginning of the presentation and will be noted in published material related to the activity. Slides, handouts, and other materials utilized as part of an educational activity cannot contain any advertising, trade names or a product group message. Speakers are required to disclose that they have nothing to disclose if this is the case.

*Amended by the STS Executive Committee: April 11, 2012*

## **OVERALL MEETING OBJECTIVES**

To present recent advances in research, surgical techniques, patient management, and the diagnosis and treatment of cardiothoracic disease to cardiothoracic specialists and related health care professionals; and to provide a forum for cardiothoracic surgeons and related healthcare professionals to exchange ideas through open discussion periods and question-and-answer sessions related to the practice of cardiothoracic surgery.

After attending the STSA Annual Meeting, participants should have a broader understanding of new and standard techniques and current research specifically related to adult cardiac surgery, thoracic surgery, congenital heart surgery, and related transplant procedures. Attendees can utilize knowledge gained from the STSA Annual Meeting to help select appropriate surgical procedures and interventions and integrate state of the art knowledge into their own practices.

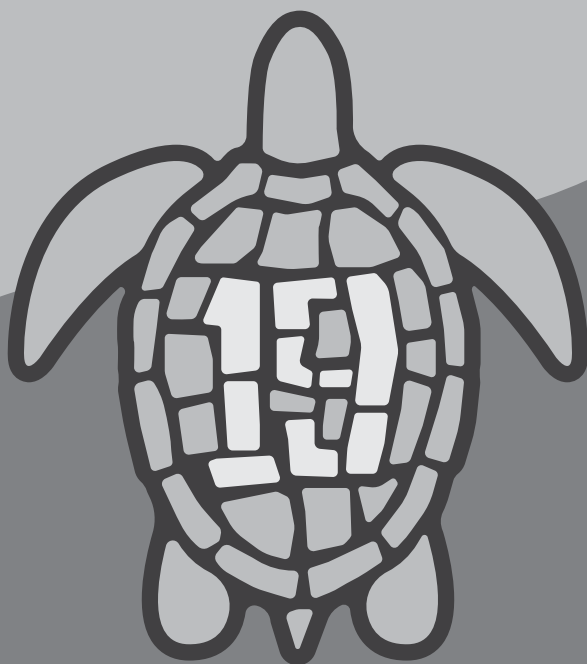
## **TARGET AUDIENCE**

The STSA Annual Meeting is intended for all professionals involved in delivery of cardiothoracic care with particular emphasis on cardiothoracic surgeons. Cardiothoracic residents, fellows, nurse practitioners, research scientists, and other health care professionals may also benefit from various sessions and interactions with cardiothoracic colleagues.

## **SPEAKER READY ROOM**

The Speaker Ready Room is located in **Calusa Ballroom 5**. Speakers are requested to go to this room upon arrival, or at least four hours prior to the opening of their session to upload slides. Speakers will not be allowed to bring their laptop to the podium. **NOTE: Slides should be prepared in a 16:9 presentation format.**





# SCHEDULE OF EVENTS\*

\*Schedule of Events is subject to change. Refer to the STSA 66th Annual Meeting Mobile Application for the most current information.

# POSTGRADUATE PROGRAM

**WEDNESDAY, NOVEMBER 6, 2019**

6:00 pm – 7:00 pm

**Postgraduate Program Welcome Reception**

*Calusa Ballroom Foyer*

7:00 pm – 9:00 pm

**Postgraduate Program General Session**

*Calusa Ballroom 10-12*

**CME Credits Available: 2.0**

The first portion of the Postgraduate Program will be held on Wednesday evening, which will showcase complex case presentations and interactive discussions from STSA experts; reflecting on “I Wish I Could Have Done That Case Over” and patients who required multiple operations. Featured speakers and presentation topics will include the following:

**I Wish I Could Have Done That Case Over: Complex Case Presentations and Interactive Discussions Involving Patients That Required Multiple Operations**

**Moderators:** **D\***Matthew J. Bott and **\*Ahmet Kilic**

**Commercial Relationships:** **\*M. Bott:** Consultant/Advisory Board: AstraZeneca

**Educational Objectives:** Upon completion of this program participants will be able to:

- Describe novel surgical strategies to treat complex challenges in reoperative:
  - ♦ Cardiac Transplantation;
  - ♦ Mitral Valve Surgery;
  - ♦ Lung Surgery;
  - ♦ Esophageal Surgery and;
  - ♦ Aortic Surgery

7:00 pm - 7:30 pm

**Cardiac Transplantation Case Presentation**

**D\***Carl L. Backer

*Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL*

**Commercial Relationships:** **\*C. Backer:** Consultant/Advisory Board: W. L. Gore & Associates

7:30 pm - 7:45 pm

**Aortic Surgery Case Presentation**

**\*Constantine Mavroudis<sup>1</sup>, D\***Tomas D. Martin<sup>2</sup>

<sup>1</sup>Johns Hopkins University School of Medicine, St. Petersburg, FL; <sup>2</sup>Florida Hospital, Orlando, FL

**Commercial Relationships:** **\*T. Martin:** Consultant/Advisory Board: Bolton Medical, Terumo Aortic

7:45 pm - 7:50 pm

**Aortic Surgery: The Science Behind the Case**

**D\***Scott A. LeMaire

*Baylor College of Medicine, Texas Heart Institute, Houston, TX*

**Commercial Relationships:** **\*S. LeMaire:** Consultant/Advisory Board: Acer Therapeutics, Biom'up; Other Research Support: CytoSorbents, Terumo Aortic, W. L. Gore & Associates

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7:50 pm - 8:00 pm

**Open Discussion**

8:00 pm - 8:05 pm

**Thoracic Surgery with 3-Dimensional Modeling Case Presentation**

**D\***Shanda H. Blackmon

*Mayo Clinic, Rochester, MN*

**Commercial Relationships:** \*S. Blackmon: Consultant/Advisory Board: Olympus; Research Grant: Medtronic, truFreeze

8:05 pm - 8:10 pm

**Robotic Thoracic Surgery Case Presentation**

**D\***Robert J. Cerfolio

*NYU Langone Health, New York City, NY*

**Commercial Relationships:** \*R.J. Cerfolio: Consultant/Advisory Board: AstraZeneca, ConMed, Covidien LP, C-SATS, Ethicon, Google/Johnson & Johnson, Intuitive Surgical, Medtronic, Myriad, ROLO-7, TransEnterix

8:10 pm - 8:15 pm

**Esophageal Surgery Case Presentation**

\*Christine L. Lau

*University of Virginia, Charlottesville, VA*

8:15 pm - 8:30 pm

**Open Discussion**

8:30 pm - 8:35 pm

**Mitral Surgery Case Presentation 1**

\*Vinay Badhwar

*West Virginia University, Morgantown, WV*

8:35 pm - 8:40 pm

**Mitral Surgery Case Presentation 2**

**D\***Vinod H. Thourani

*MedStar Heart and Vascular Institute and Georgetown University, Washington, DC*

**Commercial Relationships:** \*V. Thourani: Consultant/Advisory Board: Abbott Vascular, Boston Scientific, Edwards Lifesciences; Research Grant: Abbott Vascular, Boston Scientific, Edwards Lifesciences

8:40 pm - 8:45 pm

**Mitral Surgery Case Presentation 3**

**D\***Kevin D. Accola

*Cardiovascular Surgeons, P.A., Orlando, FL*

**Commercial Relationships:** \*K. Accola: Speakers Bureau/Honoraria: Edwards Lifesciences

8:45 pm - 9:00 pm

**Open Discussion**

# ROBERT M. SADE ETHICS LECTURESHIP

THURSDAY, NOVEMBER 7, 2019

## Robert M. Sade Ethics Lectureship

7:00 am - 7:50 am

*Calusa Ballroom 6*

**Educational Objectives:** Upon completion of this program participants should be able to:

- Understand the ethically appropriate language to use when providing information to patients for the purpose of gaining surgical consent, when the patient (or parents in the case of children) refuse to allow the use of blood products during open heart surgery;
- Engage with patients and families in high-quality shared decision making during the informed consent process

**CME Credits Available: .75**

7:00 am - 7:05 am

### **Case Introduction: Painting a Vivid Picture: Persuasion versus Manipulation in the Consent Process**

**Moderator:** \*Robert M. Sade, *Medical University of South Carolina, Charleston, SC*

7:05 am - 7:20 am

**Pro:** Damien LaPar

*Columbia University College of Physicians and Surgeons, New York, NY*

7:20 am - 7:35 am

**Con:** \*John E. Mayer, Jr.

*Boston Children's Hospital, Boston, MA*

7:35 am - 7:50 am

### **Panel Discussion**

# BASIC SCIENCE FORUM

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## THURSDAY, NOVEMBER 7, 2019

7:00 am - 7:50 am

*Calusa Ballroom 8-9*

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional five minutes of discussion open to the audience.)

Presenting authors are listed in bold.

### CME Credits Available: .75

**Moderators:** **D\***Matthew J. Bott, \*Todd K. Rosengart, and \*Ross M. Ungerleider

**Commercial Relationships:** \*M. Bott: Consultant/Advisory Board: AstraZeneca

7:00 am - 7:12 am (page 52)

### **1B. Impact of Social Determinants of Health on Non-Small Cell Lung Cancer Aggressive Somatic Phenotypes**

**DLoretta Erhunmwunsee<sup>1</sup>**, Hengrui Hu<sup>2</sup>, Catherine Raquel<sup>2</sup>, Lisa Lopez<sup>2</sup>, Jenny Shen<sup>2</sup>, Lennie Wong<sup>2</sup>, Jae Kim<sup>2</sup>, Dan Raz<sup>2</sup>, Karen Reckamp<sup>2</sup>, Ravi Salgia<sup>2</sup>, Stacy Gray<sup>2</sup>

<sup>1</sup>City of Hope Cancer Center, Duarte, CA; <sup>2</sup>City of Hope Medical Center, Duarte, CA

**Discussant:** \*Eric L. Grogan, Vanderbilt University Medical Center, Nashville, TN

7:12 am - 7:24 am (page 54)

### **2B. Pretreatment With Nicorandil Preserves Motor Function After Spinal Cord Ischemia-Reperfusion Injury**

**Yuki Ikeno<sup>1</sup>**, Christian Ghincea<sup>1</sup>, Gavriel Roda<sup>1</sup>, Linling Cheng<sup>1</sup>, \*Muhammad Aftab<sup>2</sup>, Xianzhong Meng<sup>1</sup>, Michael Weyant<sup>2</sup>, Joseph Cleveland, Jr.<sup>1</sup>, \*David Fullerton<sup>2</sup>, \*Thomas Reece<sup>2</sup>

<sup>1</sup>University of Colorado, Aurora, CO; <sup>2</sup>University of Colorado Denver, Aurora, CO

**Discussant:** **D\***Joseph S. Coselli, Baylor College of Medicine, Houston, TX

7:24 am - 7:36 am (page 56)

### **3B. High Mutational Concordance Between Next Generation Sequencing Profiles of Colorectal Cancer and Pulmonary Metastases**

Saumil Datar<sup>1</sup>, **\*Erin Corsini<sup>1</sup>**, Kyle Mitchell<sup>1</sup>, \*Reza Mehran<sup>1</sup>, \*David Rice<sup>1</sup>, \*Boris Sepesi<sup>1</sup>, \*Garrett Walsh<sup>1</sup>, \*Stephen Swisher<sup>1</sup>, Jack Roth<sup>1</sup>, \*Ara Vaporicyan<sup>1</sup>, \*Wayne Hofstetter<sup>1</sup>, Jonathan Loree<sup>2</sup>, Van Morris<sup>1</sup>, \*Mara Antonoff<sup>1</sup>

<sup>1</sup>University of Texas, MD Anderson Cancer Center, Houston, TX; <sup>2</sup>BC Cancer, Vancouver, BC, Canada

**Discussant:** \*Virginia R. Litle, Boston University School of Medicine, Boston, MA

7:36 am - 7:48 am (page 58)

### **4B. ST2 as a Predictor of Long-Term Risk of Unplanned Readmission After Pediatric Congenital Heart Surgery**

**Devin Parker<sup>1</sup>**, Allen Everett<sup>2</sup>, Marshall Jacobs<sup>2</sup>, \*Jeffrey Jacobs, \*Luca Vricella<sup>3</sup>, Chirag Parikh<sup>3</sup>, Jeremiah Brown<sup>1</sup>

<sup>1</sup>The Dartmouth Institute for Health Policy and Clinical Practice, Lebanon, NH; <sup>2</sup>Johns Hopkins University School of Medicine, Baltimore, MD; <sup>3</sup>Johns Hopkins University, Baltimore, MD

**Discussant:** \*James D. St. Louis, Children's Mercy Hospital and Clinics, Kansas City, MO

7:50 am - 8:00 am

### **Break**

*Calusa Ballroom Foyer*

# FIRST SCIENTIFIC SESSION

## THURSDAY, NOVEMBER 7, 2019

8:00 am - 10:00 am

*Calusa Ballroom 6*

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience.)

Presenting authors are listed in bold.

**CME Credits Available: 2.25**

**Moderators:** **D\***Kevin D. Accola, **D\***Jeffrey P. Jacobs and **D\***Vinod H. Thourani

**Commercial Relationships:** \*K. Accola: Consultant/Advisory Board: Edwards Lifesciences; Speakers Bureau/Honoraria: Edwards Lifesciences; \*J. Jacobs: Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare; \*V. Thourani: Consultant/Advisory Board: Abbott Vascular, Boston Scientific, Edwards Lifesciences; Research Grant: Abbott Vascular, Boston Scientific, Edwards Lifesciences

8:00 am - 8:15 am (page 60)

### 1. Fate of the Preserved Sinuses of Valsalva After Emergency Repair for Acute Type A Aortic Dissection

**Markian Bojko**<sup>1</sup>, Maham Suhail<sup>2</sup>, Joseph Bavaria<sup>3</sup>, Andreas Habetheruer<sup>3</sup>, Robert Hu<sup>3</sup>, Joey Harmon<sup>3</sup>, Nimesh Desai<sup>3</sup>, Rita Milewski<sup>3</sup>, \*Matthew Williams<sup>3</sup>, Wilson Szeto<sup>3</sup>, Jana Mossey<sup>4</sup>, Prashanth Vallabhajosyula<sup>3</sup>

<sup>1</sup>Drexel University College of Medicine, Philadelphia, PA; <sup>2</sup>Rowan University, College of Osteopathic Medicine, Stratford, NJ; <sup>3</sup>University of Pennsylvania, Philadelphia, PA;

<sup>4</sup>Dornsife School of Public Health, Drexel University, Philadelphia, PA

**Discussant:** **D\***Joseph S. Coselli, Baylor College of Medicine, Houston, TX

8:15 am - 8:30 am (page 62)

### 2. Surgical Outcomes of Combined Neoadjuvant Atezolizumab and Chemotherapy in Resectable Non-Small Cell Lung Cancer

**Richard Dubois**<sup>1</sup>, Catherine Shu<sup>1</sup>, Lexi Cao<sup>1</sup>, Adrian Sacher<sup>1</sup>, Stephanie Smith-Marrone<sup>1</sup>, Mark Stoopler<sup>1</sup>, \*Joshua Sonett<sup>2</sup>, Frank D'Ovidio<sup>1</sup>, Matthew Baccheta<sup>3</sup>, Anjali Saqi<sup>1</sup>, Naiyernaiyer Rizvi<sup>1</sup>, B. Payne Stanifer<sup>1</sup>

<sup>1</sup>Columbia University Medical Center, New York, NY; <sup>2</sup>New York Presbyterian/ Columbia University, Pomona, NY; <sup>3</sup>Vanderbilt University Medical Center, Nashville, TN

**Discussant:** **D**Stephen Broderick, Johns Hopkins University, Baltimore, MD

8:30 am - 8:45 am (page 64)

### 3. Hypoplastic Left Heart Syndrome – Twenty Years Follow-up in Norway

**Tom Hoel**, Egil Seem, Britt Fredriksen, Sigurd Birkeland, Kjell Saatvedt,

\*Harald Lindberg

*Oslo University Hospital, Oslo, Norway*

**Discussant:** Marshall L. Jacobs, Johns Hopkins University School of Medicine, Baltimore, MD



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8:45 am - 9:00 am (page 66)

**4. Effect of Ascending Aorta Size on Outcomes Following the Norwood Procedure**

**Horacio Carvajal<sup>1</sup>**, Matthew Canter<sup>2</sup>, \*Pirooz Eghtesady<sup>1</sup>

<sup>1</sup>Washington University School of Medicine, St. Louis, MO; <sup>2</sup>Washington University in St. Louis, St. Louis, MO

**Discussant:** DRichard G. Ohye, University of Michigan, Ann Arbor, MI

9:00 am - 9:15 am (page 68)

**5. Clinical Predictors of In-Hospital Mortality in Venoarterial Extracorporeal Membrane Oxygenation in Patients With Refractory Cardiogenic Shock**

**Navin Vigneshwar<sup>1</sup>**, Mark Lucas<sup>1</sup>, Patrick Kohtz<sup>2</sup>, Michael Bronsert<sup>3</sup>, Muhammad Masood<sup>4</sup>, Akinobu Itoh<sup>4</sup>, Michael Weyant<sup>2</sup>, \*Thomas Reece<sup>2</sup>, \*Jay Pal<sup>2</sup>, Joseph Cleveland, Jr.<sup>1</sup>, \*David Fullerton<sup>2</sup>, \*Muhammad Aftab<sup>2</sup>

<sup>1</sup>University of Colorado, Aurora, CO; <sup>2</sup>University of Colorado Denver, Aurora, CO; <sup>3</sup>Adult and Child Consortium for Health Outcomes Research and Delivery Science, Aurora, CO; <sup>4</sup>Washington University School of Medicine, St. Louis, MO

**Discussant:** \*J. Michael DiMaio, Baylor University Medical Center, Dallas, TX

9:15 am - 9:30 am (page 70)

**6. National Prevalence and Overall Survival of Primary Stereotactic Body Radiation Therapy for Operable Early-Stage Non-Small Cell Lung Cancer**

**Rhami Khorfan**, Tim Kruser, Ankit Bharat, Karl Bilimoria, David Odell  
Northwestern University, Chicago, IL

**Discussant:** D\*Min P. Kim, Houston Methodist Hospital, Houston, TX

9:30 am - 9:45 am (page 72)

**7. Culture of Safety Improvement in a High-Volume Cardiothoracic Surgery Center**

**Matthew Henn<sup>1</sup>**, Clare Ridley<sup>1</sup>, \*Hersh Maniar<sup>2</sup>, Aaron Dahl<sup>3</sup>, Aaron Steinberg<sup>2</sup>, Michael Avidan<sup>1</sup>, \*Ralph Damiano<sup>2</sup>, \*G. Alexander Patterson<sup>2</sup>, \*Marc Moon<sup>2</sup>

<sup>1</sup>Washington University School of Medicine, Barnes-Jewish Hospital, St. Louis, MO; <sup>2</sup>Washington University School of Medicine, St. Louis, MO; <sup>3</sup>University of Chicago, Chicago, IL

**Discussant:** \*Thoralf M. Sundt, Massachusetts General Hospital, Boston, MA

9:45 am - 10:00 am (page 74)

**8. Academic Representation of Women in the Southern Thoracic Surgical Association: Evidence for Positive Change**

**Jacqueline Olive<sup>1</sup>**, Niki Iranpour<sup>1</sup>, \*Ourania Preventza<sup>1</sup>, \*Shanda Blackmon<sup>2</sup>, \*Mara Antonoff<sup>3</sup>

<sup>1</sup>Baylor College of Medicine, Houston, TX; <sup>2</sup>Mayo Clinic, Rochester, MN; <sup>3</sup>University of Texas, MD Anderson Cancer Center, Houston, TX

**Discussant:** Elizabeth Stephens, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL

# HAROLD URSCHER HISTORY LECTURESHIP

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10:00 am – 10:15 am

*Calusa Ballroom 6*

**Moderator:** \*John W. Hammon

10:00 am - 10:15 am (page 76)

**9. Max Brödel: Father of American Surgical Illustration: Did He Help Make Cardiac Surgeons Famous?**

**\*W. Randolph Chitwood, Jr.**

*East Carolina University, Greenville, NC*

10:00 am -12:00 pm

**EXHIBITS OPEN**

*Calusa Ballroom 7*

10:15 am -10:30 am

**Break – Visit Exhibits**

*Calusa Ballroom 7*

# GENERAL SESSION

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10:30 am – 12:15 pm

*Calusa Ballroom 6*

## **CME Credits Available: 1.5**

**Moderators:** **D\***Jeffrey P. Jacobs and **D\***Alan M. Speir

**Commercial Relationships:** \*J. Jacobs: Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare; \*A. Speir: Consultant/Advisory Board: AtriCure, Inc., Medtronic

10:30 am - 10:55 am

## **President's Invited Lecturer – Decision Making in Pediatric Cardiac Surgery... The Rational or Irrational Basis for Why We Do What We Do**

James A. Quintessenza

*Kentucky Children's Hospital, Lexington, KY*

10:55 am – 11:20 am

## **President's Invited Keynote – Why BE a Cardiothoracic Surgeon... Nice Work if You Can Get It; A Life of Privilege**

Martin J. Elliott

*The Great Ormond Street Hospital for Children, London, United Kingdom*

11:20 am - 12:15 pm

## **Presidential Address: "Y"**

**D\***Jeffrey P. Jacobs

**Commercial Relationships:** \*J. Jacobs: Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare

12:15 pm

## **All Attendee Luncheon**

*Calusa Foyer & Terrace*

1:30 pm – 2:00 pm

## **Dessert Served in the Exhibit Hall**

*Calusa Ballroom 7*

1:30 pm – 2:00 pm

## **2019 Cardiothoracic Surgery Jeopardy Competition for North America**

Round 1

*Calusa Ballroom 7*

1:30 pm – 3:30 pm

## **EXHIBITS OPEN**

# SECOND SCIENTIFIC SESSION

2:00 pm – 3:00 pm

Calusa Ballroom 6

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience.)

Presenting authors are listed in bold.

**CME Credits Available: 1.0**

**Moderators:** \*Joseph A. Dearani and \*Daniela Molena

**Resident Moderator:** Kimberly A. Holst

2:00 pm - 2:15 pm (page 78)

## **10. Comparative Effectiveness of Mechanical Valves, Bioprosthetic Valves and Homografts in the Management of Complex Aortic Endocarditis**

**Zaid Abdelsattar**, Mohamed Elsisy, \*Hartzell Schaff, Kevin Greason, Richard Daly, M. Sertac Cicek, \*John Stulak, \*Joseph Dearani, Alberto Pochettino, Vishal Khullar, Phillip Rowse, Gabor Bagameri, Arman Arghami, Juan Crestanello  
Mayo Clinic, Rochester, MN

**Discussant:** D\*Ourania Preventza, Baylor College of Medicine, Houston, TX

2:15 pm - 2:30 pm (page 80)

## **11. Mobile Lung Screening: Should We All Get on the Bus?**

\*Ashley Miller<sup>1</sup>, \*James Headrick<sup>1</sup>, \*Jeremy Smith<sup>1</sup>, **Olivia Morin**<sup>2</sup>

<sup>1</sup>CHI Memorial Chest and Lung Cancer Center, Chattanooga, TN; <sup>2</sup>University of Tennessee College of Medicine Chattanooga, Chattanooga, TN

**Discussant:** D\*Betty C. Tong, Duke University Medical Center, Durham, NC

2:30 pm - 2:45 pm (page 82)

## **12. ABO Incompatible Heart Transplant in Infants - A UNOS Registry Review**

\***Deborah Kozik**<sup>1</sup>, Jaimin Trivedi<sup>1</sup>, Joshua Sparks<sup>1</sup>, \*Mark Slaughter<sup>1</sup>, \*Bahaaldin Alsoufi<sup>1</sup>, \*Erle Austin<sup>2</sup>

<sup>1</sup>University of Louisville, Louisville, KY; <sup>2</sup>University of Louisville, Kosair Children's Hospital, Louisville, KY

**Discussant:** \*Luca A. Vricella, University of Chicago, Chicago, IL

2:45 pm - 3:00 pm (page 84)

## **13. Preoperative Left Atrial Dimension: An Indication for Asymptomatic Mitral Valve Repair?**

Tessa Watt, Alexander Brescia, Liza Rosenbloom, Haley Allgeyer, Sonali Reddy, Shannon Murray, Xiaoting Wu, \***Steven Bolling**  
University of Michigan, Ann Arbor, MI

**Discussant:** \*Vinay Badhwar, West Virginia University, Morgantown, WV

3:00 pm - 3:30 pm

## **Break – Visit Exhibits**

Calusa Ballroom 7

3:00 pm - 3:30 pm

## **2019 Cardiothoracic Surgery Jeopardy Competition for North America**

Round 2

Calusa Ballroom 7

# THIRD SCIENTIFIC SESSION

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3:30 pm – 5:30 pm

Calusa Ballroom 6

*(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience. Papers or videos listed without a discussant, do not have one assigned. All discussion time will remain open to the audience.)*

**CME Credits Available: 2.0**

**Moderators:** \*Andrea J. Carpenter, \*John H. Calhoun and \*Elizabeth A. David

3:30 pm - 3:45 pm (page 86)

## **14. The Role of Frailty in Failure to Rescue After Cardiovascular Surgery: Improved Outcomes Seen at High-Performing Cardiac Surgical Centers**

**Krish Dewan**<sup>1</sup>, Suparna Navale<sup>2</sup>, Sameer Hirji<sup>3</sup>, Siran Koroukian<sup>2</sup>, Karan Dewan<sup>1</sup>, Lars Svensson<sup>1</sup>, A. Marc Gillinov<sup>1</sup>, Eric Roselli<sup>1</sup>, Douglas Johnston<sup>1</sup>, \*Faisal Bakaen<sup>1</sup>, Edward Soltesz<sup>1</sup>

<sup>1</sup>Cleveland Clinic, Cleveland, OH; <sup>2</sup>Case Western Reserve University, Cleveland, OH;

<sup>3</sup>Brigham and Women's Hospital, Boston, MA

**Discussant:** David M. Shahian, Massachusetts General Hospital, Boston, MA

3:45 pm - 4:00 pm (page 88)

## **15. Concurrent Breast and Lung Cancer is a Common Finding in Women With a History of Smoking**

**Tamar Nobel**, Raul Caso, Giye Choe, Prasad Adusumilli, Manjit Bains, \*Matthew Bott, Robert Downey, James Huang, \*James Isbell, Bernard Park, Gaetano Rocco, Valerie Rusch, Smita Sihag, \*David Jones, \*Daniela Molena  
Memorial Sloan Kettering Cancer Center, New York, NY

**Discussant:** D\*Alden M. Parsons, WakeMed Health & Hospitals, Raleigh, NC

4:00 pm - 4:15 pm (page 90)

## **16. Outcomes of Tricuspid Valve Surgery in Patients With Functional Tricuspid Regurgitation**

**Siddharth Pahwa**, Nishant Saran, Alberto Pochettino, \*Hartzell Schaff, \*John Stulak, Kevin Greason, Juan Crestanello, Richard Daly, M. Sertac Cicek, Katherine King, \*Joseph Dearani  
Mayo Clinic, Rochester, MN

**Discussant:** \*Vinay Badhwar, West Virginia University, Morgantown, WV

4:15 pm - 4:30 pm (page 92)

## **17. Clinical Outcomes of Non-Cardiac Surgery Patients Requiring Postoperative ECMO**

**Harrison Lang**, Mitchell Milanuk, John Brady, Elizabeth Lyden, \*HelenMari Merritt Genore  
University of Nebraska Medical Center, Omaha, NE

**Discussant:** D\*Joseph B. Zwischenberger, University of Kentucky, Lexington, KY

# THIRD SCIENTIFIC SESSION

4:30 pm - 4:45 pm (page 94)

## 18. Unicuspid Aortic Valve Repair Using Geometric Ring Annuloplasty

**Ming-Sing Si<sup>1</sup>**, Jennifer Romano<sup>1</sup>, Matthew Romano<sup>1</sup>, Nicholas Andersen<sup>2</sup>,

\*John Conte<sup>3</sup>, \*J. Scott Rankin<sup>4</sup>, Lawrence Wei<sup>4</sup>, \*Vinay Badhwar<sup>4</sup>, \*Joseph Turek<sup>2</sup>

<sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Duke University, Durham, NC; <sup>3</sup>Penn State

University, Hershey, PA; <sup>4</sup>West Virginia University, Morgantown, WV

**Discussant:** \*Mark S. Bleiweis, University of Florida, Gainesville, FL

4:45 pm - 5:00 pm (page 96)

## 19V. Aortic Valve Neocuspidization (Ozaki Procedure) for Pediatric and Congenital Aortic Valve Disease

**\*Damien LaPar<sup>1</sup>**, Emile Bacha<sup>2</sup>

<sup>1</sup>Columbia University College of Physicians and Surgeons, New York, NY; <sup>2</sup>Columbia

University College of Physicians and Surgeons, Weill Cornell College of Medicine,

New York, NY

**Discussant:** \*Mark S. Bleiweis, University of Florida, Gainesville, FL

5:00 pm - 5:15 pm (page 98)

## 20. Preoperative Nutrition-Enhanced Recovery After Surgery (N-ERAS) Protocol for Thoracic Cancer Resections

**\*Lary Robinson<sup>1</sup>**, Tawee Tanvetyanon<sup>1</sup>, Deanna Grubbs<sup>1</sup>, Noah Robinson<sup>2</sup>,

Christine Pierce<sup>1</sup>, Kevin McCarthy<sup>1</sup>, Rosemarie Garcia Getting<sup>1</sup>, Sephalie Patel<sup>1</sup>

<sup>1</sup>Moffitt Cancer Center, Tampa, FL; <sup>2</sup>Georgia Institute of Technology, Atlanta, GA

**Discussant:** \*Richard K. Freeman, St. Vincent Hospital and Health System, Indianapolis, IN

5:15 pm - 5:30 pm (page 100)

## 21V. First Successful Implant of Endovascular Aortic Arch Device in the United States

**\*Puja Kachroo**, Rahul Handa, J. Westley Ohman, Luis Sanchez, \*Marc Moon

Washington University School of Medicine, St. Louis, MO

6:00 pm - 7:00 pm

## Residents Reception

Sunset Terrace

7:00 pm - 9:00 pm

## President's Mixer

Tiki Beach

# FOURTH SCIENTIFIC SESSION A

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**FRIDAY, NOVEMBER 8, 2019**

7:45 am – 12:00 pm

**EXHIBITS OPEN**

*Calusa Ballroom 7*

## **Fourth Scientific Session A**

7:00 am - 8:30 am

**Simultaneous Adult Cardiac, Thoracic, and Congenital Breakout Sessions**

**CME Credits Available: 1.5**

Attendees select to participate in one of the following three breakout sessions:

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### **Adult Cardiac Breakout**

*Calusa Ballroom 6*

*(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience. Papers or videos listed without a discussant, do not have one assigned. All discussion time will remain open to the audience.)*

Presenting authors are listed in bold.

**Moderators:** \*Jennifer S. Lawton and **D\***Scott A. LeMaire

**Resident Moderator:** \*Erin Corsini

**Commercial Relationships:** \*S. LeMaire: Consultant/Advisory Board: Acer Therapeutics, Biom'up; Other Research Support: CytoSorbents, Terumo Aortic, W. L. Gore & Associates

7:00 am - 7:15 am (page 102)

#### **22. Patient-Reported Outcomes at One Year Define Successful Cardiac Surgery**

**Eric Charles<sup>1</sup>**, \*James Mehaffey<sup>1</sup>, \*Robert Hawkins<sup>1</sup>, China Green<sup>1</sup>, Ashley Craddock<sup>1</sup>, Zachary Tyerman<sup>1</sup>, Nathaniel Larson<sup>1</sup>, \*Irving Kron<sup>1</sup>, \*Gorav Ailawadi<sup>2</sup>,

\*Benjamin Kozower<sup>3</sup>

<sup>1</sup>University of Virginia, Charlottesville, VA; <sup>2</sup>University of Virginia Health System, Charlottesville, VA; <sup>3</sup>Washington University School of Medicine, St. Louis, MO

**Discussant:** \*Felix G. Fernandez, Emory University, Atlanta, GA

7:15 am - 7:30 am (page 104)

#### **23. Longer-Term Outcomes of Coronary Bypass Surgery With and Without Mitral Valve Repair in Moderate Ischemic Mitral Regurgitation**

**Laura Seese**, Keith Dufendach, Ibrahim Sultan, Edgar Aranda-Michel, Thomas Gleason, Yisi Wang, Floyd Thoma, Arman Kilic

University of Pittsburgh Medical Center, Pittsburgh, PA

**Discussant:** **D\***Steven F. Bolling, University of Michigan, Ann Arbor, MI

7:30 am - 7:45 am (page 106)

#### **24V. One Stage Repair With Primary Fistula Closure for Huge Aorto-Esophageal Fistula After TEVAR**

**Toshiki Fujiyoshi<sup>1</sup>**, Usman Ahmad<sup>2</sup>, Kyle Miletic<sup>2</sup>, Siva Raja<sup>1</sup>, Patrick Vargo<sup>1</sup>, Emidio Germano<sup>1</sup>, Eric Roselli<sup>1</sup>

<sup>1</sup>Cleveland Clinic, Cleveland, OH; <sup>2</sup>Cleveland Clinic Foundation, Cleveland, OH

# FOURTH SCIENTIFIC SESSION A

7:45 am - 8:00 am (page 108)

## **25. Development of a Readmission Risk Score for Coronary Artery Bypass Graft Surgery**

**Rodrigo Zea-Vera**, Qianzi Zhang, Rohan Shah, \*Subhasis Chatterjee, \*Matthew Wall, \*Todd Rosengart, \*Ravi Ghanta  
Baylor College of Medicine, Houston, TX

**Discussant:** Jo Chikwe, Mount Sinai Health System, New York, NY

8:00 am - 8:15 am (page 110)

## **26. Bicuspid Aortic Valve Repair: Causes of Valve Failure and Long Term Outcomes**

**Sri Harsha Patlolla**, \*Hartzell Schaff, \*John Stulak, Hector Michelena, Nishant Saran, Katherine King, \*Joseph Dearani  
Mayo Clinic, Rochester, MN

**Discussant:** Prashanth Vallabhajosyula, University of Pennsylvania Health System, Philadelphia, PA

8:15 am - 8:30 am (page 112)

## **27V. A Transcatheter Solution for Pure Aortic Insufficiency**

**James Edelman**<sup>1</sup>, \*Christian Shults<sup>2</sup>, Lowell Satler<sup>3</sup>, I. Itsik Ben-Dor<sup>3</sup>, Toby Rogers<sup>3</sup>, Ron Waksman<sup>3</sup>, \*Vinod Thourani<sup>2</sup>

<sup>1</sup>Medstar Heart and Vascular Institute, Washington, DC; <sup>2</sup>MedStar Heart and Vascular Institute/Georgetown University School of Medicine, Washington, DC; <sup>3</sup>MedStar Washington Hospital Center, Washington, DC

## **Thoracic Breakout**

Calusa Ballroom 10-12

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience. Papers or videos listed without a discussant, do not have one assigned. All discussion time will remain open to the audience.)

Presenting authors are listed in bold.

**Moderators:** \*Lisa M. Brown and \*Stephen R. Hazelrigg

**Resident Moderator:** Melanie P. Subramanian

7:00 am - 7:15 am (page 114)

## **28. Outcomes Following Thoracic Metastasectomy in Patients With Metastatic Germ Cell Tumors**

**Raul Caso**, Gregory Jones, Kay See Tan, Darren Feldman, Samuel Funt, Victor Reuter, Manjit Bains, \*David Jones  
Memorial Sloan Kettering Cancer Center, New York, NY

**Discussant:** \*Joe B. Putnam, Jr., Baptist MD Anderson Cancer Center, Jacksonville, FL



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7:15 am - 7:30 am (page 116)

**29. Re-Resecting to a Negative Margin After an Initial Positive Esophagectomy Margin Enhances Progression Free Survival**

**Sahar Saddoughi**<sup>1</sup>, Kyle Mitchell<sup>2</sup>, Kristin Fruth<sup>1</sup>, Mark Allen<sup>1</sup>, \*K. Robert Shen<sup>1</sup>, Francis Nichols<sup>1</sup>, Scott Harmsen<sup>1</sup>, \*Stephen Cassivi<sup>1</sup>, Dennis Wigle<sup>1</sup>, Jim Taswell<sup>1</sup>, Taofic Mounajjed<sup>1</sup>, \*Garrett Walsh<sup>2</sup>, \*Reza Mehran<sup>2</sup>, \*Wayne Hofstetter<sup>2</sup>, \*Stephen Swisher<sup>2</sup>, Jack Roth<sup>2</sup>, \*Boris Sepesi<sup>2</sup>, \*Ara Vaporicyan<sup>2</sup>, \*David Rice<sup>2</sup>, \*Mara Antonoff<sup>2</sup>, \*Shanda Blackmon<sup>1</sup>

<sup>1</sup>Mayo Clinic, Rochester, MN; <sup>2</sup>University of Texas, MD Anderson Cancer Center, Houston, TX

**Discussant:** \*Daniela Molena, Memorial Sloan Kettering Cancer Center, New York, NY

7:30 am - 7:45 am (page 118)

**30V. Resection and Reconstruction of Primary Adenoid Cystic Carcinoma of the Trachea**

**Domenico Galetta**, Lorenzo Spaggiari  
European Institute of Oncology, Milan, Italy

7:45 am - 8:00 am (page 120)

**31. A Pathway for Obstructing Esophageal Cancer Facilitates Care**

**John Pagteilan**<sup>2</sup>, \*Nicholas Tingquist<sup>1</sup>, \*Jason Muesse<sup>2</sup>, Kevin Sexton<sup>2</sup>, \*Matthew Steliga<sup>1</sup>

<sup>1</sup>University of Arkansas, Little Rock, AR; <sup>2</sup>University of Arkansas for Medical Sciences, Little Rock, AR

**Discussant:** \*Subrato J. Deb, University of Oklahoma Health Sciences Center, Oklahoma City, OK

8:00 am - 8:15 am (page 122)

**32V. Robotic Sleeve Resection of the Airway: Technical Considerations and Mid-Term Results**

**Travis Geraci**<sup>1</sup>, Dana Ferrari-Light<sup>2</sup>, \*Robert Cerfolio<sup>1</sup>

<sup>1</sup>New York University, New York, NY; <sup>2</sup>NYU Langone Health, New York, NY

8:15 am - 8:30 am (page 124)

**33. Analysis of a Statewide Narcotic Reporting Database Identifies High Prevalence of Long-Term Opioid Dependence After Resection for Lung Cancer**

**Nick Levinsky**<sup>1</sup>, Matthew Byrne<sup>1</sup>, Alexander Cortez<sup>2</sup>, Rachel Beaupre<sup>1</sup>, Julian Guitron<sup>1</sup>, Sandra Starnes<sup>1</sup>, Robert Van Haren<sup>1</sup>

<sup>1</sup>University of Cincinnati College of Medicine, Cincinnati, OH; <sup>2</sup>Cincinnati Research on Outcomes and Safety in Surgery (CROSS), Cincinnati, OH

**Discussant:** \*Hugh M. van Gelder, Bayfront Health St. Petersburg, St. Petersburg, FL

# FOURTH SCIENTIFIC SESSION A

## Congenital Breakout

Calusa Ballroom 8-9

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience.)

Presenting authors are listed in bold.

**Moderators:** \*James J. Gangemi and \*James D. St. Louis

7:00 am - 7:15 am (page 126)

### **34. Incidence of Reintervention Following Aortic Arch Repair Using a Tailored Autologous Pericardial Patch**

Harris Glenn, **Muhammad Owais Abdul Ghani**, Muhammad Aanish Raees, Chevis Shannon, George Nicholson, \*David Bichell  
Vanderbilt University Medical Center, Nashville, TN

**Discussant:** \*Mark S. Bleiweis, University of Florida, Gainesville, FL

7:15 am - 7:30 am (page 128)

### **35V. Resuscitating the PTFE Graft-to-Innominate Artery After Neonatal Arch Reconstructions: Straightforward Access for Arterial Cannulation During Stage II Palliation or Pulmonary Artery Debanding + Complete Repair in Infancy**

\*Ali Dodge-Khatami<sup>1</sup>, Jannika Dodge-Khatami<sup>1</sup>, Robert Hanfland<sup>1</sup>, \*Raina Sinha<sup>2</sup>, \*Jorge Salazar<sup>3</sup>

<sup>1</sup>UT Health at Houston/ Children's Memorial Hermann Hospital, Houston, TX; <sup>2</sup>University of Texas Health Science Center at Houston, Houston, TX; <sup>3</sup>McGovern Medical School at UTHealth, Houston, TX

**Discussant:** James M. Hammel, Children's Hospital and Medical Center, Omaha, NE

7:30 am - 7:45 am (page 130)

### **36. Bidirectional Glenn Procedure in Patients Less Than 3 Months of Age: A 14 Year Experience With Stage II Palliation**

**Melita Viegas**, Carlos-Eduardo Diaz, Mario Castro-Medina, Luciana Da Fonseca Da Silva, \*Victor Morell  
UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA

**Discussant:** \*Kristine J. Guleserian, Nicklaus Children's Hospital, Miami, FL

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7:45 am - 8:00 am (page 132)

**37. Establishing Biventricular Circulation in Interrupted Aortic Arch and Ventricular Septal Defect With Small Aortic Annulus**

**Demetrios Mallios**, W. Hampton Gray, Winfield Wells, Vaughn Starnes, Ram Kumar Subramanyan

*University of Southern California, Los Angeles, CA*

**Discussant:** \*Jorge D. Salazar, *UT Houston, Children's Hermann Memorial, Houston, TX*

8:00 am - 8:15 am (page 134)

**38. Autograft Failure After the Ross Procedure and its Reoperation**

**Yuki Nakayama**, Takeshi Shinkawa, Goki Matsumura, Ryogo Hoki, Kei Kobayashi, Hiroshi Niinami

*Tokyo Women's Medical University, Tokyo, Japan*

**Discussant:** \*Ross M. Ungerleider, *Driscoll Children's Hospital, Corpus Christi, TX*

8:15 am - 8:30 am (page 136)

**39. Impact of Preoperative Aortic Valve Leaflet Morphology on Re-Intervention Rates Following Ross Operation in Children**

**Govinda Paudel**<sup>1</sup>, \*Christopher Knott-Craig<sup>1</sup>, John Sun<sup>1</sup>, Jonathan Rho<sup>1</sup>, Tiffany Street<sup>2</sup>, Xinhua Yu<sup>3</sup>, \*Umar Boston<sup>2</sup>

<sup>1</sup>*University of Tennessee Health Science Center, Memphis, TN*; <sup>2</sup>*Le Bonheur Children's Hospital, Memphis, TN*; <sup>3</sup>*University of Memphis, Memphis, TN*

**Discussant:** \*Ross M. Ungerleider, *Driscoll Children's Hospital, Corpus Christi, TX*

8:30 am - 9:00 am

**Break** – Visit Exhibits

*Calusa Ballroom 7*

# FOURTH SCIENTIFIC SESSION B

## Fourth Scientific Session B

9:00 am - 10:00 am

**Rapid Fire Abstract Presentations: Simultaneous Adult Cardiac, Thoracic, and Congenital Breakout Sessions**

**CME Credits Available: 1.0**

Attendees select to participate in one of the following three breakout sessions:

### Adult Cardiac Breakout

*Calusa Ballroom 6*

*(Presentations are limited to two minutes, followed by two minutes of Q&A from the session moderators. Each presentation has a one minute buffer built into the presentation time.)*

Presenting authors are listed in bold.

**Moderators:** \*Vinay Badhwar and \*J. Michael DiMaio

**Resident Moderator:** Eric Charles

9:00 am - 9:05 am (page 138)

#### **40. Contemporary Experience With the Use or Repair of Homografts in 97 Proximal Aortic Repairs**

**D\*Joseph Coselli**<sup>1</sup>, Hiruni Amarasekara<sup>2</sup>, Matt Price<sup>2</sup>, Susan Green<sup>2</sup>, \*Ourania Preventza<sup>2</sup>, \*Scott LeMaire<sup>2</sup>

**Commercial Relationships:** \*J. Coselli: Consultant/Advisory Board: Medtronic, Terumo Aortic, W. L. Gore; Ownership Interest: Terumo Aortic; Research Grant: Abbott, Cytosorbents, Edwards Lifesciences, Medtronic, Terumo Aortic, W. L. Gore

<sup>1</sup>Baylor College of Medicine, Texas Heart Institute, Houston, TX; <sup>2</sup>Baylor College of Medicine, Houston, TX

9:05 am - 9:10 am (page 140)

#### **41. Progression of Aortic Insufficiency Following Left Ventricular Assist Device Implantation: Predictors and Impact on Clinical Outcomes**

Hiroshi Kagawa, Edgar Aranda-Michel, Robert Kormos, Mary Keebler, Gavin Hickey, Yisi Wang, Michael Mathier, Arman Kilic

University of Pittsburgh Medical Center, Pittsburgh, PA

9:10 am - 9:15 am (page 142)

#### **42. Transfusion in Elective Aortic Root Replacement: Analysis of the STS Adult Cardiac Surgery Database**

Jonathan Hemli<sup>1</sup>, S Jacob Scheinerman<sup>1</sup>, Martin Lesser<sup>2</sup>, Seungjun Ahn<sup>2</sup>, Efstathia Mihelis<sup>1</sup>, Lynda Jahn<sup>3</sup>, Nirav Patel<sup>1</sup>, **Derek Brinster**<sup>1</sup>

<sup>1</sup>Lenox Hill Hospital/ Northwell Health, New York, NY; <sup>2</sup>Feinstein Institute for Medical Research/ Northwell Health, Manhasset, NY; <sup>3</sup>Northwell Health, Manhasset, NY

9:15 am - 9:20 am (page 144)

#### **43. Are Surgeons Still Needed in Transcatheter Aortic Valve Replacement**

Spencer Melby<sup>1</sup>, \***Puja Kachroo**<sup>1</sup>, Marci Damiano<sup>1</sup>, Marc Sintek<sup>1</sup>, Alan Zajarias<sup>1</sup>, John Lasala<sup>1</sup>, Nishath Quader<sup>2</sup>, \*Ralph Damiano<sup>1</sup>, \*Hersh Maniar<sup>1</sup>

<sup>1</sup>Washington University School of Medicine, St. Louis, MO; <sup>2</sup>Washington University in St. Louis, St. Louis, MO

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9:20 am – 9:25 am (page 146)

**44. Long-Term Economic Follow-Up of Distant Referral for Degenerative Mitral Valve Disease**

Alexander Brescia<sup>1</sup>, Michael Paulsen<sup>2</sup>, Tessa Watt<sup>1</sup>, Liza Rosenbloom<sup>1</sup>, Alexander Wisniewski<sup>3</sup>, Wallace Hopp<sup>4</sup>, \*Steven Bolling<sup>1</sup>

<sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Stanford University, Stanford, CA; <sup>3</sup>University of Toledo, Toledo, OH; <sup>4</sup>University of Michigan Ross School of Business, Ann Arbor, MI

9:25 am – 9:30 am (page 148)

**45. Burden and Impact of Tricuspid Regurgitation in Patients Undergoing Coronary Artery Bypass**

William Chancellor<sup>1</sup>, Jared Beller<sup>1</sup>, Nathan Haywood<sup>2</sup>, \*James Mehaffey<sup>1</sup>, \*Alan Speir<sup>3</sup>, Mohammed Quader<sup>4</sup>, \*Leora Yarboro<sup>1</sup>, \*Nicholas Teman<sup>1</sup>, \*Gorav Ailawadi<sup>2</sup>

<sup>1</sup>University of Virginia, Charlottesville, VA; <sup>2</sup>University of Virginia Health System, Charlottesville, VA; <sup>3</sup>INOVA Heart and Vascular Institute, Falls Church, VA; <sup>4</sup>Virginia Commonwealth University, Richmond, VA

9:30 am – 9:35 am (page 150)

**46. National Trends in Racial and Ethnic Differences for CABG versus PCI Treatment of Coronary Artery Disease**

Rodrigo Zea-Vera, Rohan Shah, Qianzi Zhang, \*Subhasis Chatterjee, \*Matthew Wall, \*Todd Rosengart, \*Ravi Ghanta

Baylor College of Medicine, Houston, TX

9:35 am – 9:40 am (page 152)

**47. Cardiac Surgery and Postoperative Allograft Failure in Renal Transplantation Recipients**

\*James Mace, Rongbing Xie, Luqin Deng, Ammar Asban, Wesley Kim, \*Sara Pereira, \*James Kirklin, \*James Davies

University of Alabama at Birmingham, Birmingham, AL

9:40 am – 9:45 am (page 154)

**48. Monitoring Anticoagulation in Patients on Extracorporeal Membrane Oxygenation: Back to the Basics**

Jolian Dahl, Jared Beller, Dustin Money, William Chancellor, \*James Mehaffey, Surabhi Palkimas, Matthew Morrisette, Yiyu Zhao, \*Leora Yarboro, \*Nicholas Teman

University of Virginia, Charlottesville, VA

9:45 am – 9:50 am (page 156)

**49. Does Elective Sternal Plating In BMI > 35 Patients Reduce Sternal Complication Rates?**

Carmen Tugulan<sup>1</sup>, \*Aditya Bansal<sup>2</sup>, \*Michael Bates<sup>2</sup>, \*Nathan Zwintscher<sup>1</sup>, Stephen Spindel<sup>2</sup>, \*William Smith<sup>1</sup>, \*Patrick Parrino<sup>3</sup>

<sup>1</sup>Ochsner Medical Center, New Orleans, LA; <sup>2</sup>Ochsner Health Systems, New Orleans, LA;

<sup>3</sup>Ochsner Clinic Foundation, New Orleans, LA

# FOURTH SCIENTIFIC SESSION B

## Thoracic Breakout

Calusa Ballroom 10-12

(Presentations are limited to two minutes, followed by two minutes of Q&A from the session moderators. Each presentation has a one minute buffer built into the presentation time.)

Presenting authors are listed in bold.

**Moderators:** \*Alejandro Bribriesco and \*Hugh van Gelder

**Resident Moderator:** Dean Schraufnagel

9:00 am - 9:05 am (page 158)

### 50. Prolonged Operative Time for Pulmonary Lobectomy Predicts Worse Outcomes and Lower Value

Travis Geraci<sup>1</sup>, **Dana Ferrari-Light**<sup>2</sup>, Chao Song<sup>3</sup>, Daniel Oh<sup>4</sup>, \*Robert Cerfolio<sup>1</sup>

<sup>1</sup>New York University, New York, NY; <sup>2</sup>NYU Langone Health, New York, NY; <sup>3</sup>Intuitive Surgical, Sunnyvale, CA; <sup>4</sup>Keck School of Medicine of the University of Southern California, Los Angeles, CA

9:05 am - 9:10 am (page 160)

### 51. Clinical Outcomes of Lung Transplants From Donors With Unexpected Pulmonary Embolism

**Yuriko Terada**<sup>2</sup>, Tsuyoshi Takahashi<sup>1</sup>, Ruben Nava<sup>2</sup>, Ramsey Hachem<sup>2</sup>, Michael Pasque<sup>2</sup>, \*Benjamin Kozower<sup>2</sup>, \*G. Alexander Patterson<sup>2</sup>, \*Bryan Meyers<sup>2</sup>, Derek Byers<sup>2</sup>, Chad Witt<sup>2</sup>, Esther Lu<sup>2</sup>, Patrick Aguilar<sup>2</sup>, \*Daniel Kreisel<sup>2</sup>, Varun Puri<sup>2</sup>

<sup>1</sup>Barnes-Jewish Hospital, St. Louis, MO; <sup>2</sup>Washington University School of Medicine, St. Louis, MO

9:10 am - 9:15 am (page 162)

### 52. Outcomes Following Lobar and Sublobar Resection for Clinical Stage 1 Non-Small Cell Lung Cancer in Women

**William Phillips**<sup>1</sup>, Ritu Gill<sup>2</sup>, Emanuele Mazzola<sup>3</sup>, Julee Armitage<sup>4</sup>, Claire de Forcrand<sup>1</sup>, Yolonda Colson<sup>4</sup>, \*Barry Gibney<sup>5</sup>

<sup>1</sup>Brigham and Women's Hospital, Boston, MA; <sup>2</sup>Beth Israel Deaconess Medical Center, Boston, MA; <sup>3</sup>Dana-Farber Cancer Institute, Boston, MA; <sup>4</sup>Massachusetts General Hospital, Boston, MA; <sup>5</sup>Medical University of South Carolina, Charleston, SC

9:15 am - 9:20 am (page 164)

### 53. Reoperative Pectus Repair in Adults Using Biomaterials

**D\*Daniel L. Miller**

**Commercial Relationships:** D. Miller: Speakers Bureau/Honoraria: Acute Innovations WellStar Health System, Marietta, GA

9:20 am - 9:25 am (page 166)

### 54. Predictors of Use and Survival in Old Donor Lung Transplant: An Analysis of the UNOS Registry

**Ashley Choi**<sup>1</sup>, Oliver Jawitz<sup>2</sup>, Vignesh Raman<sup>2</sup>, \*Jacob Klapper<sup>2</sup>, \*Matthew Hartwig<sup>3</sup>

<sup>1</sup>Duke University School of Medicine, Durham, NC; <sup>2</sup>Duke University Medical Center, Durham, NC; <sup>3</sup>Duke University, Durham, NC

9:25 am - 9:30 am (page 168)

### 55. The Ideal Approach for Clinical Locally Advanced Esophageal Cancer - Neoadjuvant vs Adjuvant Strategy: An Analysis of 11,364 Patients in the National Cancer Database (NCDB)

**Binhao Huang**, Jie Zhang, \*Arjun Pennathur, James Luketich

University of Pittsburgh Medical Center, Pittsburgh, PA

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9:30 am – 9:35 am (page 170)

**56. An Assessment of the Opportunity for Clinical Variation Reduction in Propensity Matched Patients Treated for Malignant Pleural Effusion**

**\*Richard Freeman<sup>1</sup>**, \*Anthony Ascoti<sup>2</sup>, Vijay Nuthakki<sup>3</sup>

<sup>1</sup>St. Vincent's Health and Hospital System, Indianapolis, IN; <sup>2</sup>St. Vincent Medical Group, Indianapolis, IN; <sup>3</sup>St Vincent Health, Indianapolis, IN

9:35 am – 9:40 am (page 172)

**57. Risk Factors for Non-Home Discharge After Esophagectomy**

**Christopher Heid**, Mitri Khoury, \*Tracy Geoffrion, Alberto De Hoyos

University of Texas Southwestern Medical Center, Dallas, TX

9:40 am – 9:45 am (page 174)

**58. Rib Plating Offers Favorable Outcomes in Patients with Chronic Non-Union of Prior Rib Fractures**

**Kerrie Buehler**, Candice Wilshire, Adam Bograd, Eric Vallieres

Swedish Cancer Institute, Seattle, WA

9:45 am – 9:50 am (page 176)

**59. Minimum Volume Standards for Surgical Care of Early Stage Lung Cancer: A Cost-Effectiveness Analysis**

**\*Melanie Subramanian<sup>1</sup>**, Su-Hsin Chang<sup>1</sup>, Zhang Jianrong<sup>2</sup>, Daniel Willis<sup>1</sup>,

\*Tara Semenkovich<sup>1</sup>, Brendan Heiden<sup>1</sup>, \*Benjamin Kozower<sup>1</sup>, \*Daniel Kreisel<sup>1</sup>,

\*Bryan Meyers<sup>1</sup>, Ruben Nava<sup>1</sup>, \*G. Alexander Patterson<sup>1</sup>, Varun Puri<sup>1</sup>

<sup>1</sup>Washington University School of Medicine, St. Louis, MO; <sup>2</sup>Brown School at Washington University, St. Louis, MO

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**Congenital Breakout**

Calusa Ballroom 8-9

(Presentations are limited to two minutes, followed by two minutes of Q&A from the session moderators. Each presentation has a one minute buffer built into the presentation time.)

Presenting authors are listed in bold.

**Moderators:** \*Joseph A. Dearani and \*Jeffrey P. Jacobs

**Resident Moderator:** Elizabeth Stephens

9:00 am - 9:05 am (page 178)

**60. Evolution and Current Results of a Unified Strategy for Sinus Venosus Surgery**

**Elizabeth Stephens**, Michael Monge, Osama Eltayeb, Angira Patel, Gregory Webster, Cynthia Rigsby, \*Carl Backer

Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL

9:05 am - 9:10 am (page 180)

**61. Right Ventricular Outflow Tract Reconstruction in Patients With Truncus Arteriosus: A 37-Year Experience**

**Jeremy Herrmann<sup>1</sup>**, Emilee Larson<sup>1</sup>, Christopher Mastropietro<sup>1</sup>, Mark Rodefeld<sup>1</sup>, Mark Turrentine<sup>1</sup>, \*John Brown<sup>2</sup>

<sup>1</sup>Indiana University School of Medicine, Indianapolis, IN; <sup>2</sup>Indiana University, Indianapolis, IN

# FOURTH SCIENTIFIC SESSION B

9:10 am - 9:15 am (page 182)

## **62. Antibiotic Prophylaxis in Children Undergoing Delayed Sternal Closure: Foundations for Standardization of Practice**

**John Kennedy, III<sup>1</sup>**, Olivia DiLeonardo<sup>2</sup>, \*Jennifer Nelson<sup>2</sup>

<sup>1</sup>University of Central Florida College of Medicine, Orlando, FL; <sup>2</sup>Nemours Children's Hospital, Orlando, FL

9:15 am - 9:20 am (page 184)

## **63. Efforts to Reduce Infections in Delayed Sternal Closure Patients: A Survey of Pediatric Practice**

Cathy Woodward<sup>1</sup>, Richard Taylor<sup>1</sup>, Roozbeh Taeed<sup>2</sup>, Minnette Son<sup>3</sup>, \***S. Adil Husain<sup>4</sup>**

<sup>1</sup>UT Health San Antonio, San Antonio, TX; <sup>2</sup>Dell Medical School, University of Texas at Austin, Austin, TX; <sup>3</sup>Children's Mercy Hospital, UMKC School of Medicine, Kansas City, MO; <sup>4</sup>University of Utah Health/ Primary Children's Hospital, Salt Lake City, UT

9:20 am - 9:25 am (page 186)

## **64. Minimally Invasive, Sternal-Sparing Approaches for Congenital Heart Disease: Versatile, Safe and Effective**

**Zoe Hinton<sup>1</sup>**, James Meza<sup>2</sup>, Alyssa Habermann<sup>3</sup>, Nicholas Andersen<sup>3</sup>,

\*Mani Daneshmand<sup>2</sup>, John Haney<sup>3</sup>, \*Joseph Turek<sup>3</sup>

<sup>1</sup>Duke University School of Medicine, Durham, NC; <sup>2</sup>Duke University Medical Center, Durham, NC; <sup>3</sup>Duke University, Durham, NC

9:25 am - 9:30 am (page 188)

## **65. The Intraoperative Use of Recombinant Activated Factor VII in Arterial Switch Operations**

**Ziyad Binsalamah<sup>1</sup>**, Christopher Ibarra<sup>2</sup>, Zachary Spigel<sup>1</sup>, Jessica Zink<sup>2</sup>, \*Carlos Mery<sup>3</sup>, Erin Gottlieb<sup>2</sup>, \*Charles Fraser<sup>2</sup>, \*Jeffrey Heinle<sup>1</sup>

<sup>1</sup>Texas Children's Hospital/ Baylor College of Medicine, Houston, TX; <sup>2</sup>Texas Children's Hospital, Houston, TX; <sup>3</sup>University of Texas Dell Medical School, Austin, TX

9:30 am - 9:35 am (page 190)

## **66. Early Results of Less Than 5 mm RV to PA Conduits for Neonatal Palliation of Single Ventricle Lesions**

\***Raina Sinha<sup>1</sup>**, \*Ali Dodge-Khatami<sup>2</sup>, \*Jorge Salazar<sup>3</sup>

<sup>1</sup>University of Texas Health Science Center at Houston, Houston, TX; <sup>2</sup>UT Health at Houston/ Children's Memorial Hermann Hospital, Houston, TX; <sup>3</sup>McGovern Medical School at UTHealth, Houston, TX

9:35 am - 9:40 am (page 192)

## **67. Evaluating Surgical Treatment Strategies for Congenital Hypertrophic Cardiomyopathy: A 30 Year Experience**

\***Damien LaPar<sup>1</sup>**, Eliana Al Haddad<sup>2</sup>, Meredith Pesce<sup>3</sup>, David Kalfa<sup>1</sup>, Teresa Lee<sup>1</sup>, Emile Bacha<sup>4</sup>, Warren Zuckerman<sup>1</sup>

<sup>1</sup>Columbia University College of Physicians and Surgeons, New York, NY; <sup>2</sup>Columbia University Medical Center, New York, NY; <sup>3</sup>New York Presbyterian/ Columbia University, New York, NY; <sup>4</sup>Columbia University College of Physicians and Surgeons, Weill Cornell College of Medicine, New York, NY



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9:40 am – 9:45 am (page 194)

**68. Valve Sparing Aortic Root Replacement in Teenagers and Young Adults With Aortic Root Aneurysms and Bicuspid Aortic Valves**

**Amy Lie<sup>1</sup>**, Salil Ginde<sup>2</sup>, Peter Bartz<sup>2</sup>, Michael Earing<sup>2</sup>, Scott Cohen<sup>2</sup>, Jennifer Gerardin<sup>2</sup>, William Johnson<sup>2</sup>, \*Michael Mitchell<sup>2</sup>

<sup>1</sup>Medical College of Wisconsin, Milwaukee, WI; <sup>2</sup>Children's Hospital of Wisconsin, Milwaukee, WI

9:45 am – 9:50 am (page 196)

**69. Outcomes of Shone's Complex Surgery; A Single Center Experience**

**Ahmed Elmahrouk<sup>1</sup>**, Mohamed Ismail<sup>2</sup>, Amr Arafat<sup>3</sup>, Tamer Hamouda<sup>4</sup>, Abdelmonem Helal<sup>1</sup>, Ahmed Dohain<sup>5</sup>, Osman Al-Radi<sup>6</sup>, Ahmed Jamjoom<sup>1</sup>

<sup>1</sup>King Faisal Specialist Hospital & Research Center, Riyadh, Saudi Arabia; <sup>2</sup>Mansoura University, Mansoura, Egypt; <sup>3</sup>Faculty of Medicine Tanta University, Tanta, Egypt; <sup>4</sup>Benha University, Benha, Egypt; <sup>5</sup>Cairo University, Cairo, Egypt; <sup>6</sup>King Abdulaziz University, Jeddah, Saudi Arabia

10:00 am - 10:30 am

**Break** – Visit Exhibits

*Calusa Ballroom 7*

10:00 am - 10:30 am

**2019 Cardiothoracic Surgery Jeopardy Competition for North America**

Final Round

*Calusa Ballroom 7*

# GENERAL SESSION

## General Session: DIVERSITY, HISTORY, and ADVOCACY

Calusa Ballroom 6

10:30 am - 12:00 pm

**CME Credits Available: 1.5**

**Moderators:** **D**\*Shanda H. Blackmon, **D**\*Jeffrey P. Jacobs, and **D**\*Vinod H. Thourani

**Commercial Relationships:** \*S. Blackmon: Consultant/Advisory Board: Olympus; Research Grant: Medtronic, truFreeze; \*J. Jacobs: Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare; \*V. Thourani: Consultant/Advisory Board: Abbott Vascular, Boston Scientific, Edwards Lifesciences; Research Grant: Abbott Vascular, Boston Scientific, Edwards Lifesciences

**Educational Objectives:** Upon completion of this program participants will be able to:

- Describe strategies to ensure a diverse cardiothoracic surgical workforce;
- Summarize the importance of the history of cardiothoracic surgery;
- Understand the importance of professional advocacy

10:30 am - 10:50 am

### **DIVERSITY: KENT TRINKLE EDUCATION LECTURESHIP**

#### **Education and Diversity in Cardiothoracic Surgery**

\*Robert S.D. Higgins

*Johns Hopkins University School of Medicine, Baltimore, MD*

10:50 am - 11:20 am

### **HISTORY: MEDICAL ILLUSTRATION IN THE ERA OF CARDIAC SURGERY**

#### **70. Medical Illustration in the Era of Cardiac Surgery** (page 198)

\*Constantine Mavroudis

*Johns Hopkins University School of Medicine, St. Petersburg, FL*

11:20 am - 12:00 pm

### **ADVOCACY: WHY PROFESSIONAL ADVOCACY IS IMPORTANT TO ME**

11:20 am - 11:35 am

\*Keith S. Naunheim

*St. Louis University, St. Louis, MO*

11:35 am - 11:50 am

\*John E. Mayer, Jr.

*Boston Children's Hospital, Boston, MA*

11:50 am - 12:00 pm

Open Discussion

12:00 pm - 1:00 pm

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## **Lunch on Own**

*A variety of on-property dining options are available for lunch:*

*Tesoro: Coastal Mediterranean, located on fifth floor of Lanai Tower*

*Quinn's: Casual American, located on the beach outside the Lanai Tower*

*400 Pazzi's: Casual Italian, located in the Islands Tower*

*Café San Marco: Grab 'n Go, located in the main concourse*

*10K Alley: Elevated Bar Food, located on fifth floor of Lanai Tower*

*Kane Tiki Bar & Grill: Balinese inspired, located near the Tiki Pool*

*Resort maps, restaurant hours and descriptions are available at Registration.*

12:00 pm – 1:00 pm – *Calusa Ballroom 3*

### **Early Practitioners Luncheon**

Cardiothoracic surgeons in practice less than 10 years are invited to attend this luncheon to network with other early practitioners.

12:45 pm – 3:30 pm

### **EXHIBITS OPEN**

*Calusa Ballroom 7*

1:00 pm – 1:30 pm

### **Break – Visit Exhibits**

*Calusa Ballroom 7*

# FOURTH SCIENTIFIC SESSION C

## Fourth Scientific Session C

1:30 pm - 2:30 pm

**Simultaneous Adult Cardiac, Thoracic, Adult Congenital, and ECMO/Transplant Breakout Sessions**

**CME Credits Available: 1.0**

Attendees select to participate in one of the following four breakout sessions:

### Adult Cardiac Breakout

*Calusa Ballroom 6*

*(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience. Papers or videos listed without a discussant, do not have one assigned. All discussion time will remain open to the audience.)*

Presenting authors are listed in bold.

**Moderators:** **D\***Ourania Preventza and **\*T.** Brett Reece

**Resident Moderator:** Carmen Tugulan

**Commercial Relationships:** **\*O.** Preventza: Consultant/Advisory Board: Terumo Aortic, W. L. Gore & Associates

1:30 pm - 1:45 pm (page 200)

#### **71. Impact of Endovascular False Lumen Embolization on Thoracic Aortic Remodeling in Chronic Dissection**

**Kyle Miletic**<sup>1</sup>, Bogdan Kindzelski<sup>2</sup>, Kevin Hodges<sup>2</sup>, Jocelyn Beach<sup>2</sup>, Michael Tong<sup>2</sup>, **\*Faisal Bakaeen**<sup>2</sup>, Douglas Johnston<sup>2</sup>, Eric Roselli<sup>2</sup>

<sup>1</sup>Cleveland Clinic Foundation, Cleveland, OH; <sup>2</sup>Cleveland Clinic, Cleveland, OH

**Discussant:** **D\***Bradley G. Leshnower, *Emory University, Atlanta, GA*

1:45 pm - 2:00 pm (page 202)

#### **72. Coronary Ostia Management During Aortic Root Replacement: Is the Modified Cabrol Reattachment Inferior to the Carrel Button?**

Akiko Tanaka<sup>1</sup>, **Zain Al Rstum**<sup>2</sup>, Nicolas Zhou<sup>1</sup>, Kenton Rommens<sup>3</sup>, Harleen Sandhu<sup>3</sup>, Charles Miller<sup>1</sup>, **\*Hazim Safi**<sup>1</sup>, **\*Anthony Estrera**<sup>1</sup>

<sup>1</sup>McGovern Medical School at UTHealth, Houston, TX; <sup>2</sup>The University of Texas Health Science Center at Houston, Houston, TX; <sup>3</sup>University of Texas Health Science Center at Houston, Houston, TX

**Discussant:** **\*Luca A.** Vricella, *University of Chicago, Chicago, IL*

2:00 pm - 2:15 pm (page 204)

#### **73. Further Evidence for Abandoning Lumbar Drain Placement for Isolated Descending Thoracic Endovascular Aortic Repair**

**Soraya Voigt**<sup>1</sup>, Jatin Anand<sup>1</sup>, Vignesh Raman<sup>2</sup>, Oliver Jawitz<sup>2</sup>, **\*Ryan Plichta**<sup>1</sup>, **\*Jeffrey Gaca**<sup>1</sup>, Richard McCann<sup>1</sup>, **\*G.** Chad Hughes<sup>2</sup>

<sup>1</sup>Duke University, Durham, NC; <sup>2</sup>Duke University Medical Center, Durham, NC

**Discussant:** **D\***Himanshu J. Patel, *University of Michigan Cardiovascular Center, Ann Arbor, MI*

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2:15 pm - 2:30 pm (page 206)

**74V. Aortic Valve Repair and Selective Sinus Remodeling for Aortic Root Aneurysm**

**\*Richard Downey<sup>1</sup>**, Scott Weaver<sup>2</sup>, \*J. Scott Rankin<sup>3</sup>, \*Vinay Badhwar<sup>3</sup>

<sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Corazon Medical, Columbus, OH; <sup>3</sup>West Virginia University, Morgantown, WV

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**Thoracic Breakout**

Calusa Ballroom 10-12

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience. Papers or videos listed without a discussant, do not have one assigned. All discussion time will remain open to the audience.)

Presenting authors are listed in bold.

**Moderators:** \*Melanie A. Edwards and \*Erin A. Gillaspie

1:30 pm - 1:45 pm (page 208)

**75. Signet Ring Cell Histology Confers Worse Overall Survival in Treated Esophageal Adenocarcinoma**

**Andrew Tang<sup>1</sup>**, Jesse Rappaport<sup>1</sup>, Siva Raja<sup>2</sup>, \*Alejandro Bribiesco<sup>2</sup>, Hafiz Umair Siddiqui<sup>1</sup>, Daniel Raymond<sup>2</sup>, Davendra Sohal<sup>1</sup>, Sudish Murthy<sup>2</sup>, Usman Ahmad<sup>1</sup>

<sup>1</sup>Cleveland Clinic Foundation, Cleveland, OH; <sup>2</sup>Cleveland Clinic, Cleveland, OH

**Discussant: D**\*Wayne Hofstetter, University of Texas, MD Anderson Cancer Center, Houston, TX

1:45 pm - 2:00 pm (page 210)

**76. VATS Lobectomy is Not Dead— Improved Long-Term Postoperative Quality of Life Metrics After VATS Lobectomy Compared to Robotic-Assisted Lobectomy**

**Aaron Williams<sup>1</sup>**, Tyler Grenda<sup>1</sup>, Lili Zhao<sup>1</sup>, Ben Biesterveld<sup>1</sup>, Umar Bhatti<sup>1</sup>, \*Philip Carrott, Jr.<sup>2</sup>, William Lynch<sup>1</sup>, Jules Lin<sup>1</sup>, Kiran Lagisetty<sup>1</sup>, \*Andrew Chang<sup>3</sup>, Rishindra Reddy<sup>1</sup>

<sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Baylor College of Medicine, Houston, TX;

<sup>3</sup>University of Michigan Health System, Ann Arbor, MI

**Discussant:** \*Allan Pickens, Emory University Hospital Midtown, Atlanta, GA

2:00 pm - 2:15 pm (page 212)

**77V. Basilar Thoracoscopic Segmentectomy for Lobar & Extralobar Sequestration With Bochdalek Hernia Repair**

\*Shanda Blackmon, **Johnathan Aho**, Sahar Saddoughi  
Mayo Clinic, Rochester, MN

2:15 pm - 2:30 pm (page 214)

**78. Lymph Node Assessment in Surgery for Limited Stage Small Cell Lung Cancer**

**A. Justin Rucker**, Vignesh Raman, Oliver Jawitz, \*Thomas D'Amico, \*David Harpole  
Duke University Medical Center, Durham, NC

**Discussant:** \*Stephen C. Yang, Johns Hopkins Medical Institutions, Baltimore, MD

# FOURTH SCIENTIFIC SESSION C

## Adult Congenital Breakout

Calusa Ballroom 8-9

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience.)

Presenting authors are listed in bold.

**Moderators:** Stephanie Fuller and \*Jennifer S. Nelson

**Resident Moderator:** \*Shawn Shah

1:30 pm - 1:45 pm (page 216)

### **79. Mid-Term Outcomes of a Novel Trans-Conal Approach to Anomalous Aortic Origin of Left Main Coronary Artery Arising From Right Coronary Sinus With Extended Trans-Septal Course**

**Hani Najm**<sup>1</sup>, Tara Karamlou<sup>1</sup>, Munir Ahmad<sup>2</sup>, Saad Hasan<sup>1</sup>, \*Robert Stewart<sup>1</sup>, Joanna Ghobrial<sup>1</sup>, David Majdalany<sup>1</sup>, Yezan Salam<sup>3</sup>, Gosta Pettersson<sup>1</sup>

<sup>1</sup>Cleveland Clinic, Cleveland, OH; <sup>2</sup>Cleveland Clinic Foundation, Cleveland, OH;

<sup>3</sup>Alfaisal University, Riyadh, Saudi Arabia

**Discussant:** \*Kristine J. Guleserian, Nicklaus Children's Hospital, Miami, FL

1:45 pm - 2:00 pm (page 218)

### **80. Anomalous Origin of the Right Coronary Artery From the Pulmonary Artery: Analysis of 192 Published Cases With a Proposed Classification System**

**Timothy Guenther**<sup>1</sup>, Curtis Wozniak<sup>2</sup>, Gary Raff<sup>1</sup>

<sup>1</sup>University of California Davis, Davis, CA; <sup>2</sup>University of California San Francisco, San Francisco, CA

**Discussant:** Julie Brothers, The Children's Hospital of Philadelphia, Philadelphia, PA

2:00 pm - 2:15 pm (page 220)

### **81V. Right Video-Assisted Thoracoscopic Surgical Division of Aberrant Right Subclavian Artery and Right Subclavian-Carotid Transposition**

**Christian Ghincea**<sup>1</sup>, Yuki Ikeno<sup>1</sup>, Michael Weyant<sup>2</sup>, John Mitchell<sup>3</sup>,

\*Muhammad Aftab<sup>2</sup>, \*Thomas Reece<sup>2</sup>

<sup>1</sup>University of Colorado, Aurora, CO; <sup>2</sup>University of Colorado Denver, Aurora, CO;

<sup>3</sup>University of Colorado School of Medicine, Aurora, CO

**Discussant:** Alberto Pochettino, Mayo Clinic, Rochester, MN

2:15 pm - 2:30 pm (page 222)

### **82V. Bentall and Redo-Konno Operation for an Adult With Aortic Para-Prosthetic Leak With Root Aneurysm**

**Takeshi Shinkawa**, Yuki Nakayama, Ryogo Hoki, Kei Kobayashi, Tomohiro Nishinaka, Hiroshi Niinami

Tokyo Women's Medical University, Tokyo, Japan

**Discussant:** \*Joseph A. Dearani, Mayo Clinic, Rochester, MN

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## ECMO/Transplant Breakout

Calusa Ballroom 4

(Presentations are limited to five minutes, followed by two minutes of discussion from a selected discussant and an additional eight minutes of discussion open to the audience.)

Presenting authors are listed in bold.

**Moderators:** \*Christine L. Lau and \*Ezequiel J. Molina

**Resident Moderator:** Walker Julliard

1:30 pm - 1:45 pm (page 224)

### **83. Hospital Cost and Resource Utilization Are Similar for ECMO Irrespective of Cannulation Strategy**

**Karen Walker**, Kunal Kotkar, Marci Damiano, \*Ralph Damiano, \*Marc Moon, Akinobu Itoh, Muhammad Masood

Washington University School of Medicine, St. Louis, MO

**Discussant:** Jeremiah W. Hayanga, University of Pittsburgh Medical Center, Pittsburgh, PA

1:45 pm - 2:00 pm (page 226)

### **84. High Center Volume May Partially Mitigate the Increased Mortality Associated With Pre-Transplant Admission Status in Lung Transplant Recipients**

**Neel Ranganath**<sup>1</sup>, Travis Geraci<sup>2</sup>, Stacey Chen<sup>1</sup>, Deane Smith<sup>1</sup>, Bonnie Lonze<sup>3</sup>, Melissa Lesko<sup>1</sup>, Luis Angel<sup>1</sup>, Zachary Kon<sup>1</sup>

<sup>1</sup>NYU Langone Health, New York, NY; <sup>2</sup>New York University, New York, NY; <sup>3</sup>NYU Langone Transplant Institute, New York, NY

**Discussant:** D\*Matthew G. Hartwig, Duke University, Durham, NC

2:00 pm - 2:15 pm (page 228)

### **85. Comparison of Heart Transplantation Survival Outcomes of HIV Seropositive Recipients to Seronegative Recipients Using Propensity Score Matching**

**\*Julie Doberne**<sup>1</sup>, Oliver Jawitz<sup>2</sup>, Vignesh Raman<sup>2</sup>, Benjamin Bryner<sup>1</sup>, Jacob Schroder<sup>1</sup>, \*Carmelo Milano<sup>1</sup>

<sup>1</sup>Duke University, Durham, NC; <sup>2</sup>Duke University Medical Center, Durham, NC

**Discussant:** \*Keki R. Balsara, Vanderbilt University Medical Center, Nashville, TN

2:15 pm - 2:30 pm (page 230)

### **86. Nighttime Operation is Associated With Adverse Outcomes After Lung Transplantation**

**Zhizhou Yang**<sup>1</sup>, Tsuyoshi Takahashi<sup>2</sup>, Christy Hamilton<sup>1</sup>, \*Melanie Subramanian<sup>1</sup>, \*Bryan Meyers<sup>1</sup>, \*Benjamin Kozower<sup>1</sup>, \*G. Alexander Patterson<sup>1</sup>, Ruben Nava<sup>1</sup>, Michael Pasque<sup>1</sup>, Ramsey Hachem<sup>1</sup>, Chad Witt<sup>1</sup>, Patrick Aguilar<sup>1</sup>, Derek Byers<sup>1</sup>, \*Daniel Kreisel<sup>1</sup>, Varun Puri<sup>1</sup>

<sup>1</sup>Washington University School of Medicine, St. Louis, MO; <sup>2</sup>Barnes-Jewish Hospital, St. Louis, MO

**Discussant:** John Dunning, Tampa General Hospital, Tampa, FL

2:30 pm - 3:00 pm

### **Break - Visit Exhibits**

Calusa Ballroom 7

# FIFTH SCIENTIFIC SESSION

## Fifth Scientific Session

3:00 pm – 4:00 pm

Calusa Ballroom 6

(Abstract presentations in this session are limited to 15 minutes each.)

Presenting authors are listed in bold.

### CME Credits Available: 1.0

**Moderators:** \*John H. Calhoon, **D**\*Robert J. Cerfolio, and **D**\*Alan M. Speir

**Commercial Relationships:** \*A. Speir: Consultant/Advisory Board: AtriCure, Inc., Medtronic;

\*R.J. Cerfolio: Consultant/Advisory Board: AstraZeneca, ConMed, Covidien LP, C-SATS, Ethicon, Google/Johnson & Johnson, Intuitive Surgical, Medtronic, Myriad, ROLO-7, TransEnterix

3:00 pm – 3:30 pm

### Update on Maintenance of Certification of the American Board of Thoracic Surgery

\*Joe B. Putnam, Jr.

Baptist MD Anderson Cancer Center, Jacksonville, FL

\*Stephen C. Yang

Johns Hopkins Medical Institutions, Baltimore, MD

3:30 pm - 3:45 pm (page 232)

### 87. Blades of Glory: An Unsung Capitol Giant

**Alexander Yang**<sup>1</sup>, \*Stephen Yang<sup>2</sup>

<sup>1</sup>George Washington University School of Medicine, Washington, DC; <sup>2</sup>Johns Hopkins Medical Institutions, Baltimore, MD

3:45 pm - 4:00 pm (page 234)

### 88. The First and Only Carolyn Reed

**D**\*Shanda H. Blackmon

Mayo Clinic, Rochester, MN

4:00 pm – 4:45 pm

### STSA Annual Business Meeting (Members Only)

**\*All new STSA Members are required to attend.**

Calusa Ballroom 6

## Dinner Gala

7:00 pm – 7:30 pm

### Reception

Calusa Ballroom Foyer

7:30 pm – 10:00 pm

### Dinner Gala

Calusa Ballroom 6



# STS CODING WORKSHOP

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**Saturday, November 9, 2019**

## **STS Coding Workshop**

7:00 am – 7:50 am

*Calusa Ballroom 6*

7:00 am – 7:10 am

### **What is New and Exciting with Coding?**

An overview of coding and coverage changes for 2020 and proposed initiatives from CMS.

**Julie R. Painter, MBA, CCVTC, CPMA, AHIMA-Approved ICD-10/PCS Trainer**

*STS Coding and Billing Manager*

7:10 am – 7:20 am

### **Thoracic Surgery Coding Tips**

General thoracic surgery coding considerations including what's new, coding tips and other concepts to help with documentation for appropriate code selection.

**Francis C. Nichols**

*Consultant General Thoracic Surgery, Professor of Surgery,*

*Medical Director of Revenue Cycle, Mayo Clinic, Rochester, MN*

7:20 am – 7:30 am

### **Adult Cardiac Surgery Coding Tips**

Adult cardiac surgery coding considerations including what's new, coding tips and other concepts to help with documentation for appropriate code selection.

**Stephen J. Lahey**

*Chief of the Division of Cardiothoracic Surgery University of Connecticut Health Center  
and Vice Chairman, Department of Surgery at the University of Connecticut*

7:30 am – 7:40 am

### **Congenital Cardiac Surgery Coding Tips**

Congenital cardiac surgery coding considerations including what's new, coding tips and other concepts to help with documentation for appropriate code selection.

**Kirk R. Kanter**

*Pediatric Cardiac Surgery, Emory University School of Medicine*

7:40 am – 7:50 am

### **Q&A**

# POSTGRADUATE PROGRAM

**Saturday, November 9, 2019**

8:00 am – 10:00 am

## POSTGRADUATE PROGRAM GENERAL SESSION

*Calusa Ballroom 6*

**CME Credits Available: 2.0**

The Postgraduate will host its second General Session on Saturday morning. With a theme of CHARITY, INNOVATION, and QUALITY, the program will feature special presentations that encompass topics currently trending within cardiothoracic surgery. These topics include charitable cardiothoracic surgery, a surgeon's reflection on the first four decades of the quality era and a special discussion with one of our cardiothoracic surgery legends.

### CHARITY, INNOVATION, and QUALITY

**Moderators:** **D**\*Shanda H. Blackmon, **D**\*Jeffrey P. Jacobs, and **D**\*Vinod H. Thourani

**Commercial Relationships:** \*S. Blackmon: Consultant/Advisory Board: Olympus; Research Grant: Medtronic, truFreeze; \*J. Jacobs: Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare; \*V. Thourani: Consultant/Advisory Board: Abbott Vascular, Boston Scientific, Edwards Lifesciences; Research Grant: Abbott Vascular, Boston Scientific, Edwards Lifesciences

**Educational Objectives:** Upon completion of this program participants will be able to:

- Describe strategies to provide charitable cardiothoracic surgical care;
- Discuss the importance of cardiothoracic surgical innovation;
- Discuss techniques to measure the quality of cardiothoracic surgery

8:00 am - 8:30 am

### CHARITY: Charitable Cardiothoracic Surgery

\*Joseph A. Dearani

*Mayo Clinic, Rochester, MN*

8:30 am – 8:40 am

### Open Discussion

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8:40 am - 9:10 am

**INNOVATION: A Conversation with a Legend: \*Duke E. Cameron**

*Massachusetts General Hospital, Boston, MA*

**Interviewed by:** Marshall L. Jacobs, *Johns Hopkins Cardiac Surgery, Baltimore, MD* and;  
\*Luca A. Vricella, *University of Chicago, Chicago, IL*

9:10 am - 9:20 am

**Open Discussion**

9:20 am - 9:50 am

**QUALITY: A Surgeon Reflects on the First Four Decades of the Quality Era**

David M. Shahian

*Massachusetts General Hospital, Boston, MA*

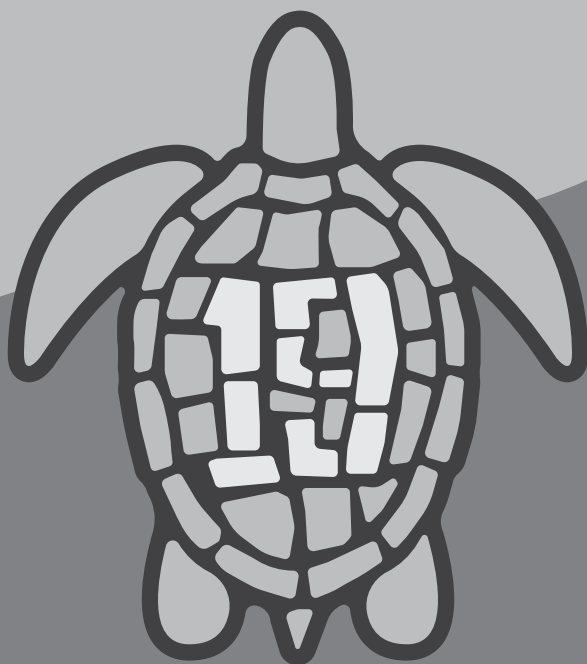
9:50 am - 10:00 am

**Open Discussion**

10:00 am

**PROGRAM ADJOURNS**





# SCIENTIFIC PAPERS

# BASIC SCIENCE FORUM

## 1B. Impact of Social Determinants of Health on Non-Small Cell Lung Cancer Aggressive Somatic Phenotypes

*Unless otherwise noted in this program book or verbally by the speakers, speakers have no relevant financial relationship to disclose and will only be presenting information on devices, products, or drugs that are FDA approved for the purposes they are discussing. Presenters and discussants listed with a **D** next to their name have indicated that they have a financial or other relationship with a healthcare-related business or other entity to disclose.*

**Authors:** **D**Loretta Erhunmwunsee<sup>1</sup>, Hengrui Hu<sup>2</sup>, Catherine Raquel<sup>2</sup>, Lisa Lopez<sup>2</sup>, Jenny Shen<sup>2</sup>, Lennie Wong<sup>2</sup>, Jae Kim<sup>2</sup>, Dan Raz<sup>2</sup>, Karen Reckamp<sup>2</sup>, Ravi Salgia<sup>2</sup>, Stacy Gray<sup>2</sup>

**Commercial Relationships:** L. Erhunmwunsee: Research Grant: AstraZeneca; Speakers Bureau/Honoraria: AstraZeneca

**Author Institution(s):** <sup>1</sup>City of Hope Cancer Center, Duarte, CA; <sup>2</sup>City of Hope Medical Center, Duarte, CA

**Discussant:** \*Eric L. Grogan, Vanderbilt University Medical Center, Nashville, TN

**Objectives:** It is unclear why poor Americans die of non-small cell lung cancer (NSCLC) at a significantly higher rate than their affluent counterparts. We evaluated the relationship between social determinants of health (SDH) and aggressive somatic biological phenotypes (i.e., KRAS G12C and G12V and TP53 mutations) in patients with NSCLC. We hypothesized that more deprived social determinants will be associated with more aggressive NSCLC somatic biological phenotypes.

**Methods:** We conducted a single institution retrospective cohort study of NSCLC patients seen at a comprehensive cancer center from 2015-2017. Clinical data were obtained from electronic medical records. Risk factor data (air quality as measured by Particulate Matter (PM) 2.5 exposure, neighborhood-level income, education, and minority population data) were obtained from the Environmental Protection Agency. Associations between SDH and somatic phenotypes were modeled using logistic regression, controlling for cigarette smoke exposure and all demographic variables (TP53) or variables significant on bivariate analyses (KRAS variants G12C and G12V).

**Results:** Of 717 patients, 546 (76%) had somatic genomic testing and were included in analyses (mean age 67.6 years, 53.1% female, 30.8% Asian, 4.2% African American, 63.7% White, 9.2% Hispanic, 64.3 % Stage 4, 83.3% adenocarcinoma, and 33% never smokers). Smokers had a mean pack-year of 20. 22% of patients had KRAS mutations and 42.3% had TP53 mutations. For neighborhood level exposures, the mean PM 2.5 level was 11.8 µg/m<sup>3</sup>. Patients were almost evenly distributed in the good and moderate PM 2.5 risk categories (good 48.3%, moderate 51.7%). There was no overall association between SDH and KRAS mutations. However, multivariable analyses revealed that smoking (OR=1.02, 95% CI 1.01-1.03, p<0.0001) and lower neighborhood education (OR=15.2, 95% CI 1.2-185.8, p=0.03) was associated with KRAS variants G12C and G12V specifically. Poor air quality as measured by PM 2.5 was associated with TP53 mutations (OR=2.3, 95% CI 1.4-3.7, p=0.001).

**Conclusions:** Poor air quality is associated with increased risk of TP53 mutations, while low neighborhood-level education is associated with KRAS G12C/G12V mutations. These hypothesis generating findings suggest a mechanism by which deprived NSCLC populations may experience inferior outcomes. Larger, prospective studies are needed to further evaluate these associations.

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**Notes:**

# BASIC SCIENCE FORUM

## 2B. Pretreatment With Nicorandil Preserves Motor Function After Spinal Cord Ischemia-Reperfusion Injury

*Unless otherwise noted in this program book or verbally by the speakers, speakers have no relevant financial relationship to disclose and will only be presenting information on devices, products, or drugs that are FDA approved for the purposes they are discussing. Presenters and discussants listed with a **D** next to their name have indicated that they have a financial or other relationship with a healthcare-related business or other entity to disclose.*

**Authors:** Yuki Ikeno<sup>1</sup>, Christian Ghincea<sup>1</sup>, Gavriel Roda<sup>1</sup>, Linling Cheng<sup>1</sup>,  
\*Muhammad Aftab<sup>2</sup>, Xianzhong Meng<sup>2</sup>, Michael Weyant<sup>2</sup>, Joseph Cleveland, Jr.<sup>1</sup>,  
\*David Fullerton<sup>2</sup>, \*Thomas Reece<sup>2</sup>

**Author Institution(s):** <sup>1</sup>University of Colorado, Aurora, CO; <sup>2</sup>University of Colorado Denver, Aurora, CO

**Regulatory Disclosure:** This presentation describes the off-label use of nicorandil for spinal cord protection in murine model.

**Discussant:** **D**\*Joseph S. Coselli, Baylor College of Medicine, Houston, TX

**Commercial Relationships:** \*J. Coselli: Consultant/Advisory Board: Medtronic, Terumo Aortic, W. L. Gore; Ownership Interest: Terumo Aortic; Research Grant: Abbott, Cytosorbants, Edwards Lifesciences, Medtronic, Terumo Aortic, W. L. Gore

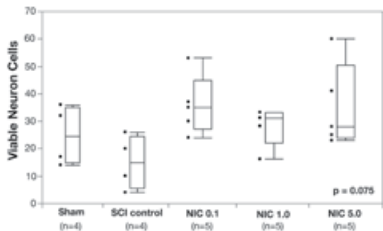
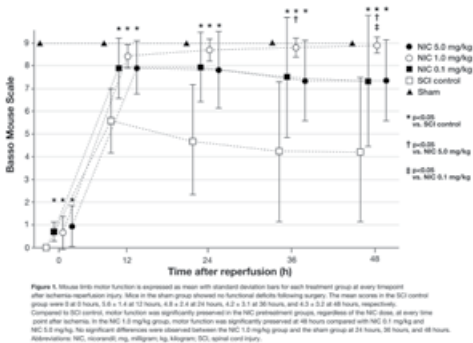
**Objectives:** Spinal cord injury (SCI) remains one of the most serious complications following thoracoabdominal aortic intervention. Activation of ATP-sensitive potassium (KATP) channels has demonstrated neuroprotective effects in SCI. Nicorandil (NIC), which is in general use for the treatment of angina pectoris in Japan and Europe, has hybrid properties, acting as a nitric oxide donor and KATP channel opener. It has neuroprotective as well as cardioprotective effects by reducing ischemia-reperfusion injury via anti-apoptotic mechanisms. We hypothesize that NIC pretreatment will be neuroprotective in a murine ischemia-reperfusion model.

**Methods:** SCI was induced by 7 minutes of thoracic aortic cross-clamping in adult male C57BL/6 mice. For the NIC treatment groups, mice received NIC pretreatment by intraperitoneal injection for 3 consecutive days before ischemia. Five groups were evaluated: SCI control (pretreatment with normal saline, n=17), NIC pretreatment 0.1 mg/kg (n=14), NIC pretreatment 1.0 mg/kg (n=15), NIC pretreatment 5.0 mg/kg (n=12), and sham (without cross-clamping, n=5). Limb motor function was assessed using Basso Mouse Score (0-9) at 12-hour intervals for 48 hours after ischemia. Spinal cords were harvested from the thoracolumbar region of mice in each group, sectioned, stained, and viable neurons within a standardized segment of the anterior horn were quantified by a blinded observer. Student's T-test was performed to analyze motor function outcomes and histological data was evaluated using ANOVA.

**Results:** Mice in the sham group showed no functional deficits following surgery. Compared to SCI control, motor function was significantly preserved in the NIC pretreatment groups, regardless of the NIC dose, at every time point after ischemia. Moreover, in the NIC 1.0 mg/kg group, motor function was significantly preserved at 48 hours compared with NIC 0.1 mg/kg and NIC 5.0 mg/kg. No significant differences were observed between NIC 1.0 mg/kg and sham at 24 hours, 36 hours, and 48 hours. Figure 1 summarizes motor function after ischemia-reperfusion injury in each group. Histological analysis showed a trend towards viable neuron preservation in the NIC treatment groups compared with SCI control (p=0.075). These data are summarized in Figure 2.



**Conclusions:** Pharmacologic pretreatment with nicorandil significantly preserved motor function after spinal cord ischemia-reperfusion injury in a murine model. Translated to clinical practice, nicorandil pretreatment may provide further improvement in the prevention of this devastating complication following aortic intervention. The fact that nicorandil is already broadly used in clinical practice at the doses administered in this study is promising for its applicability.



Notes:

# BASIC SCIENCE FORUM

## 3B. High Mutational Concordance Between Next Generation Sequencing Profiles of Colorectal Cancer and Pulmonary Metastases

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**Author Institution(s):** <sup>1</sup>University of Texas, MD Anderson Cancer Center, Houston, TX; <sup>2</sup>BC Cancer, Vancouver, BC, Canada

**Discussant:** \*Virginia R. Litle, Boston University School of Medicine, Boston, MA

**Objectives:** The advent of molecular targeting strategies has altered the treatment strategies for metastatic colorectal cancer (CRC). It has been well demonstrated that specific genetic mutations impact the extent of response to such therapeutic interventions. Concordance of mutational findings between primary CRC tumors and metastatic lesions has been thoroughly reported for nodal and hepatic disease; however, the relationship between mutational abnormalities in primary CRC tumors and associated pulmonary metastatic lesions is poorly understood. The aim of our study was to determine concordance of genetic profiles through the use of next generation sequencing (NGS) between primary CRC and pulmonary metastases.

**Methods:** Patients who underwent pulmonary metastasectomy for CRC at a single institution from 2002 to 2018 were identified. Individuals who did not have available NGS data for primary CRC and PM were excluded. Genes were selected for analysis if they were known to be therapeutically targetable or actionable, or if they were reported in both CRC primary and pulmonary metastasectomy in at least 80% of cases. Concordance was defined by either both wildtype or both mutant alleles in lung and colorectal lesion; genes with opposing mutational profiles between primary and lung were reported as discordant.

**Results:** 38 patients met inclusion criteria, in whom KRAS, BRAF, NRAS, and PIK3CA were examined for mutational concordance (Table). High levels of concordance (greater than 95%) were observed between primary CRC and lung metastases for the majority of the genes evaluated. A slightly higher frequency of discordance was noted for KRAS and PI3KCA with 5/35 (14%) and 3/31 (10%) samples displaying discordant mutational profiles, respectively. Of all discordant samples, 78% (7/9) reflect *de novo* mutations in metastatic tissue. NRAS displayed 100% concordance between CRC and pulmonary metastases. The presence of KRAS-mutant CRC was 95% sensitive for KRAS-mutant pulmonary metastatic disease. Of the patients with KRAS discordant tumors, 4/5 (80%) had *de novo* mutations and 1/5 (20%) patient converted to wildtype. Anti-EGFR therapy was used in 75% (3/4) of cases demonstrating wildtype-to-mutant conversion. In comparison, *de novo* PIK3KCA mutations were observed in 2/3 (67%), while 1/3 (33%) converted to wildtype.

**Conclusions:** High intertumoral genetic homogeneity exists, with greater than 85% CRC-lung concordance in several targetable genes. In the absence of pulmonary metastasis sequencing, it may be reasonable to use primary CRC NGS to guide prognostication and molecular targeted therapy. However, the occurrence of *de novo* KRAS-mutant pulmonary metastases is not insignificant, and should be considered, particularly in an inoperable patient previously treated with anti-EGFR therapy for KRAS wildtype disease.

Table: Mutational Concordance Between Primary Colorectal Cancer and Lung Metastasis

Gene	BRAF	KRAS	NRAS	PIKCA
NGS Pairs Examined	35	35	33	31
WTc-WTl Concordant, n (%)	32 (91)	12 (34)	30 (91)	24 (77)
MtC-MtL Concordant, n (%)	2 (6)	18 (51)	3 (9)	4 (13)
Total Concordant, n (%)	34 (97)	30 (86)	33 (100)	28 (90)
WTc-MtL Discordant, n (%)	1 (3)	4 (11)	0 (0)	2 (7)
MtC-WTl Discordant, n (%)	0 (0)	1 (3)	0 (0)	1 (3)
Total Discordant, n (%)	1 (3)	5 (14)	0 (0)	3 (10)

NGS: next generation sequencing; WT: wild-type; C: colorectal cancer; L: lung metastasis; Mt: mutant

Notes:

# BASIC SCIENCE FORUM

## 4B. ST2 as a Predictor of Long-Term Risk of Unplanned Readmission After Pediatric Congenital Heart Surgery

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**Authors:** Devin Parker<sup>1</sup>, Allen Everett<sup>2</sup>, Marshall Jacobs<sup>2</sup>, \*Jeffrey Jacobs, \*Luca Vricella<sup>3</sup>, Chirag Parikh<sup>3</sup>, Jeremiah Brown<sup>1</sup>

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**Discussant:** \*James D. St. Louis, Children's Mercy Hospital and Clinics, Kansas City, MO

**Objectives:** Approximately 10% to 20% of children are readmitted after congenital heart surgery. Very little is known about biomarkers as predictors of risk of unplanned readmission following pediatric congenital heart surgery. Novel cardiac biomarker ST2 may be associated with risk of unplanned readmission after pediatric congenital heart surgery. ST2 concentrations are believed to reflect cardiovascular stress and fibrosis. In adults, ST2 has shown to be a strong predictor of cardiovascular outcomes in both chronic and acute heart failure. Our objective was to explore the relationship between pre- and postoperative ST2 biomarker levels and long-term risk of readmission after congenital heart surgery.

**Methods:** We prospectively enrolled pediatric patients <18 years of age who underwent at least one congenital heart operation at Johns Hopkins Hospital from 2010 - 2014. Biomarker samples were collected immediately prior to surgery and at the end of bypass and measured by ELISA (Meso Scale Discovery). Patient pre- and post-operative serum biomarker levels were categorized by tercile. We used Kaplan-Meier survival analysis and Cox regression models adjusted for variables based on the Society of Thoracic Surgeons (STS) Congenital Heart Surgery Database mortality risk model.

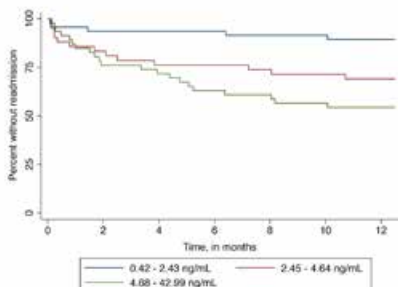
**Results:** In our cohort (N=145), there were 39 unplanned readmissions within 365 days. The median time to unplanned readmission was 54 days (IQR: 10 – 153). Kaplan-Meier survival analysis demonstrated a significant difference across terciles of pre- and post-operative ST2 biomarker levels. After adjustment, elevated preoperative ST2 levels in the middle and upper tercile were associated with increased risk of unplanned readmission (hazard ratio range 2.8 to 3.1, all p<0.05). Adjusted levels of postoperative ST2 in the upper tercile were also significantly associated with risk of unplanned readmission (hazard ratio: 3.7; p value: 0.019). Postoperative serum levels in the middle tercile were not significantly associated with long-term risk of unplanned readmission (hazard ratio: 2.5; p value: 0.093)..

**Conclusions:** Elevated pre- and postoperative levels of ST2 are associated with increased risk of long-term unplanned readmission after pediatric congenital heart surgery. Novel serum biomarker ST2 can be used for risk stratification or estimating postsurgical prognosis.

Table 1. Unadjusted and adjusted effects of preoperative and postoperative ST2 biomarker levels on long-term risk of unplanned readmission.

Serum ST2 Levels	Readmitted N (%)	Unadjusted		Adjusted	
		HR (95% CI)	p value	HR (95% CI)	p value
Preoperative					
Tercile 1 (0.46 – 1.49 ng/mL)	6 (15.4)	REF		REF	
Tercile 2 (1.50 – 2.69 ng/mL)	14 (35.9)	2.94 (1.13 – 7.64)	0.027	3.11 (1.12 – 8.62)	0.029
Tercile 3 (2.70 – 106.33 ng/mL)	19 (48.7)	3.82 (1.51 – 9.63)	0.005	2.79 (1.00 – 7.79)	0.049
Postoperative					
Tercile 1 (0.42 – 2.43 ng/mL)	5 (12.8)	REF		REF	
Tercile 2 (2.45 – 4.64 ng/mL)	13 (33.3)	3.32 (1.18 – 9.31)	0.023	2.53 (0.86 – 7.47)	0.093
Tercile 3 (4.68 – 42.99 ng/mL)	21 (53.9)	4.97 (1.86 – 13.27)	0.001	3.67 (1.23 – 10.95)	0.019

Figure 1. Kaplan Meier curves for freedom from readmission by categories of postoperative ST2 biomarker levels.



Notes:

# FIRST SCIENTIFIC SESSION

## 1. Fate of the Preserved Sinuses of Valsalva After Emergency Repair for Acute Type A Aortic Dissection

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**Authors:** Markian Bojko<sup>1</sup>, Maham Suhail<sup>2</sup>, Joseph Bavaria<sup>3</sup>, Andreas Haberbthuer<sup>3</sup>, Robert Hu<sup>3</sup>, Joey Harmon<sup>3</sup>, Nimesh Desai<sup>3</sup>, Rita Milewski<sup>3</sup>, \*Matthew Williams<sup>3</sup>, Wilson Szeto<sup>3</sup>, Jana Mossey<sup>4</sup>, Prashanth Vallabhajosyula<sup>3</sup>

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**Discussant:** **D\*** Joseph S. Coselli, Baylor College of Medicine, Houston, TX

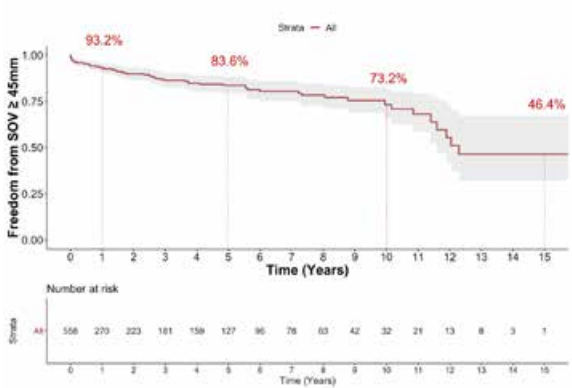
**Commercial Relationships:** \*J. Coselli: Consultant/Advisory Board: Medtronic, Terumo Aortic, W. L. Gore; Ownership Interest: Terumo Aortic; Research Grant: Abbott, Cytosorbants, Edwards Lifesciences, Medtronic, Terumo Aortic, W. L. Gore

**Objectives:** Patients with acute type A aortic dissection (ATAAD) present with heterogeneous involvement of the aortic root complex. Despite the usual involvement of the sinuses of Valsalva (SOV) and varying grades of aortic insufficiency (AI), the aortic root can be preserved the majority of the time by valve resuspension and Teflon inlay patch reconstruction of the dissected sinus segments. Though this “standard” surgical root reconstruction is well adopted, the long term fate of the repaired SOV in ATAAD remains poorly understood. We report the long term anatomic, functional, and clinical outcomes associated with the preserved SOV after emergency surgery for ATAAD.

**Methods:** From 2002-2017, of 776 emergency ATAAD operations at a single institution, 558 (71.9%) underwent valve resuspension with root repair and complete SOV preservation. Echocardiography reports were retrospectively reviewed to obtain functional and anatomic features of the aortic root complex. Mean follow up time in the 494 hospital survivors was  $4.90 \pm 4.03$  years. Freedom from SOV dilation  $\geq 45$ mm was calculated using the Kaplan Meier method. Multivariable cox regression analysis was used to determine risk factors for development of SOV dilation  $\geq 45$ mm. A repeated measures linear mixed effects model was used to assess predictors of postoperative SOV dilation.

**Results:** Mean preoperative SOV diameter was  $38.7 \pm 5.8$ mm and was significantly larger than the mean SOV diameter at discharge ( $36.5 \pm 5.8$ mm) ( $p=0.005$ ). During the follow-up period, 62 patients developed SOV diameter  $\geq 45$ mm at a mean time of  $3.30 \pm 3.81$  years after surgery. Kaplan-Meier freedom from SOV dilation  $\geq 45$ mm at 1, 5, 10, and 15 years was 93.2%, 83.6%, 73.2%, and 46.4% respectively (Figure 1). In a multivariable cox regression model, preoperative SOV diameter 40-44mm and  $\geq 45$ mm were associated with hazard ratios of 5.02 (95% CI 2.15-11.73), and 14.16 (95% CI 6.62-30.29) respectively for postoperative SOV dilation  $\geq 45$ mm compared to those with preoperative SOV diameter  $<40$ mm. In a repeated measures linear mixed effects model, preoperative SOV diameter, and male gender were significant predictors of SOV dilation. Postoperative time course was identified as highly significant indicating growth over time (Table 1).

**Conclusions:** The repaired and preserved sinuses of Valsalva (SOV) during emergency surgery for ATAAD are prone to progressive dilatation over time, especially in male subjects and those with preoperative SOV diameter  $\geq 40\text{mm}$ . More tailored and closer surveillance may be warranted in these subsets of patients.



**Table 1** - Results of Repeated Measures Linear Mixed Effects Model for Postoperative SOV Diameter

Characteristic	Coefficient	SE	p-value
Female Gender	-0.341	0.060	<0.001
Hypertension	0.078	0.075	0.297
Preoperative Aortic Insufficiency			
<2+	-	-	Reference
$\geq 2+$	0.064	0.059	0.277
Preoperative SOV Diameter			
<40mm	-	-	Reference
40-44mm	0.316	0.066	<0.001
$\geq 45\text{mm}$	0.874	0.083	<0.001
Postoperative Time Course	0.025	0.006	<0.001

SOV, Sinuses of Valsalva

**Notes:**

# FIRST SCIENTIFIC SESSION

## 2. Surgical Outcomes of Combined Neoadjuvant Atezolizumab and Chemotherapy in Resectable Non-Small Cell Lung Cancer

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**Regulatory Disclosure:** This presentation describes the off-label use of atezolizumab in neoadjuvant treatment for resectable Non-Small Cell Lung Cancer.

**Author Institution(s):** <sup>1</sup>Columbia University Medical Center, New York, NY; <sup>2</sup>New York Presbyterian/ Columbia University, Pomona, NY; <sup>3</sup>Vanderbilt University Medical Center, Nashville, TN

**Discussant:** DStephen Broderick, Johns Hopkins University, Baltimore, MD

**Commercial Relationships:** Consultant/Advisory Board: Bristol-Myers Squibb

**Objectives:** The advent of program death ligand 1 (PD-L1) inhibitors has revolutionized the treatment of unresectable non-small cell lung cancer (NSCLC); however, few studies have reported its use in resectable NSCLC. Moreover, some of the available data have demonstrated an increased degree of fibrosis in patients receiving neoadjuvant immunotherapy. Our group conducted a phase two trial of the use of PD-L1 inhibitor, atezolizumab, combined with chemotherapy in the neoadjuvant setting in resectable NSCLC. The goal of our study is to assess the treatment response, surgical outcomes, and histopathologic changes of patients following treatment with combined atezolizumab and chemotherapy.

**Methods:** Patients with stage IIA to IIIA resectable NSCLC were enrolled in a prospective, IRB-approved study and received 4 cycles of atezolizumab, nab-paclitaxel, and carboplatin prior to surgical resection. Baseline patient characteristics as well as operative approach, blood loss, and complications were analyzed. Detailed histopathologic analysis was utilized to determine percentage of viable residual tumor as well as fibroelastosis in all of the surgical specimens.

**Results:** A total of 18 patient received neoadjuvant immunotherapy and chemotherapy. Three patients were deemed unresectable at time of surgery, 2 for unresectable mediastinal lymph node involvement and 1 for extensive chest wall invasion. Four of the 15 patients (27%) achieved a complete pathologic response and an additional 5 patients (33%) had a major pathologic response. All patients received an R0 resection and 67% were done VATS. Histopathologic analysis of the slides revealed an average of 47% viable tumor and 57% fibroelastosis in the examined surgical specimens. One of the 15 patients, died in the immediate post-operative period secondary to a respiratory arrest. The average length of stay was 3.2 days. The most frequent post-operative event was atrial fibrillation, which occurred in 2 patients (13%). Zero patients had a prolonged air-leak, were discharged with a chest tube, or required re-operation.



**Conclusion:** Combined neoadjuvant atezolizumab and chemotherapy shows promising clinical outcomes for resectable NSCLC. Although this treatment does appear to elicit a fibrotic response in some patients, it does not appear to result in an excessive conversion to thoracotomy or post-operative complications. This study has progressed to a prospective, multi-center study.

Table 1: Patient characteristics including type of resection and PD-L1 percentage

Patient characteristics who underwent resection (n= 15)	Immunotherapy
Surgery years	
2015-2016	20% (3)
2017-2018	80% (12)
Age Average	69.73
Gender	
Female	47% (7)
Male	53% (8)
Type of Resection	
Bilobectomy	13% (2)
Lobectomy	80% (12)
Pneumonectomy	7% (1)
Wedge	0% (0)
Margins	
Negative	100% (15)
Positive	0% (0)
Thoracotomy	33% (5)
VATS	67% (10)
Estimated blood loss (ml)	82 (range: 0 – 600)
PD-L1 + patients	60% (9)

Table 2: Pathologic response, average fibroelastosis, viable tumor percentage, and post-operative events

Patient characteristics that underwent resection (n= 15)	Immunotherapy (n=15)
Average Pre-treatment Tumor Size (on CT, cm)	4.79
Average Post Treatment Tumor Size (on CT, cm)	3.15
Average Decrease in Tumor Size (cm)	1.64
Average Gross Residual Tumor Size on Path (cm)	4.03
Average Residual Viable Tumor Percentage (%)	47
Average Fibroelastosis Percentage (%)	57
Average Number of Positive Nodes	3.20
Average Length of Stay (days)	3.20 (range: 2 - 6)
Pathology Primary Tumor	
T0	20% (3)
T1	27% (4)
T2	40% (6)
T3	7% (1)
T4	7% (1)
Pathology Lymph Nodes	
N0	60% (9)
N1	20% (3)
N2	20% (3)
Response	
>10% residual tumor	40% (6)
Pathologic Complete Response	27% (4)
Major Pathologic Response	33% (5)
30 Days Mortality	7% (1)
Recurrence	40% (6)
Post-operative Events	33% (5)
Re-operation	0% (0)
Air Leak	0% (0)
Respiratory Failure	7% (1)
Atrial fibrillation	13% (2)
Other Infection	0% (0)
Discharged with Chest Tube	0% (0)
Discharged with Foley	7% (1)
UTI	7% (1)

Notes:

# FIRST SCIENTIFIC SESSION

## 3. Hypoplastic Left Heart Syndrome – Twenty Years Follow-up in Norway

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**Author Institution(s):** Oslo University Hospital, Oslo, Norway

**Discussant:** Marshall L. Jacobs, Johns Hopkins University School of Medicine, Baltimore, MD

**Objectives:** Norway has only one center performing surgery for congenital heart defects situated in Oslo at Rikshospitalet. The first successful operation for hypoplastic left heart syndrome (HLHS) performed on a Norwegian patient was done by Dr. William Norwood in the US in July of 1987. Until 1999, all patients with HLHS were referred to Dr. Norwood, all covered by the Norwegian government. In cooperation with Dr. Norwood and his team, the first patient cared for entirely by a Norwegian team was operated at Rikshospitalet in February 1999. We therefore want to report our experience with treating a national cohort of patients.

**Methods:** All children born in Norway between 1st of January 1999 and 31st of December 2018 were included in this study. All patients were referred to Rikshospitalet for evaluation and counselling. We have used the institutional database for collecting all data retrospectively. Survival analysis was performed in SPSS using Kaplan Meier plots. Follow-up is 100% on survival.

**Results:** All children born in Norway between 1st of January 1999 and 31st of December 2018 were included in this study. All patients were referred to Rikshospitalet for evaluation and counselling. We have used the institutional database for collecting all data retrospectively. Survival analysis was performed in SPSS using Kaplan Meier plots. Results A total of 209 children were born with HLHS in this period. After counselling, parents chose comfort care for 59 of the children (28%). 150 children were operated with a Norwood stage I procedure with the intention to do a staged Fontan. Total survival 30 days after surgery is 84%. Cumulative survival after 1, 3, 5 and 10 years are 73%, 68%, 67% and 65%. We looked at the impact of shunt type on survival and found a significantly better survival in the patients receiving Sano shunts compared to mBT shunts ( $p < 0.004$  at one year) 30 day survival.

**Conclusion:** Survival has improved over the twenty years we have performed palliations for HLHS. There was a substantial improvement when we changed from mBT shunts to Sano shunts, and the survival benefit in favor of Sano shunts seems to stay over the years. HLHS is still a serious condition.

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**Notes:**

# FIRST SCIENTIFIC SESSION

## 4. Effect of Ascending Aorta Size on Outcomes Following the Norwood Procedure

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**Author Institution(s):** <sup>1</sup>Washington University School of Medicine, St. Louis, MO;

<sup>2</sup>Washington University in St. Louis, St. Louis, MO

**Discussant:** DRichard G. Ohye, University of Michigan, Ann Arbor, MI

**Commercial Relationships:** Consultant/Advisory Board: PECA Labs

**Objectives:** There is conflicting data regarding the impact of ascending aorta size on outcomes following the Norwood procedure. One of the largest multicenter studies, the Pediatric Heart Network Single Ventricle Reconstruction (SVR) Trial, found that aortic size was not associated with deleterious outcomes. However, this conclusion was drawn from a heterogeneous population with right ventricle (RV)-dependent systemic circulation. The objective of this study was to specifically evaluate the impact of ascending aortic diameter on short- and long-term outcomes in patients with aortic atresia (AA).

**Methods:** Patients from the SVR dataset with a diagnosis of AA and no VSD were included. After analyzing survival by baseline aortic diameter in increments of 0.5mm, patients were separated into three groups: 1) <1.5mm; 2) >1.5mm and <3.0mm; and 3) >3.0mm.

We analyzed the following outcomes: ECMO during Norwood procedure, ECMO or CPR during Norwood hospitalization, post-Norwood hospital stay (LOS), duration of mechanical ventilation, transplant-free one-month and 14-month survival, moderate-severe tricuspid regurgitation at 14 months, and RV function (measured by RV fractional area change) at 14 months. The effect of shunt type on mortality was also studied.

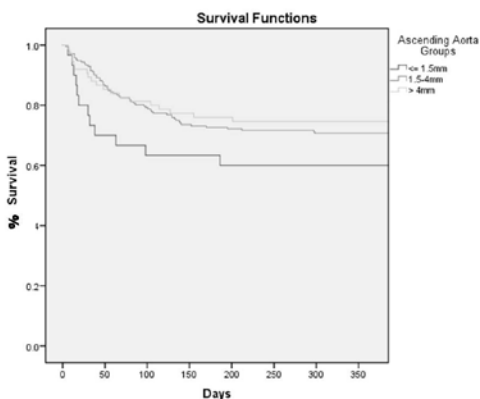
**Results:** A total of 317 patients met the inclusion criteria, with 164 randomized to BT shunt and 153 to Sano. There were 30 patients in group 1, 212 in group 2, and 75 in group 3. Patients in group 1 had significantly higher 30-day mortality ( $p=0.016$ ). Although there was no significant difference for the other outcomes, patients with aortas <1.5mm experienced higher rates of ECMO during surgery, ECMO/CPR during Norwood hospitalization, longer ventilator duration, higher 14-month mortality, and lower RV fractional area change at 14 months than those in the rest of the cohort (Table 1).

Survival at 14 months was nearly identical for groups 2 and 3 (70.8% and 74.7% respectively). Patients with ascending aortic diameters <1.5mm had a lower survival at 14 months (60%), although this difference did not reach statistical significance ( $p=0.22$ , Figure 1). Likewise, there was no difference between short- and long-term outcomes between patients with a BT or Sano shunt.

**Conclusion:** Aortic diameter and shunt type do not appear to play an important role in negative outcomes following the Norwood procedure in patients with AA. However, patients with extremely small aortas (<1.5mm) are at an increased risk for early (one-month) mortality, and may experience worse outcomes than their larger counterparts.

Table 1. Outcomes by baselines aortic diameter groups.				
Outcome	Ascending Aortic Diameter $\leq 1.5$ mm (n=30)	Ascending Aortic Diameter $>1.5$ mm, $\leq 3.0$ mm (n=212)	Ascending Aortic Diameter $>3.0$ mm (n=75)	p-value
ECMO at Norwood % (N)	13.3% (4)	7.5% (16)	6.7% (5)	0.494
ECMO/CPR during Norwood Hospitalization % (N)	30.0% (9)	19.0% (40)	16.0% (12)	0.253
Ventilator Duration Median (IQR)	8.5 (5-14.5)	7 (5-14)	6 (4-11)	0.190
Hospital LOS Median (IQR)	23.5 (15.8- 46.5)	24.0 (16-41)	23.0 (15-35)	0.514
One-month Mortality/Transplant % (N)	26.7% (8)	9% (19)	12% (9)	0.016
14-month mortality/Transplant % (N)	46.7% (14)	31.3% (66)	28.0% (21)	0.105
Moderate-Severe TR at 14 months % (N)	20.0% (6)	13.7% (29)	16.0% (12)	0.625
RV Fractional Area Change at 14 Months (mean $\pm$ SD)	0.29 $\pm$ 0.08	0.33 $\pm$ 0.07	0.33 $\pm$ 0.08	0.184

Figure 1. Kaplan Meier Survival Curve by Ascending Aorta Size



Notes:

# FIRST SCIENTIFIC SESSION

## 5. Clinical Predictors of In-Hospital Mortality in Venoarterial Extracorporeal Membrane Oxygenation in Patients With Refractory Cardiogenic Shock

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**Discussant:** \*J. Michael DiMaio, Baylor University Medical Center, Dallas, TX

**Objectives:** Venoarterial-extracorporeal membrane oxygenation (VA-ECMO) is utilized as a life-saving procedure and a bridge to myocardial recovery for patients in refractory cardiogenic shock. Despite technical advancements, VA-ECMO retains a high mortality, particularly for patients presenting with sudden cardiac arrest. This retrospective study aims to identify the clinical predictors of in-hospital mortality after the VA-ECMO in order to improve risk stratification for this tenuous patient population.

**Methods:** The RESCUE database is a prospective, multi-center, observational analysis of the incidence, epidemiology and management and outcomes of ECMO patients. From 2013 to 2017, 890 patients were enrolled in the study with cardiogenic shock who underwent VA-ECMO. We performed a bivariate analysis on >300 variables regarding their association with in-hospital mortality. We conducted forward stepwise logistic regression analyses for potential predictors chosen based on their clinical significance and statistical significance in the bivariate analysis. All tests were considered significant at a 2-sided p <0.05.

**Results:** Among 892 patients, 37.8% were successfully separated from VA-ECMO and survived the hospitalization. Bivariate comparisons of patient characteristics of surviving and non-surviving cohort are listed (Table 1). Multivariate predictors for the in-hospital mortality include older age, pre-ECMO cardiac arrest, admission diagnoses of non-ischemic cardiomyopathy and acute coronary syndrome, elevated pre-ECMO total bilirubin, and severe left ventricular dysfunction necessitating placement of left ventricular vent (Table 2).

**Conclusion:** In a large study of recent VA-ECMO patients, in-hospital mortality remains significant. Advanced age, cardiac arrest, non-ischemic cardiomyopathy, acute coronary syndrome and need for the left ventricular vent are recognized as predictors for mortality. Identification of these predictors can help stratify the highest risk patients when providing prolonged VA-ECMO support.

Table 1: Bivariate comparison of 850 patients with and without mortality requiring ECLS/ECMO support for severe cardiogenic shock

Characteristic*	Alive	In-Hospital Mortality	P value†
	N (%)‡	N (%)‡	
<b>Demographics</b>			
Age, years, mean (SD)	60.57 (15.1)	55.04 (11.3)	<.001
Gender			
Female	62 (56.8)	151 (34.1)	.80
Male	288 (77.4)	311 (52.2)	
Body mass index, kg/m <sup>2</sup>	29.1 (8.1)	30.1 (7.5)	0.87
Race/ethnicity			
Caucasian	211 (50.8)	161 (34.1)	.77
African American or Black	84 (16.0)	79 (33.5)	
Hispanic/Latino	6 (46.3)	9 (46.3)	
Asian	4 (50.0)	4 (50.0)	
Native American or Alaska Native	1 (100.0)	0 (0.0)	
Other	51 (38.3)	82 (33.3)	
<b>Comorbidities Pre-ECMO</b>			
Coronary Artery Disease (CAD)			
No	256 (59.8)	387 (60.2)	.805
Yes	74 (29.2)	179 (29.8)	
Systemic Hypertension			
No	229 (61.7)	319 (58.2)	.0002
Yes	301 (29.6)	243 (26.4)	
Polycystic Ovary Syndrome			
No	291 (38.3)	471 (31.6)	.03
Yes	29 (20.0)	91 (20.8)	
Diabetes mellitus			
No	258 (60.1)	329 (58.7)	.39
Yes	76 (29.5)	181 (29.6)	
COPD with oxygen			
No	547 (57.7)	588 (56.6)	.09
Yes	3 (17.6)	54 (30.3)	
COPD without oxygen			
No	517 (58.8)	515 (55.0)	.80
Yes	13 (21.6)	47 (28.8)	
Chronic Kidney Disease (CKD)			
No	278 (59.6)	431 (51.3)	.47
Yes	36 (30.4)	121 (30.4)	
ECMO requiring dialysis			
No	334 (37.8)	549 (37.2)	0.62
Yes	6 (10.0)	13 (28.3)	
Chronic Liver Disease			
No	828 (97.8)	547 (81.5)	.006
Yes	2	15 (28.6)	
Prior myocardial infarction (MI)			
No	609 (69.3)	696 (61.7)	.03
Yes	4 (27.3)	16 (27.3)	
<b>Substance abuse</b>			
History of smoking			
No	175 (41.6)	175 (34.3)	.12
Current	34 (18.6)	51 (26.5)	
Former	73 (36.2)	120 (33.7)	
History of drug abuse			
No	306 (58.3)	328 (51.6)	.30
Current	11 (50.0)	11 (50.0)	
Former	11 (50.0)	11 (50.0)	

\*Abbreviations: ECMO, extracorporeal membrane oxygenation; SD, standard deviation.

†NSI, non-invasive ventilation.

‡Values are frequency and row percent unless otherwise specified.

§Missing P values are less than &lt;0.05.

Table 2: Multivariate Analysis- Pre-ECMO Predictors of In-Hospital Mortality

Predictor	Odds Ratio (95% CI)	P value
<b>Age, years</b>	<b>1.018 (1.008-1.029)</b>	<b>&lt;.001</b>
<b>Admission Diagnosis:</b>		
Acute Coronary Syndrome	2.370 (1.113-5.046)	0.0253
Non-Ischemic Cardiomyopathy	2.064 (1.071-3.975)	0.0303
<b>Total Bilirubin</b>	<b>1.074 (1.005-1.148)</b>	<b>0.0352</b>
<b>Cardiac Arrest</b>	<b>1.652 (1.026-2.660)</b>	<b>0.0389</b>
<b>Left ventricular vent</b>	<b>2.076 (1.230-3.502)</b>	<b>.0062</b>
<b>Sinus Rhythm</b>	<b>0.665 (0.421-1.050)</b>	<b>0.0802</b>
<b>Past Medical History</b>		
Diabetes	1.355 (0.962-1.909)	0.0826
Stroke/TIA	1.647 (0.883-3.073)	0.1169
<b>Aortic Insufficiency</b>		
Trace	0.914 (0.524-1.593)	0.7513
Mild	1.453 (0.826-2.557)	0.1951
Moderate	0.8242 (0.343-2.346)	0.8242
Severe	0.424 (0.154-1.170)	0.0974
<b>Mean Arterial Pressure</b>	<b>0.993 (0.984-1.003)</b>	<b>0.1514</b>
<b>Post-Cardiotomy Shock</b>	<b>1.245 (0.848-1.827)</b>	<b>0.2638</b>
<b>BUN</b>	<b>1.004 (0.996-1.011)</b>	<b>0.3369</b>
<b>Ischemic Cardiomyopathy</b>	<b>1.379 (0.673-2.826)</b>	<b>0.3805</b>
<b>ALT</b>	<b>1.000 (1.000-1.000)</b>	<b>0.4133</b>
<b>Cardiogenic Shock</b>	<b>0.704 (0.423-1.171)</b>	<b>0.1765</b>
<b>Arterial Cannulation*</b>		
Femoral Artery	1.356 (0.719-2.559)	0.3469
Axillary Artery	1.361 (0.633-2.923)	0.4300
<b>Venous Cannulation**</b>		
Femoral Vein	0.740 (0.379-1.442)	0.3759
Internal Jugular Vein	0.603 (0.296-1.230)	0.1614
Other Vein Access	0.967 (0.518-1.806)	0.9171
Bicarbonate	0.986 (0.947-1.027)	0.4871
No Prior Cardiac Intervention	1.132 (0.786-1.631)	0.5047
No Prior Lung Disease	0.922 (0.659-1.292)	0.6379
Respiratory Failure	0.975 (0.564-1.684)	0.9273

†Bolted P values are less than &lt;0.05

\* Reference Group: Aortic Cannulation

\*\*Reference Group: Right Atrium

# FIRST SCIENTIFIC SESSION

## 6. National Prevalence and Overall Survival of Primary Stereotactic Body Radiation Therapy for Operable Early-Stage Non-Small Cell Lung Cancer

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**Authors:** Rhami Khorfan, Tim Kruser, Ankit Bharat, Karl Bilimoria, David Odell

**Author Institution(s):** Northwestern University, Chicago, IL

**Discussant:** **D\***Min P. Kim, Houston Methodist Hospital, Houston, TX

**Commercial Relationships:** \*M. Kim: Other: Trainer for Intuitive Surgical, Inc., Medtronic, and Veran Medical

**Objectives:** Stereotactic body radiation therapy (SBRT) has become an accepted primary treatment option for inoperable early-stage non-small cell lung cancer (NSCLC). Its role in the treatment of operable disease remains unclear. Our goals were (1) to retrospectively evaluate the proportion of patients with operable early-stage NSCLC who elected to receive primary SBRT instead of surgery, (2) to examine factors associated with refusing recommendations for surgery, and (3) to compare overall survival after primary surgery and primary SBRT for operable early-stage NSCLC.

**Methods:** The National Cancer Database was queried for patients with stage I or II NSCLC and N0 disease from 2004-2015. Patients who were not recommended surgery due to contraindications or other reasons were excluded. We included only patients who were deemed operative candidates and for whom surgery was recommended. We compared patients who underwent surgical resection (surgery arm) with those patients for whom surgery was recommended but who refused and elected to receive SBRT (SBRT arm). Multivariable logistic regression was used to identify factors associated with choosing SBRT over surgery. Kaplan-Meier and Cox proportional hazards analyses were used to compare survival.

**Results:** A total of 122,209 patients met inclusion criteria, with 121,136 (99.1%) in the surgery arm and 1,073 (0.9%) in the SBRT arm. The proportion of patients receiving SBRT increased significantly over time, from 0.15% in 2004 to 0.68% in 2010, and further to 1.51% in 2015 ( $p < 0.01$ ). Age  $\geq 60$ , black race, Medicaid/Medicare coverage, Charlson co-morbidity score  $< 2$ , clinical stage I, and treatment at an academic institution were factors associated with refusing surgery and opting for primary SBRT (Table). Median survival was significantly longer in patients treated surgically (91.8 months) as opposed to those who underwent SBRT (49.8 months; log-rank  $p < 0.001$ ) (Figure). This survival benefit persisted after adjustment for age, comorbidities, and cancer stage, with a hazard ratio for death of 0.69 for surgery compared to SBRT ( $p < 0.01$ ).

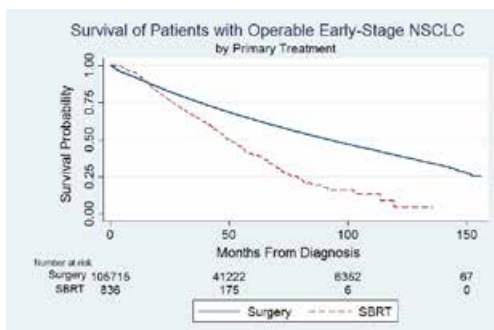
**Conclusion:** While  $< 1\%$  of patients with operable, early-stage NSCLC refused surgery and elected primary radiotherapy, this number is increasing. However, median survival was significantly higher after surgery, with a 30% lower adjusted risk of mortality compared to SBRT. Operable patients considering primary SBRT should be educated regarding this difference in survival.



**Table. Factors Associated With Opting for SBRT as Primary Treatment, on Multivariable Logistic Regression**

	Odds Ratio	95% Confidence Interval	
<b>Sex</b>			
Male	Referent		
Female	0.99	0.88	1.12
<b>Age</b>			
18-49	Referent		
50-59	1.84	0.83	4.05
60-69*	3.76	1.76	8.07
≥70*	10.92	5.09	23.43
<b>Race/Ethnicity</b>			
White	Referent		
Black*	1.47	1.18	1.84
Hispanic	0.63	0.37	1.07
Other	0.81	0.52	1.26
<b>Insurance</b>			
None	1.47	0.71	3.05
Private	Referent		
Medicaid*	3.19	2.35	4.32
Medicare*	1.65	1.34	2.04
<b>Charlson co-morbidity score</b>			
<2	Referent		
≥2*	0.62	0.51	0.75
<b>Hospital type</b>			
Non-academic	Referent		
Academic*	1.52	1.13	2.05
<b>Clinical Stage</b>			
I	Referent		
II*	0.48	0.36	0.62
<b>Year</b>			
2004-2009	Referent		
2010-2015*	2.73	2.29	3.24
<b>Annual Lung Cancer Volume of Treating Hospital</b>			
Quartile 1	Referent		
Quartile 2	0.60	0.35	1.03
Quartile 3	0.65	0.39	1.09
Quartile 4	0.83	0.49	1.38

\*indicates significance at  $p < 0.05$



**Notes:**

# FIRST SCIENTIFIC SESSION

## 7. Culture of Safety Improvement in a High-Volume Cardiothoracic Surgery Center

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**Authors:** Matthew Henn<sup>1</sup>, Clare Ridley<sup>1</sup>, \*Hersh Maniar<sup>2</sup>, Aaron Dahl<sup>3</sup>, Aaron Steinberg<sup>2</sup>, Michael Avidan<sup>1</sup>, \*Ralph Damiano<sup>2</sup>, \*G. Alexander Patterson<sup>2</sup>, \*Marc Moon<sup>2</sup>

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**Discussant:** \*Thoralf M. Sundt, Massachusetts General Hospital, Boston, MA

**Objectives:** Previous studies have demonstrated that an effective teamwork atmosphere can improve quality in high-stress, high-risk industries. In addition, effective communication has been shown to improve safety in complex team tasks. The objective of this study was to assess the impact of a formal team training curriculum and collaborative organizational effort among cardiothoracic anesthesia, nursing, and surgery leadership to enhance bidirectional cooperation in the operating room.

**Methods:** All members of the cardiothoracic surgery service line underwent a 4-week team training curriculum (TeamSTEPPS). Cardiothoracic anesthesia, surgery, and nursing leadership then held periodic “town hall” meetings to review findings and encourage continuing efforts to improve the operating room culture of safety. During the following 12 months, team members completed surveys (n=10,618) immediately following operations to assess the level of teamwork and communication during the procedure. A 5-point Likert scale was used to assess the level of teamwork and communication during the procedure.  $\chi^2$ -test was used to analyze intergroup differences and changes over time.

**Results:** TEAMWORK ASSESSMENT: During the course of the year, perception of positive teamwork significantly increased from 82% Strongly Agree to 91%(p<0.001) for the entire cohort (Table 1). The improvement in overall impression of positive teamwork was driven by significant changes among perfusionists(p<0.001), scrub nurses(p=0.012), circulating nurses(p < 0.005) and anesthesia technicians(p<0.001) (Table 1).

PSYCHOLOGICAL SAFETY ASSESSMENT: During the course of the year, perception of freedom of communication significantly increased from 87% Strongly Agree to 94%(p<0.001) for the entire cohort (Table 2). The improvement in comfort speaking up was driven not only by significant changes among perfusionists(p<0.001), circulating nurses(p=0.046), and RNFA's(p<0.005), but remarkably also among faculty surgeons(p=0.023) and faculty anesthesiologists(p<0.001) (Table 2).

**Conclusion:** TeamSTEPPS and a collaborative effort from anesthesia, surgery, and nursing leadership to enhance cooperation improved teamwork and communication in the high-stress, high-risk cardiothoracic surgery service line. Further studies will be necessary to determine whether an enhanced culture of safety will improve job satisfaction, error handling, and clinical outcomes.

**Table 1**  
**"I AM SATISFIED WITH OUR TEAMWORK"**

% Strongly Agree	#	Q1	Q2	Q3	Q4	p-value *
Surgeon	1406	94.4	96.4	96.3	96.5	= 0.168
Anesthesiologist	1447	77.0	83.9	85.4	81.5	= 0.080
Perfusionist	688	60.6	73.4	83.2	90.9	< 0.001
Scrub Nurse	1639	84.6	88.6	90.1	94.1	= 0.012
Circulating Nurse	1761	83.0	83.4	85.1	90.7	< 0.005
RNFA	778	87.5	94.8	89.6	90.1	= 0.166
CRNA	755	88.6	93.5	95.5	93.1	= 0.191
Anesthesia Tech	105	60.0	50.0	75.5	84.9	< 0.001
Surgery Trainee	1301	N/A	95.7	94.7	94.9	= 0.337
Anesthesia Trainee	567	N/A	76.7	75.5	81.3	= 0.288
Prefer Not Identify	171	N/A	73.8	79.4	79.4	= 0.310
All Roles	10618	82.2	87.4	88.4	90.9	< 0.001

\* p-value is for  $\chi^2$ -test comparing Q1–Q4

**Table 2**  
**"I FELT COMFORTABLE SPEAKING UP"**

% Strongly Agree	#	Q1	Q2	Q3	Q4	p-value *
Surgeon	1406	95.6	97.9	98.5	99.1	= 0.023
Anesthesiologist	1447	86.3	92.0	96.5	97.0	< 0.001
Perfusionist	688	61.2	75.9	87.9	94.1	< 0.001
Scrub Nurse	1639	93.9	94.4	94.5	97.2	= 0.507
Circulating Nurse	1761	86.9	87.3	92.7	93.4	< 0.046
RNFA	778	90.4	95.9	86.1	91.8	< 0.005
CRNA	755	93.9	94.5	95.9	97.5	= 0.382
Anesthesia Tech	105	80.0	71.4	77.4	90.9	= 0.539
Surgery Trainee	1301	N/A	96.0	94.0	91.2	= 0.165
Anesthesia Trainee	567	N/A	77.4	80.1	82.0	= 0.331
Prefer Not Identify	171	N/A	78.6	80.9	90.3	= 0.297
All Roles	10618	87.4	90.7	92.1	93.9	< 0.001

\* p-value is for  $\chi^2$ -test comparing Q1–Q4

**Notes:**

# FIRST SCIENTIFIC SESSION

## 8. Academic Representation of Women in the Southern Thoracic Surgical Association: Evidence for Positive Change

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**Authors:** Jacqueline Olive<sup>1</sup>, Niki Iranpour<sup>1</sup>, \*Ourania Preventza<sup>1</sup>, \*Shanda Blackmon<sup>2</sup>, \*Mara Antonoff<sup>3</sup>

**Author Institution(s):** <sup>1</sup>Baylor College of Medicine, Houston, TX; <sup>2</sup>Mayo Clinic, Rochester, MN; <sup>3</sup>University of Texas, MD Anderson Cancer Center, Houston, TX

**Discussant:** Elizabeth Stephens, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL

**Objectives:** While the representation of women in the field of cardiothoracic surgery has increased, it is unclear that there have been parallel gains in academic achievement for women in our specialty. On a national level, we recently demonstrated that women have remained stagnant in authorship and leadership roles within the Society of Thoracic Surgeons despite an increase in overall presence. Having characterized women's involvement nationally, we sought to identify trends by region. In this study, we aimed to evaluate the representation of women among academic opportunities in the Southern Thoracic Surgical Association (STSA) over the last 15 years.

**Methods:** STSA Annual Meeting Program books from 2003, 2008, 2013, and 2018 were reviewed for the representation of women among oral abstract authors (first and senior positions), leadership roles at the Annual Meeting, STSA Council and Committee Members, and award recipients. Differences between the sexes and time points were assessed with chi-squared analyses and t-tests, respectively.

**Results:** In 2003, women accounted for 4/102 (3.9%) authors, including 2/51 (3.9%) presenting and 2/51 (3.9%) senior roles. From 2003 to 2018, increases in female authorship were observed, with 18/85 (21.2%) presenting and 13/85 (15.3%) senior authorship positions filled by women ( $p=0.017$  and  $0.072$ , respectively). Compared to men, women accounted for significantly fewer invited speaking opportunities at each Annual Meeting studied ( $p<0.050$  for all). Although women also occupied fewer Session Chair roles than men in each year ( $p<0.050$  for all), a significant increase was observed over time, from 0/2 (0%) in 2003 to 18/105 (17.1%) positions in 2018 ( $p=0.0085$ ). Compared to 2003, in 2018, women also increased significantly in their positions as STSA Committee Members (0/7 [0%] in 2003 vs 6/40 [15.0%] in 2018,  $p<0.0010$ ). Women did not increase in their representation as award recipients (1/4 [25.0%] in 2003 vs 3/13 [23.1%] in 2018,  $p=0.87$ ).

**Conclusion:** Over the last 15 years, women have been increasingly represented among presenting authors, Annual Meeting Session Chairs, and STSA Committee Members. However, opportunity for greater emphasis on diversity and inclusion exists, particularly among invited speakers, societal leadership, and recipients of academic awards.

# Women's Representation Among STSA Academic Opportunities in 2003, 2008, 2013, and 2018

	2003	2008	2013	2018	P-value (2003 and 2018)
Presenting and Senior Authors	4 (3.9%)	14 (9.3%)	20 (11.5%)	31 (18.2%)	<b>0.0017</b>
Presenting Authors	2 (3.9%)	11 (14.7%)	11 (12.6%)	18 (21.1%)	<b>0.017</b>
Senior Authors	2 (3.9%)	3 (4.0%)	9 (10.3%)	13 (15.3%)	0.072
Invited Speakers	4 (17.4%)	0 (0.0%)	2 (7.4%)	3 (20.0%)	0.98
Session Chairs	0 (0.0%)	4 (4.4%)	11 (12.1%)	18 (17.1%)	<b>0.0085</b>
STSA Council Members	0 (0.0%)	1 (8.3%)	3 (23.1%)	4 (30.8%)	0.10
STSA Committee Members	0 (0.0%)	3 (11.5%)	3 (10.0%)	6 (15.0%)	<b>&lt; 0.0010</b>

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# HAROLD URSCHEL HISTORY LECTURESHIP

## 9. Max Brödel: Father of American Surgical Illustration: Did He Help Make Cardiac Surgeons Famous?

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**Authors:** \*W. Randolph Chitwood, Jr.

**Author Institution(s):** East Carolina University, Greenville, NC

**Body of History Abstract:** In 1894 Max Brödel came from the Leipzig Königliche Kunst Akademie to Johns Hopkins Hospital as their first medical illustrator. In Leipzig he had illustrated for the famous physiologist Karl Ludwig at the Institute für Physiologie. Fortuitously, there he met William Henry Welch, the new Dean at Johns Hopkins. Welch recruited Brödel to come to Johns Hopkins and illustrate Howard Kelly's textbook of Gynecology. Brödel's illustrations were very different from the flat appearing ones of that century. He used a technique like none other by making a charcoal sketch and then transferring it on to another piece of paper by rubbing it, creating a negative. This then was transferred to a chalk stipple board, rendering a positive image again. For carbon dust or pen and ink drawings, he created very fine lines by scratching black base paint to expose under lying white chalk using a fine knife tip. Thus, his illustrations transmitted texture, wetness, and three dimensionality to the viewer. In the early days of Johns Hopkins, he illustrated for not only Kelly, but also for Harvey Cushing and William Stewart Halsted. How does all this relate to later day cardiac surgeon's fame? Brödel established the School of Art as Applied to Medicine. Through his students his techniques and thinking were transferred throughout major universities in the United States. His students and their progeny sketched in the cardiac operating rooms of Robert Gross, Dwight Harken and Aldo Castenada in Boston, Alfred Blalock in Baltimore, and David Sabiston at Duke. Perhaps Brödel's most famous later day student was Leon Schlossberg, who illustrated all of Dr. Blalock's publications. As a resident at Duke, Schlossberg even illustrated for me. Thus, through Brödel's influence many cardiac surgeons published scientific articles that were richly illustrated with the realistic tones and depth. Most certainly Max Brödel's influence helped to make these and other surgeons famous through their realistically illustrated publications. This presentation will be a visual trek through the history of Brödel's contributions in the past and today.



**Notes:**

## SECOND SCIENTIFIC SESSION

### 10. Comparative Effectiveness of Mechanical Valves, Bioprosthetic Valves and Homografts in the Management of Complex Aortic Endocarditis

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**Authors:** Zaid Abdelsattar, Mohamed Elsisy, \*Hartzell Schaff, Kevin Greason, Richard Daly, M. Sertac Cicek, \*John Stulak, \*Joseph Dearani, Alberto Pochettino, Vishal Khullar, Phillip Rowse, Gabor Bagameri, Arman Arghami, Juan Crestanello

**Author Institution(s):** Mayo Clinic, Rochester, MN

**Discussant:** D\*Ourania Preventza, Baylor College of Medicine, Houston, TX

**Commercial Relationships:** Consultant/Advisory Board: Terumo Aortic, W. L. Gore & Associates

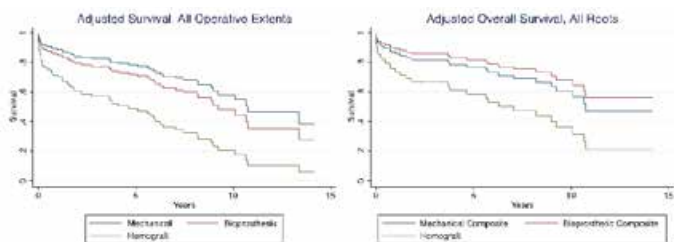
**Objectives:** The ideal surgical reconstruction of the aortic root in patients with complex endocarditis is controversial. We compare the short- and long-term outcomes between mechanical valves, bioprostheses and homografts.

**Methods:** We identified all patients undergoing surgery for active complex aortic endocarditis at our institution between 1/2003 and 12/2017 from a prospective database. We included patients with an abscess in the interventricular septum, outflow tract, sinuses of Valsalva, or aortic annulus. We grouped patients based on their operation into those who had a mechanical valve, a bioprosthesis, or a homograft. We used multiple logistic regression and proportional hazards models to estimate associations and outcomes. To minimize confounding by indication, we used risk adjustment by marginal modeling to simulate that every patient with their inherent confounders would undergo (contrary to fact) all 3 operations. We also conducted a subgroup analysis limited to those who underwent a root replacement.

**Results:** Of 159 patients with complex active endocarditis, 26 (16.4%) patients had a valve replaced only, 48 (30.2%) had a valve + patch reconstruction, and 85 (53.4%) had a root replacement. Of all, 50 (31.5%) had a mechanical valve, 56 (35.2%) had a bioprosthesis, and 53 (33.3%) had a homograft. The 3 groups were similar in age, sex, BMI, comorbid conditions, organism, abscess location and mitral valve involvement (all  $p > 0.05$ ). However, patients receiving a mechanical valve were more likely to have native valve endocarditis (46% vs 37.5% vs 17%;  $p = 0.005$ ) and less likely to undergo root replacement 32% vs 28.6% vs 98.1%;  $p < 0.001$ . Marginal risk-adjusted operative mortality was lowest for mechanical valves (4.8%) and highest for homografts (16.9%;  $p = 0.041$ ). Long-term survival was worse with homografts compared to mechanical valves, even after risk adjustment (aHR=2.9;  $p = 0.041$ ) and limiting the analysis to root replacements only (Figure).

**Conclusion:** In patients with complex endocarditis, mechanical valves are associated with better short- and long-term outcomes when compared to homografts, even after adjusting for important baseline characteristics. This holds true when comparing root replacements utilizing mechanical valve composite grafts to homografts.





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## SECOND SCIENTIFIC SESSION

### 11. Mobile Lung Screening: Should We All Get on the Bus?

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**Authors:** \*Ashley Miller<sup>1</sup>, \*James Headrick<sup>1</sup>, \*Jeremy Smith<sup>1</sup>, **Olivia Morin**<sup>2</sup>

**Author Institution(s):** <sup>1</sup>CHI Memorial Chest and Lung Cancer Center, Chattanooga, TN; <sup>2</sup>University of Tennessee College of Medicine Chattanooga, Chattanooga, TN

**Discussant:** **D**\*Betty C. Tong, Duke University Medical Center, Durham, NC

**Commercial Relationships:** \*B. Tong: Consultant/Advisory Board: Medtronic; Speakers Bureau/Honoraria: Integra Life Sciences, Inc.

**Objectives:** Despite favorable recommendations supporting lung screening, national adoption rates remain low (2-3%). Asymptomatic patients, at risk for lung cancer, are reluctant to schedule screening exams. Many patients in rural areas do not have the access to lung screening programs nor the understanding of the survival benefits. We initiated a mobile lung screening program to increase convenience, decrease perceived burdens and serve the rural population at risk. This is what we have learned from this 12 month feasibility project.

**Methods:** Utilizing a multidisciplinary collaborative approach, we began an 8 month design and build schedule. This was the first build of this type. Independent power supply, constant temperature regulation, vehicle leveling, remote transmission and drivability were all design challenges. An operational team was utilized for workflow design, to perform mobile screening and provide public education for the project. This team included a radiology tech, nurse practitioner, CDL driver and program developer. Specialized software was used for data mining, program management and data submission. Downstream revenue projections were based off previously published Medicare claims data. Generally accepted accounting principles (GAAP) were used.

**Results:** The prototype bus was delivered in January 2018. During the 12 month feasibility period, we performed 548 low dose lung screenings at 104 sites. Mean age was 62 years (range: 50-86), pack years 41 (range: 1-110) with 258 (47%) male. Two lung cancers were found; one stage 1 adenocarcinoma treated surgically, one stage 3 squamous cell treated with chemotherapy and radiation therapy. A type B thymoma was also discovered and underwent robotic resection. Utilizing published downstream projections, breakeven analysis on the pilot project was 397 lung screens. We performed 548 which exceeded projected need by 27%. Based on first year data, expected capital cost and 5 year financial projections, the net present value (NPV) = 1.44 million, Internal Rate of return (IRR) = 44.8% and profitability index (PI) = 2.72. When the same projections were performed without capturing any downstream revenue, the IRR was -7.5% and the PI was 0.50.

**Conclusion:** Although many challenges exist, a commercially viable bus and a financially sound mobile program can be developed. However, without a centralized approach and protocol driven pathways for incidental findings, the downstream revenue may be at risk as well as the financial viability of the project.



**Notes:**

## SECOND SCIENTIFIC SESSION

### 12. ABO Incompatible Heart Transplant in Infants - A UNOS Registry Review

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**Authors:** \*Deborah Kozik<sup>1</sup>, Jaimin Trivedi<sup>1</sup>, Joshua Sparks<sup>1</sup>, \*Mark Slaughter<sup>1</sup>, \*Bahaaldin Alsoufi<sup>1</sup>, \*Erle Austin<sup>2</sup>

**Author Institution(s):** <sup>1</sup>University of Louisville, Louisville, KY; <sup>2</sup>University of Louisville, Kosair Children's Hospital, Louisville, KY

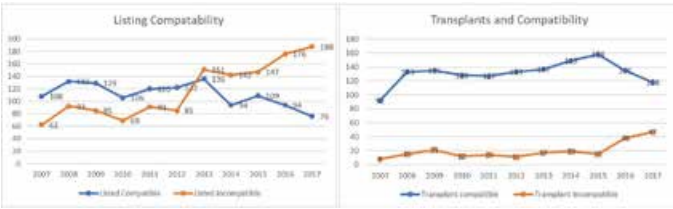
**Discussant:** \*Luca A. Vricella, University of Chicago, Chicago, IL

**Objectives:** ABO incompatible (ABOi) heart transplant (HT) in infants has been utilized to reduce wait list time and mortality and has demonstrated comparable outcomes compared to ABO compatible (ABOc). Prior studies suggested that ABOi outcomes were comparable to ABO compatible (ABOc) HT. We sought to assess trends in ABOi listing and transplantation for infants within the United Network for Organ Sharing (UNOS) registry and to assess its influence on outcomes.

**Methods:** We reviewed infants ( $\leq 1$  year) listed for HT at the UNOS registry (2007-17). We compared demographic and clinical characteristics, wait-list duration, graft survival and 1-year freedom from rejection between patients listed for ABOi and ABOc groups. Cochran-Armitage trend test (CAT), univariate non-parametric statistical methods and Kaplan-Meier curves were used to analyze the data.

**Results:** During the study period, 2514 patients listed for HT, of which 1288 (51%) were listed as ABOi. There was a trend of increased ABOi listing with time (36% in 2007 vs. 71% in 2017,  $p < 0.0001$ ). The median waitlist time for patients listed as blood group O and receiving an ABOi transplant was significantly shorter (43 days vs. 67 days,  $p < 0.0001$ ). Among the 1668 patients who received HT, 220 (13%) were ABOi. The incidence of ABOi HT increased from 8% in 2007 to 28% in 2017 (CAT  $p < 0.0001$ , Figure 1). Patients listed for ABOi HT were more likely to have a lower weight and unoperated congenital heart disease (Table 1). The 1 year post transplant mortality for ABOi patients was higher compared to ABOc (20% vs. 12%,  $p = 0.004$ ). The number of patients treated for rejection within 1 year of HT was similar between ABOi and ABOc groups (8% vs. 10%).

**Conclusion:** The number of infants listed and transplanted as ABO incompatible have gradually increased over the last decade. At 1 year post transplant, rejection is comparable between the ABOi and ABOc groups, however mortality is higher in the ABOi group.



# Listing with ABO Incompatible Organ Acceptance: Baseline characteristics

Baseline (listing)	ListedBNC (n=1288)	ListedComp (n=1226)	p-value
gender (M)	54% (695)	53% (642)	0.4
BMI	14.2 (12.8-26.0)	14.9 (13.4-26.6)	<0.0001
weight (kg)	4.7 (3.3-5.7)	5.8 (3.9-8.0)	<0.0001
height (CM)	14 (50-60)	61 (53-70)	<0.0001
creatinine	0.3 (0.2-0.5)	0.3 (0.2-0.4)	0.06
Albumin	5.2 (2.8-5.6)	5.4 (3.0-5.9)	<0.0001
mean PAPA	21 (18-30)	21 (16-29)	0.8
Diagnosis			
CHD surgery	44% (567)	40% (493)	
CHD*	20% (262)	12% (148)	<0.0001
Idiopathic	19% (243)	22% (268)	
Other	17% (216)	26% (315)	
Bloodtype			
A	37% (474)	35% (425)	
B	12% (157)	13% (160)	
O	50% (646)	50% (617)	0.08
AB	3% (40)	2% (28)	

\*Available for 33% patients only  
 \*CHD with no surgery (see theoplasty, LHS)

Notes:

## SECOND SCIENTIFIC SESSION

### 13. Preoperative Left Atrial Dimension: An Indication for Asymptomatic Mitral Valve Repair?

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**Authors:** Tessa Watt, Alexander Brescia, Liza Rosenbloom, Haley Allgeyer, Sonali Reddy, Shannon Murray, Xiaoting Wu, \***Steven Bolling**

**Author Institution(s):** University of Michigan, Ann Arbor, MI

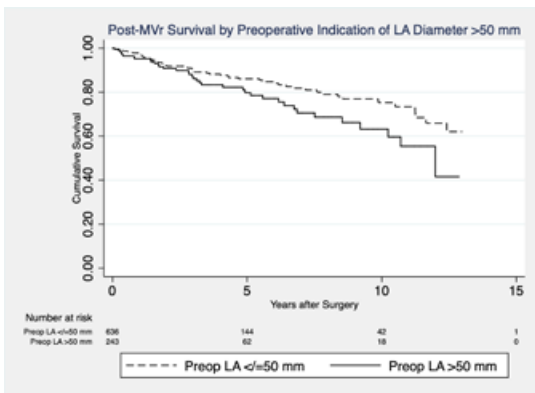
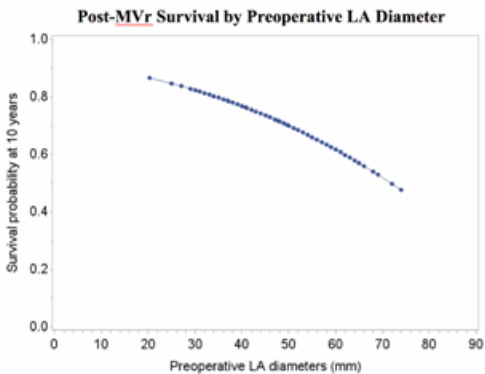
**Discussant:** David M. Shahian, Massachusetts General Hospital, Boston, MA

**Objectives:** Indications for mitral valve repair (MVR) for severe, asymptomatic, primary mitral regurgitation (MR) include EF  $\leq 60\%$ , pulmonary artery systolic pressure (PASP)  $> 50\text{mmHg}$ , left ventricular end systolic dimension (LVESD)  $\geq 40\text{mm}$ , and new onset atrial fibrillation (AF). Left atrial (LA) dilation is one of the earliest sequelae of MR and may be a valuable marker for patients who would benefit from early MVR. In addition, MVR also facilitates LA remodeling back to normal size, offsetting complications of chronic LA enlargement such as AF. Therefore, this study evaluates the association of preoperative LA dimension and LA remodeling with outcomes after degenerative MVR.

**Methods:** Patients without preoperative atrial fibrillation who underwent isolated MVR between 2003 and 2017 at a single institution were identified. Primary endpoint was association between preoperative LA dimension and survival. Secondary endpoint was relationship between postoperative remodeling in LA size and survival. For the remodeling analysis, 42 mm was considered the upper limit of normal LA diameter. Statistical analyses included Cox proportional-hazards model, multivariable logistic regression, and Kaplan-Meier survival analyses. For adjusted analyses, clinically-relevant covariates were included in the model.

**Results:** Among the 879 patients in this study, mean preoperative EF was  $58 \pm 14\%$ . Median time from surgery to postoperative echo was 6 months. For the primary endpoint, preoperative LA diameter inversely correlated with survival at 10 years after MVR (Figure 1,  $p\text{-value}=0.034$ ). In addition, increasing preoperative LA dimension was found to increase odds of death after MVR (OR 1.04 [CI 1.01-1.07],  $p=0.017$ ). Importantly, patients with preoperative LA diameter  $\leq 50\text{mm}$  had significantly improved long-term survival compared to those with preoperative LA diameter  $> 50\text{mm}$  (Figure 2, log-rank  $p=0.038$ ). For the secondary endpoint, patients who had successful postoperative LA remodeling had significantly improved long-term survival compared to those who did not (log-rank  $p<0.001$ ). Furthermore, increasing preoperative LA diameter correlated with increased failure of LA remodeling after MVR (OR 1.06 [CI 1.04-1.08],  $p<0.001$ ).

**Conclusion:** These findings suggest that smaller preoperative LA dimension at time of surgery is associated with both improved survival and likelihood of LA remodeling after MVR. In particular, preoperative LA dimension  $\leq 50\text{ mm}$  conferred a significant long-term survival benefit and should be considered as a potential indication for early mitral surgery.



Notes:

## THIRD SCIENTIFIC SESSION

### 14. The Role of Frailty in Failure to Rescue After Cardiovascular Surgery: Improved Outcomes Seen at High-Performing Cardiac Surgical Centers

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**Authors:** Krish Dewan<sup>1</sup>, Suparna Navale<sup>2</sup>, Sameer Hirji<sup>3</sup>, Siran Koroukian<sup>2</sup>, Karan Dewan<sup>1</sup>, Lars Svensson<sup>1</sup>, A. Marc Gillinov<sup>1</sup>, Eric Roselli<sup>1</sup>, Douglas Johnston<sup>1</sup>, \*Faisal Bakaeen<sup>1</sup>, Edward Soltesz<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Cleveland Clinic, Cleveland, OH; <sup>2</sup>Case Western Reserve University, Cleveland, OH; <sup>3</sup>Brigham and Women's Hospital, Boston, MA

**Discussant:** \*Fred H. Edwards, University of Florida, Jacksonville, FL

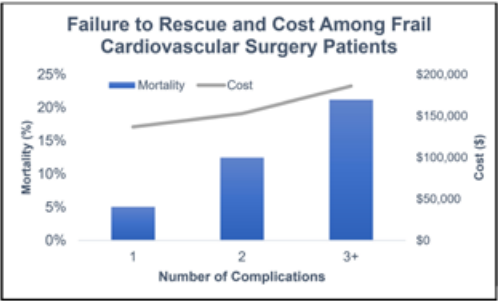
**Objectives:** Failure to rescue (FTR) is gaining popularity as a quality metric. Previous work has demonstrated the contribution of frailty to poor outcomes among patients undergoing cardiovascular surgery. However, the relationship between patient frailty and FTR after cardiovascular surgery has not been fully explored. This study aimed to utilize a national database to examine the impact of patient frailty on FTR.

**Methods:** We identified 5,199,534 patients undergoing cardiovascular surgery (isolated coronary artery bypass graft, isolated valve, isolated aortic, or combination of these) between 2000 and 2014 from the Nationwide Inpatient Sample database. Of these, 75,851 (1.5%) were identified as frail based on the Johns Hopkins Adjusted Clinical Groups (ACG) frailty-defining diagnoses indicator. FTR was defined as mortality in patients with a major complication (respiratory failure, acute renal failure, postoperative bleeding, wound infection, stroke, sepsis, pneumonia, and prolonged mechanical ventilation). Propensity-score matching was used to adjust for patient- and hospital-level characteristics and comorbidities when comparing frail and non-frail patients.

**Results:** Frail patients were older on average ( $68 \pm 12$  vs  $65 \pm 12$ ;  $p < 0.0001$ ) and had more comorbidities including heart failure, and chronic lung, liver, or renal disease. Surgery was more often conducted for an urgent indication (57% [ $n=43,284/75,851$ ] vs 40% [ $n=2,026,912/5,123,683$ ];  $p < 0.0001$ ). Among 68,472 matched pairs, frail patients had significantly higher rates of FTR (8.5% [ $n=5,797/68,472$ ] vs 5.1% [ $n=3,497/68,244$ ];  $p < 0.0001$ ). This contributed to a \$39,796 increase in cost ( $p < 0.0001$ ). When stratified by procedure type, FTR consistently remained higher among frail patients (CABG 6.5% [ $n=2,397/36,907$ ] vs 3.4% [ $n=1,227/36,602$ ]; Valve 10.6% [ $n=1,766/16,667$ ] vs 6.2% [ $n=1,107/16,435$ ]; Combination 11.3% [ $n=1,530/13,580$ ] vs 8% [ $n=1,104/13,883$ ],  $p < 0.0001$  all) with the exception of isolated aortic surgery ( $p=0.18$ ). Renal failure (69% [ $n=4,010/5,797$ ]), respiratory failure (52% [ $n=2,999/5,797$ ]), pneumonia (40% [ $n=2,334/5,797$ ]) and sepsis (38% [ $n=2,204/5,797$ ]) contributed most to FTR in frail patients. When hospitals were stratified by risk-adjusted mortality, low-mortality (1st quintile) centers had significantly lower FTR rates and costs among frail patients when compared to high-mortality (5th quintile) centers.



**Conclusion:** Frailty contributes significantly to FTR after cardiovascular surgery. Frail patients can expect better outcomes with lower costs at cardiac surgical centers of excellence who can adequately manage postoperative outcomes. Preoperative assessment of frailty may better guide risk estimation and identification of patients who would benefit from appropriate pre-habilitative interventions to optimize outcomes.



**Notes:**

## THIRD SCIENTIFIC SESSION

### 15. Concurrent Breast and Lung Cancer is a Common Finding in Women With a History of Smoking

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**Authors:** Tamar Nobel, Raul Caso, Giye Choe, Prasad Adusumilli, Manjit Bains, \*Matthew Bott, Robert Downey, James Huang, \*James Isbell, Bernard Park, Gaetano Rocco, Valerie Rusch, Smita Sihag, \*David Jones, \*Daniela Molena

**Author Institution(s):** Memorial Sloan Kettering Cancer Center, New York, NY

**Discussant:** D\*Alden M. Parsons, WakeMed Health & Hospitals, Raleigh, NC

**Commercial Relationships:** A. Parsons: Ownership Interest: BeeWell

**Objectives:** Breast and lung cancer are the most common malignancies among women in the United States. Concurrent disease has been described, but the frequency, clinicopathologic features and prognosis have not been well described.

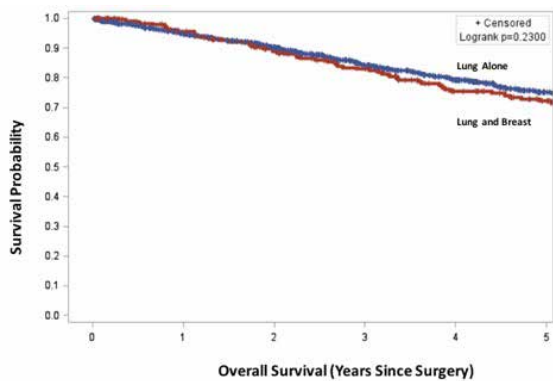
**Methods:** Females with history of breast cancer within 5 years of lung cancer diagnosis were identified from a prospective database of lung cancer resections between 2000-2017 and compared against women undergoing surgery without history of lung cancer.

**Results:** There were 1444 females who met inclusion criteria during the study period; of these, 260 (18%) had concurrent breast cancer. ASA, age and clinical stage did not differ between groups; however, women with concurrent disease had a trend towards more stage I disease at surgery (78% vs 74%).

Females with history of breast cancer had a higher rate of squamous histology than those without (8% vs 4%,  $p=0.006$ ). Most women with concurrent disease had history of smoking ( $N=186$ , 72%) as compared to 256 (22%) of women without concurrent disease ( $p<.0001$ ). Only 33% ( $N=86$ ) of women with concurrent disease met lung cancer screening criteria (age over 55 and 30 pack year history) and in the majority of cases the lung cancer were diagnosed during work-up for the breast cancer. Women with concurrent disease received neoadjuvant therapy less frequently than those without (8% vs 12%,  $p=0.032$ ), while adjuvant therapy was similar between groups.

Although there was no difference in nodal status, pathologic stage, R0 resection or 5-year recurrence risk, 5-year overall survival was lower in females with concurrent breast cancer as compared to no history (75.6% vs 79.7%,  $p=0.230$ ) (Figure 1).

**Conclusion:** Recent breast cancer history is common among females undergoing lung cancer surgery. Although women with history of recent breast cancer are more likely to be smokers, nearly 70% did not meet current criteria for lung cancer screening. Further studies evaluating the prevalence of lung cancer in patients diagnosed with breast cancer are needed to better understand if screening for lung cancer would be helpful in this population.



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## THIRD SCIENTIFIC SESSION

### 16. Outcomes of Tricuspid Valve Surgery in Patients With Functional Tricuspid Regurgitation

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**Authors:** Siddharth Pahwa, Nishant Saran, Alberto Pochettino, \*Hartzell Schaff, \*John Stulak, Kevin Greason, Juan Crestanello, Richard Daly, M. Sertac Cicek, Katherine King, \*Joseph Dearani

**Author Institution(s):** Mayo Clinic, Rochester, MN

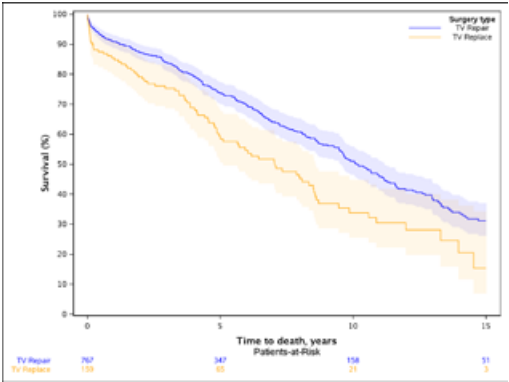
**Discussant:** \*Vinay Badhwar, West Virginia University, Morgantown, WV

**Objectives:** Tricuspid valve (TV) with functional tricuspid regurgitation (TR) has mostly been amenable to TV repair (TVr), with fewer patients needing TV replacement (TVR). We sought to review our experience of TV surgery for functional-TR, and identify the patient-factors associated with repair/replacement and analyze their outcomes.

**Methods:** A retrospective analysis of all patients ( $\geq 18$  years) who underwent primary TV surgery for functional-TR (n=926; mean age  $68.6 \pm 12.5$  years; 67% females) from 1/1993 through 6/2018 was conducted. Functional-TR was defined as TR due to dilated TV annulus ( $\pm$  leaflet tethering) in an otherwise normal TV subsequent to left-sided pathology, pulmonary hypertension and/or atrial fibrillation. There were 767(83%) patients who underwent TVr (Ring annuloplasty, 67%, n=511; Purse string suture annuloplasty, 33%, n=256) and 159(17%) underwent TVR (Bioprosthetic valves, 87%, n=139; Mechanical valves, 13%, n=20). Median follow-up was 8.2 years (95%CI 7.2-8.9 years).

**Results:** The cohort of TVR had a greater proportion of patients with severe TR ( $P < 0.001$ ), congestive heart failure (CHF,  $P = 0.001$ ), previous aortic valve replacement (AVR,  $P = 0.002$ ), previous mitral valve (MV) repair ( $P = 0.010$ ) and replacement ( $P < 0.001$ ) while TVr cohort had a greater proportion with severe MV regurgitation ( $P < 0.001$ ), concomitant AVR ( $P = 0.001$ ), concomitant MV repair ( $P < 0.001$ ) and replacement ( $P < 0.001$ ). Cardiopulmonary bypass and cross-clamp times were longer in TVr cohort ( $P < 0.001$ ). Overall, early-mortality (TVR, 9% vs TVr, 3%;  $P = 0.004$ ), postoperative renal failure (TVR, 10% vs TVr, 5%;  $P = 0.014$ ) and prolonged ventilation (TVR, 25% vs TVr, 17%;  $P = 0.015$ ) were more common in TVR patients. Duration of intensive care unit (TVR,  $139 \pm 330$  hrs vs TVr,  $82 \pm 155$  hrs;  $P = 0.008$ ) and hospital stay (TVR,  $15 \pm 15$  days vs  $12 \pm 11$  days;  $P < 0.001$ ) was longer in TVR patients. Survival at 1, 5, and 10 years was 90%, 71% and 48%, respectively. The TVR cohort had worse survival (HR 1.57, 95%CI 1.23-1.99). Multivariable analysis identified advancing age (HR 1.04, 95%CI 1.03-1.05), CHF (HR 1.37, 95%CI 1.10-1.72), renal failure (HR 1.79, 95%CI 1.14-2.82), previous MV surgery (HR 1.35, 95%CI 1.05-1.72) and TVR (HR 1.36, 95%CI 1.03-1.79) as independent risk factors for late-mortality. Overall, need for reoperation (n=20) was no different between TVR and TVr (HR 1.49, 95%CI 0.40-3.57).

**Conclusion:** In patients with functional-TR, those who undergo TVr have better early and late outcomes with no higher need for reoperation. Functional-TR should be repaired at the time of index MV surgery since both previous MV surgery and TVR were found as independent risk factors for late mortality.



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## THIRD SCIENTIFIC SESSION

### 17. Clinical Outcomes of Non-Cardiac Surgery Patients Requiring Postoperative ECMO

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**Authors:** Harrison Lang, Mitchell Milanuk, John Brady, Elizabeth Lyden,  
\*HelenMari Merritt Genore

**Author Institution(s):** University of Nebraska Medical Center, Omaha, NE

**Discussant:** **D**\*Joseph B. Zwischenberger, University of Kentucky, Lexington, KY

**Commercial Relationships:** J. Zwischenberger: Consultant/Advisory Board: Cytosorbents, Inc.;  
Ownership Interest: Avalon; Research Grant: National Institutes of Health

**Objectives:** The currently published data for post-cardiotomy ECMO report survival rates through hospital discharge between 16% and 58%. However, little to no work has been dedicated to researching the application and successful use of ECMO for non-cardiotomy, postoperative indications such as pneumonectomy, liver transplant, esophagectomy, lung resection, tracheal intervention, and many others. Addressing whether ECMO can be successfully used in the management of these patients could change how physicians approach treating such a complex cohort of patients with an improvement in clinical outcomes and patient survival.

**Methods:** All ECMO events in a four-year time period at our institution were considered. Inclusion criteria were for initiation of ECMO within the index hospitalization for a non-cardiac surgery. Non-cardiac surgeries included six groups: lung resection (n=4), pneumonectomy (n=2), tracheal intervention (n=2), esophagectomy (n=2), liver transplant (n=4), and other (n=6). Descriptive statistics were used to summarize the data. The Mann-Whitney test was used to compare continuous data (median values) between the groups. Fisher's exact test was used to compare categorical data between the groups. A p-value <0.05 was considered statistically significant.

**Results:** Twenty patients were identified who underwent a non-cardiac surgery and required postoperative ECMO. These patients were compared with our larger cohort of 226 patients who required ECMO for all other indications. The types of non-cardiac operations and outcomes are summarized in the table below. Overall, patient characteristics and survival were not different compared to our larger cohort of ECMO patients. Ability to wean from ECMO was 55%, with survival through hospital discharge 50%. Median duration of support was 5.5 days and median hospital length of stay was 30.2 days. The types of ECMO used showed statistically significant difference between the non-cardiac surgery patients (35% VA) and the larger cohort (50% VA). When post-thoracic surgery patients were reviewed independently, their survival rates were similar to the larger cohort as well. There were no survivors in the liver transplant group (n=4).

**Conclusion:** Patients who required ECMO following non-cardiac surgery showed similar outcomes compared to our larger cohort and published ECMO data. In our experience, liver transplant patients who require ECMO are not salvageable. Continued research is needed to elucidate what clinical factors predict more successful outcomes for ECMO used after non-cardiac surgery.

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**Notes:**

## THIRD SCIENTIFIC SESSION

### 18. Unicuspid Aortic Valve Repair Using Geometric Ring Annuloplasty

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**Authors:** Ming-Sing Si<sup>1</sup>, Jennifer Romano<sup>1</sup>, Matthew Romano<sup>1</sup>, Nicholas Andersen<sup>2</sup>, \*John Conte<sup>3</sup>, \*J. Scott Rankin<sup>4</sup>, Lawrence Wei<sup>4</sup>, \*Vinay Badhwar<sup>4</sup>, \*Joseph Turek<sup>2</sup>

**Author Institution(s):** <sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Duke University, Durham, NC; <sup>3</sup>Penn State University, Hershey, PA; <sup>4</sup>West Virginia University, Morgantown, WV

**Discussant:** \*Mark S. Bleiweis, University of Florida, Gainesville, FL

**Objectives:** Unicuspid aortic valve (UAV) disease (Sievers Type 2 bicuspid) is a congenital disorder characterized by major fusion of the right/left (R/L) coronary commissure, and minor fusion of the right/non (R/N). Repair has been difficult because of the two fusions and variable relative sinus sizes, often requiring addition of pericardial leaflet substitutes with mixed results. A repair method using primarily native leaflet tissue could be useful to enhance repair durability.

**Methods:** Twelve patients with UAV defects have undergone successful valve repair in 4 institutions using an internal bicuspid aortic annuloplasty ring. R/L major fusion and RN minor fusion were present in 11/12 (92%), and in one, the major-minor fusions were reversed. A complete commissurotomy was performed on the minor fusion, extending to the aortic wall, occasionally requiring ultrasonic calcium debridement. A bicuspid annuloplasty ring with circular base geometry and two 180° subcommissural posts (Figure 1) was sized as: ring diameter = non-fused leaflet free-edge length/1.8. The ring was sutured beneath the annulus with the 2 posts straddling the non-fused cusp. Annuloplasty ring remodeling equalized the annular circumferences of the fused and non-fused cusps. The non-fused cusp then was pliated to an adequate effective height, and the cleft in the major fusion was closed linearly until leaflet effective heights and lengths were equal.

**Results:** In the 12 patients, average age (Mean ± SD) was 22.3 ± 12.3 years (range 13-58), 6/12 (50%) were symptomatic, 6/12 (50%) required aortic aneurysm resection, and pre-repair hemodynamic data included: mean systolic valve gradient 27.8 ± 14.6 mmHg, aortic insufficiency (AI) grade 2.7±1.1, and annular diameter 25.0 ± 3.4 mm. No mortality or major complications occurred, although 1 patient required reoperation for bleeding. Native leaflet tissue was completely adequate in 11/12 (92%), and 1 patient required a small pericardial commissural augmentation. At an average follow-up of 8 months (range 1-16), all 12 patients were asymptomatic. Post-repair, mean valve gradient fell to 18.1±5.5 mmHg, AI grade decreased to 0.3±0.5, and annular (ring) size was 20.7±1.5 mm (all p<0.0001). All patients returned to full activity.

**Conclusion:** Repair of UAV is enhanced by bicuspid aortic ring annuloplasty. Annular diameter is reduced effectively, recruiting more leaflet to mid-line coaptation. Minor fusion commissurotomy and annular remodeling to 180° commissures converts the procedure to a simple Sievers Type 1 repair, and importantly, pericardial tissue substitutes are minimized. This approach shows promise, but continued experience and follow-up are required for full validation.





**Notes:**

## THIRD SCIENTIFIC SESSION

### 19V. Aortic Valve Neocuspidization (Ozaki Procedure) for Pediatric and Congenital Aortic Valve Disease

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**Authors:** \*Damien LaPar<sup>1</sup>, Emile Bacha<sup>2</sup>

**Author Institution(s):** <sup>1</sup>Columbia University College of Physicians and Surgeons, New York, NY; <sup>2</sup>Columbia University College of Physicians and Surgeons, Weill Cornell College of Medicine, New York, NY

**Discussant:** \*Mark S. Bleiweis, University of Florida, Gainesville, FL

**Objectives:** Congenital aortic valve disease remains a frequent surgical dilemma confronted by pediatric and congenital cardiac surgeons. While the Ross procedure remains the gold-standard surgical treatment for complex aortic valve disease, certain patient populations remain high risk for long-term autograft failure. Aortic valve neocuspidization (Ozaki procedure) provides an attractive alternative to other surgical therapies for aortic valve disease, including the potential to accommodate aortic annular growth among pediatric patients.

**Methods:** In the video, we demonstrate a successful aortic valve neocuspidization procedure in an 11-year-old (34 kg) patient with bicuspid aortic valve and progressive moderate aortic insufficiency. The patient had an AV peak gradient of 26mmHg, mildly dilated aortic root (Z+2.7), and severely dilated left ventricle (LVEDV 155ml, Z+15) with preserved function. Surgical repair utilized customized autologous pericardial leaflets.

**Results:** Post-operative transesophageal echocardiography demonstrated a successful repair with well-functioning aortic valve leaflets, no aortic insufficiency, no LVOT, and good biventricular function. The patient was extubated on postoperative day 0 and ultimately discharged home on postoperative day 4. Serial follow-up visits have continued to show an asymptomatic patient with well-functioning aortic valve leaflets, no aortic insufficiency and normal biventricular function. The patient has not required any catheter-based or surgical reinterventions.

**Conclusion:** The aortic valve neocuspidization (Ozaki procedure) repair can be performed safely and with good results in pediatric patients. This technique has inherent advantages for properly selected patients with bicuspid aortic valve disease and predominant aortic insufficiency, aortic root/annular dilation, and in those where other aortic valve replacement options are contraindicated. Long-term results on valve durability are needed.

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**Notes:**

## THIRD SCIENTIFIC SESSION

### 20. Preoperative Nutrition-Enhanced Recovery After Surgery (N-ERAS) Protocol for Thoracic Cancer Resections

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**Authors:** \*Lary Robinson<sup>1</sup>, Tawee Tanvetyanon<sup>1</sup>, Deanna Grubbs<sup>1</sup>, Noah Robinson<sup>2</sup>, Christine Pierce<sup>1</sup>, Kevin McCarthy<sup>1</sup>, Rosemarie Garcia Getting<sup>1</sup>, Sephalie Patel<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Moffitt Cancer Center, Tampa, FL; <sup>2</sup>Georgia Institute of Technology, Atlanta, GA

**Regulatory Disclosure:** This presentation describes the off-label use of Impact Advanced Recovers, a unique immunonutrition beverage specially formulated to help support the body's nutrient needs before and after major surgery, whether they are malnourished or not. This presentation describes the off-label use of ClearFast, a palatable preoperative drink that safely hydrates and nourishes patients before anesthesia and major surgery.

**Discussant:** \*Richard K. Freeman, St. Vincent Hospital and Health System, Indianapolis, IN

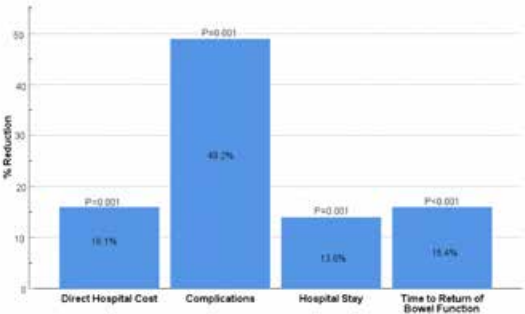
**Objectives:** Since studies have documented that the preoperative nutritional status strongly influences perioperative outcomes in major surgical procedures, we developed a program to decrease postoperative morbidity and improve results by optimizing preoperative nutrition in patients undergoing thoracic cancer resections. Based on published studies, we instituted a preoperative nutritional protocol for patients over a 2-year period and compared results to a cohort from the 2 years immediately prior to starting this program.

**Methods:** We performed a retrospective review of patients undergoing curative thoracic neoplasm resections from July 15, 2016 to July 15, 2018 who underwent a preoperative nutritional-enhanced recovery after surgery protocol (N-ERAS) consisting of: (a) 5 days of an oral immunonutrition drink three times a day, (b) daily probiotics and (c) a complex carbohydrate loading drink the preoperative night. A historical control cohort (Standard nutrition) were patients undergoing surgery operated on by the same surgeon during the prior 24 months. Surgical procedures for esophageal, diagnostic, benign, emergency or palliative reasons were excluded. Non-parametric and parametric statistical tests were employed for this analysis.

**Results:** 462 patients were analyzed. For the N-ERAS group, there were 229 patients (89/140 men/women), mean age 67.6 (range 30-88), mean post-bronchodilator %FEV1 88.6±18.3 (range 43-146), mean serum albumin 4.3±0.3gm/dl (range 3.3-5.1) and mean Charlson Co-Morbidity Index 5.8±2.8 (range 0-15). For the Standard group, there were 233 patients (105/128 men/women), mean age 65.8 (range 23-88), mean post-bronchodilator %FEV1 85.2±20.0 (range 31-135), mean serum albumin 4.2±0.4gm/dl (range 2.4-5.1) and mean Charlson Co-Morbidity Index 5.5±2.8 (range 0-15). There were no significant differences among groups for demographics and surgical caseload. There was 100% patient compliance with N-ERAS although 2 patients (0.9%) stopped early due to diarrhea. Major significant postop outcome differences are shown (Table/Image). There was a 16% reduction (\$2,198) in mean direct hospital costs/patient with N-ERAS. Consequently, for the N-ERAS cohort, the hospital was likely saved \$503,342 in costs over the two-year period for the 229 patients just by using the N-ERAS protocol.

**Conclusion:** Use of this patient-compliant, inexpensive nutrition protocol is associated with improved results. Thoracic surgeons should consider using the N-ERAS protocol for their major surgical patients with an expectation of improved clinical results at a lower hospital cost--an important consideration when exploring ways to decrease costs in the prospective payment environment.

POSTOPERATIVE VARIABLES	STANDARD PATIENTS (n=233)	N-ERAS PATIENTS (n=229)	p VALUE
Patients without any complication, No. (%)	173 (74.2%)	199 (86.9%)	<0.001
Flatus or BM, Postop day Number, mean ± SD	1.3 ± 0.5	1.1 ± 0.3	0.001
Mild Discharge Pain Medicine (Hydrocodone, Tramadol, Ibuprofen or Acetaminophen), No. (%)	131 (56.2%)	153 (67.1%)	0.02
Hospital Stay, Days, Mean ± SD, (median)	4.4±2.6 (4)	3.8±1.9 (3)	0.001
Hospital Costs, \$US, Mean ± SD	\$13,714 ± 7163	\$11,516 ± 4551	<0.001



Notes:

## THIRD SCIENTIFIC SESSION

### 21V. First Successful Implant of Endovascular Aortic Arch Device in the United States

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**Authors:** \*Puja Kachroo, Rahul Handa, J. Westley Ohman, Luis Sanchez, \*Marc Moon

**Author Institution(s):** Washington University School of Medicine, St. Louis, MO

**Regulatory Disclosure:** This presentation describes the use of RelayPlus, a Bolton Medical device that is currently undergoing feasibility studies in the United States; this device has an FDA status of Investigational.

**Objectives:** Endovascular treatment options for aortic arch aneurysms are limited secondary to the variability of arch anatomy. We present the first successful implant of an off-the-shelf endovascular device that provides Zone 0 coverage for a distal aortic arch aneurysm.

**Methods:** Using a combination of live video and fluoroscopic images from the operating room, we outline the steps of the implant procedure.

**Results:** This video captures the first successful implantation of an endovascular stent device that covers from Zone 0 to the proximal descending aorta. It also accommodates limbs to the innominate artery and the left common carotid artery and provides flow to the left subclavian artery via bypass graft.

**Conclusion:** The use of this endovascular off-the-shelf device can successfully treat aneurysms of the entire aortic arch. This device is currently undergoing early feasibility studies and may provide a future option for the endovascular treatment of high surgical risk patients.

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**Notes:**

## FOURTH SCIENTIFIC SESSION A - ADULT CARDIAC BREAKOUT

### 22. Patient-Reported Outcomes at One Year Define Successful Cardiac Surgery

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**Authors:** Eric Charles<sup>1</sup>, \*James Mehaffey<sup>1</sup>, \*Robert Hawkins<sup>1</sup>, China Green<sup>1</sup>, Ashley Craddock<sup>1</sup>, Zachary Tyerman<sup>1</sup>, Nathaniel Larson<sup>1</sup>, \*Irving Kron<sup>1</sup>, \*Gorav Ailawadi<sup>2</sup>, \*Benjamin Kozower<sup>3</sup>

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**Discussant:** \*Felix G. Fernandez, Emory University, Atlanta, GA

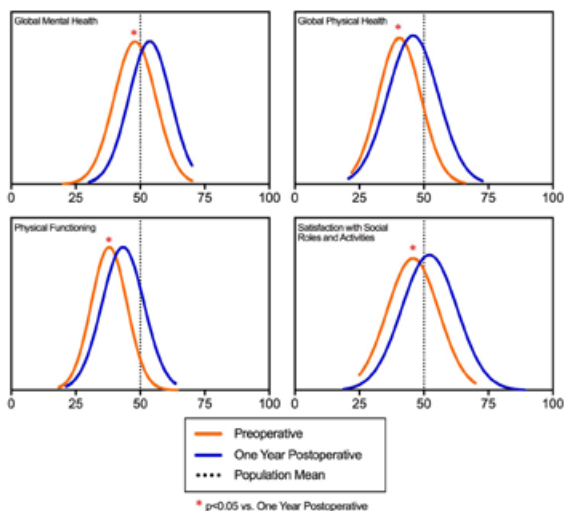
**Objectives:** Current risk algorithms and quality measures focus on 30-day perioperative outcomes, which fall woefully short of defining true success after cardiac surgery. No data exist to accurately counsel patients on expected meaningful outcomes, such as long-term well-being, functionality, and independence. Our objective was to define long-term quality by prospectively measuring patient-reported outcomes before and one year following cardiac surgery.

**Methods:** Patients undergoing cardiac surgery at an academic medical center (2016-2017) were eligible for preoperative enrollment. Patient-reported outcomes were assessed using the NIH Patient-Reported Outcomes Measurement Information System (PROMIS) both before and one year after cardiac surgery in the following five domains: global mental health, global physical health, physical functioning, satisfaction with social roles and activities, and applied cognition. Baseline data and perioperative outcomes were obtained from the Society of Thoracic Surgeons adult cardiac database. The effect of cardiac surgery on long-term patient-reported quality of life was assessed, along with the impact of hospital discharge to a facility.

**Results:** Ninety-eight eligible patients were enrolled preoperatively with 92.9% (91/98) successful follow-up at one year. Median age was 69 [61-75] years. The most common operation was CABG (63.3% [62/98]), with approximately two-thirds of enrolled patients undergoing an elective operation (60.2% [59/98]). Rate of major morbidity was 11.2% (11/98) and operative mortality was 2% (2/98). One-year all-cause mortality was 5.1% (5/98). Cardiac surgery significantly improved patient-reported outcomes at one year across four NIH PROMIS domains: global mental health (Preop: 47.3±7.7 vs. Postop: 51.1±8.9, p=0.0004), global physical health (41.2±8.2 vs. 46.3±9.3, p=0.0003), physical functioning (39.8±8.6 vs. 44.8±8.5, p<0.0001), and satisfaction with social roles and activities (46.8±10.9 vs. 50.7±10.8, p=0.022, Figure). Mean postoperative scores in applied cognition were not different compared with preoperative values. Hospital discharge to a facility did not affect one-year patient-reported outcomes.

**Conclusion:** Durable improvement in patient-reported outcomes defines successful cardiac surgery. Mental, physical, and social well-being scores were significantly higher one year after cardiac surgery compared with preoperative values. Data collection with NIH PROMIS provides meaningful, quantifiable results critical to inform medical decision-making and should be used to assess true quality.





Notes:

## FOURTH SCIENTIFIC SESSION A - ADULT CARDIAC BREAKOUT

### 23. Longer-Term Outcomes of Coronary Bypass Surgery With and Without Mitral Valve Repair in Moderate Ischemic Mitral Regurgitation

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**Authors:** Laura Seese, Keith Dufendach, Ibrahim Sultan, Edgar Aranda-Michel, Thomas Gleason, Yisi Wang, Floyd Thoma, Arman Kilic

**Author Institution(s):** University of Pittsburgh Medical Center, Pittsburgh, PA

**Discussant:** **D**\*Steven F. Bolling, University of Michigan, Ann Arbor, MI

**Commercial Relationships:** Consultant/Advisory Board: Abbott, Boston Scientific, Edwards Lifesciences

**Objectives:** Although randomized trial data exists for 2-year outcomes comparing isolated coronary artery bypass grafting (CABG) versus CABG with concomitant mitral valve repair (CABG+MVR) in the setting of moderate ischemic mitral regurgitation (IMR), longer-term outcomes are unclear. This study evaluated longitudinal outcomes of CABG versus CABG+MVR for moderate IMR.

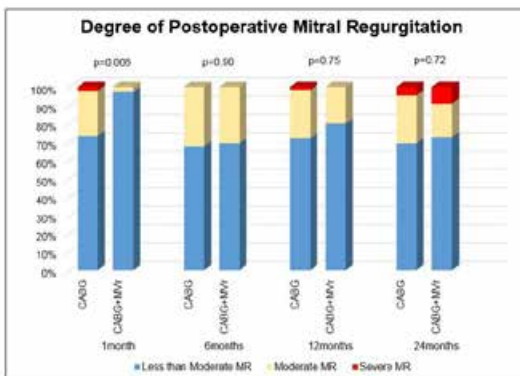
**Methods:** Patients with moderate IMR undergoing isolated CABG or CABG+MVR from January 2010 to February 2018 at a single institution were included. Primary outcomes included 5-year survival and freedom from heart failure readmission. Secondary outcomes included longitudinal freedom from persistent or recurrent moderate mitral regurgitation and changes in left ventricular end diastolic diameter (LVEDD). Multivariable Cox regression was used for risk-adjustment.

**Results:** 578 patients underwent isolated CABG (n=528) or CABG+MVR (n=50) in the setting of moderate IMR. Survival at 30-days (98.0% vs 95.8%, p=0.71), 1-year (96.0% vs 89.6%, p=0.20), and 5-years (75.2% vs 76.6%, p=0.90) was similar. The 5-year freedom from readmission for heart failure were also similar (28.0% vs 28.3%, p=0.96). The comparable survival and freedom from heart-failure readmission at 5 years persisted in risk-adjusted analysis (**Table**). Patients undergoing isolated CABG had higher rates of at least moderate mitral regurgitation at 1-month although this difference no longer persisted by 6 months postoperatively (**Figure**). Rates of severe mitral regurgitation were very low in both groups (0% in both groups at 6-months, 1.5% isolated CABG vs 0% CABG+MVR at 1-year and 2.2% isolated CABG vs 0% CABG+MVR at 5-years; each p>0.05). There were no reoperations on the mitral valve in either cohort. LVEDD was comparable at each time interval (each p>0.05).

**Conclusions:** The majority of patients undergoing coronary revascularization in the setting of moderate IMR can undergo isolated CABG without an adverse longer-term impact on survival or heart failure readmission. Rates of recurrent or persistent mitral regurgitation equalize at 6 months and the vast majority do not progress to severe regurgitation. These data support the use of isolated CABG in patients with moderate IMR.

Multivariable Cox Proportional Hazards Models			
5-Year Heart Failure Readmission			
Variable	Hazard Ratio	95% Confidence Interval	P Value
CABG	Reference	Reference	Reference
CABG+MVR	0.80	0.50, 1.28	0.36
BMI (increasing)	1.03	1.01, 1.06	0.003
Serum Albumin (increasing, per 1g/dL)	0.75	0.57, 0.97	0.03
Chronic Obstructive Pulmonary Disease	1.49	1.13, 1.97	0.0045
Cerebrovascular Disease	1.34	1.02, 1.77	0.04
5-Year Mortality			
CABG	Reference	Reference	Reference
CABG+MVR	0.88	0.44, 1.75	0.71
Peripheral Arterial Disease	1.89	1.24, 2.91	0.003
Serum Albumin (increasing, per 1g/dL)	0.54	0.37, 0.78	0.001
Serum Creatinine (increasing, per 1mg/dL)	1.23	1.08, 1.41	0.002
Congestive Heart failure	1.71	1.11, 2.62	0.02

Abbreviations: BMI, body mass index; CABG, coronary artery bypass grafting; CABG+MVR, combined coronary artery bypass grafting and mitral valve repair



Notes:

## FOURTH SCIENTIFIC SESSION A - ADULT CARDIAC BREAKOUT

### 24V. One Stage Repair With Primary Fistula Closure for Huge Aorto-Esophageal Fistula After TEVAR

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**Authors:** Toshiki Fujiyoshi<sup>1</sup>, Usman Ahmad<sup>2</sup>, Kyle Miletic<sup>2</sup>, Siva Raja<sup>1</sup>, Patrick Vargo<sup>1</sup>, Emídio Germano<sup>1</sup>, Eric Roselli<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Cleveland Clinic, Cleveland, OH; <sup>2</sup>Cleveland Clinic Foundation, Cleveland, OH

**Objectives:** Aorto-esophageal fistula (AEF) is a rare complication after aortic surgery and is generally fatal without surgical treatment. Despite significant refinement in surgical techniques, the operative mortality of AEF repair is still high because of these patients often present in poor condition and may require frequent surgery.

**Methods:** An 80-year-old woman, who had a history of TEVAR for a saccular descending aortic aneurysm 4 months prior. After TEVAR, during the follow-up period, both clinical and radiological course was uneventful until he was admitted to emergency department for hematemesis and chest pain. Contrast-enhanced CT examination showed free air around descending aortic endovascular stent graft. The esophagus is dilated and thickened, and there are significant thrombi within the esophagus lumen. Esophagogastroduodenoscopy found a blood clot in the esophagus or stomach. There was 8 cm huge aorto-esophageal fistula at 30 cm from the incisors.

**Results:** After left posterolateral thoracotomy, we successfully performed one stage repair of aorto-esophageal fistula with 26mm rifampin-soaked graft with left heart bypass, primary repair of esophagus with mucosa-to-mucosa repair and buttress repair with remaining aortic wall, and omental flap placed after wrapped-around the graft with Bovine pericardium.

After the operation, she discharged from hospital in stable condition without spinal code ischemia and esophageal fistulae.

**Conclusions:** We report a case of one stage repair with primary fistula closure for huge aorto-esophageal fistula after TEVAR.

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**Notes:**

## FOURTH SCIENTIFIC SESSION A - ADULT CARDIAC BREAKOUT

### 25. Development of a Readmission Risk Score for Coronary Artery Bypass Graft Surgery

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**Authors:** Rodrigo Zea-Vera, Qianzi Zhang, Rohan Shah, \*Subhasis Chatterjee, \*Matthew Wall, \*Todd Rosengart, \*Ravi Ghanta

**Author Institution(s):** Baylor College of Medicine, Houston, TX

**Discussant:** Jo Chikwe, Mount Sinai Health System, New York, NY

**Objectives:** Readmission after coronary artery bypass grafting (CABG) is increasingly utilized for quality metrics and may negatively impact hospital reimbursement. Our objective was to develop a clinical point system that can be utilized to predict 90-day readmission risk for CABG patients and identify at-risk patients.

**Methods:** Using the National Readmission Databases between 2013 and 2014, we identified a cohort of 104,930 patients who were discharged after undergoing isolated CABG. Using structured random sampling, patients were divided into a derivation cohort (n=62,958; 60%) and a validation cohort (n=41,972; 40%). In the training data set, we utilized multivariate analysis to identify statistically significant risk factors. A point system risk score was developed from the selected predictive model based on the magnitude of odds ratios (OR) and its performance was assessed. Risk score was not assigned to variables with OR < 1.3 to reduce statistical noise. Test accuracy was defined as number of correctly identified cases divided by number of patients in the cohort.

**Results:** The overall 90-day readmission rate after CABG was 19% (n=20,193). Fourteen variables were found significantly associated with increased risk of 90-day readmission (Table). From these variables, a point system was derived and a summative readmission risk score, ranging from 0 to 52, could be calculated for each patient. The median readmission risk score was 13 for readmitted patients and 9 for non-readmitted patients. The three largest scores were assigned to patients who stayed in the hospital more than 10 days after surgery (score=10), had Medicaid (score=7), and were discharged to short term hospital or skilled nursing facility (score=5). Model c-statistic was 0.7. We identified a threshold of 18 points for the risk score to predict 90 day readmission with an accuracy of 77%.

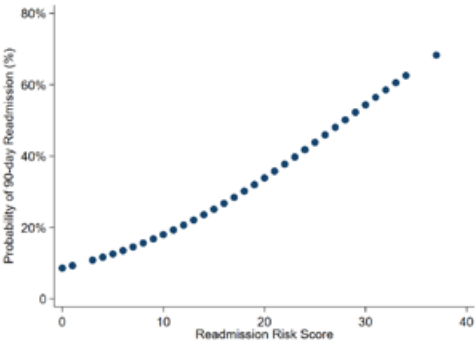
**Conclusions:** Ninety-day readmission after CABG surgery is most likely in patients with prolonged length of stay, Medicaid status, and discharge to skilled nursing facility. A clinical readmission risk score has been developed to identify high-risk patients who may need additional post-discharge resources to reduce the incidence of readmissions.

Table: Predictive Model of 90-day Readmission After CABG with Point Scores

	OR	95% CI	P VALUE	READMISSION RISK POINTS
LENGTH OF STAY*				
>= 10 DAYS	1.946	[1.774, 2.135]	<.001	10
5-10 DAYS	1.261	[1.157, 1.375]	<.001	3
INSURANCE*				
MEDICAID	1.695	[1.561, 1.84]	<.001	7
MEDICARE	1.296	[1.23, 1.366]	<.001	3
SELF/OTHER	1.099	[1.004, 1.203]	0.04	1
DISCHARGE TO SNF*	1.503	[1.424, 1.585]	<.001	5
CONGESTIVE HEART FAILURE	1.386	[1.127, 1.705]	0.002	4
RENAL FAILURE	1.387	[1.308, 1.47]	<.001	4
PERIPHERAL VASCULAR DISEASE	1.383	[1.305, 1.466]	<.001	4
LIVER DISEASE	1.373	[1.171, 1.611]	<.001	4
INFECTION	1.37	[1.098, 1.709]	0.005	4
FEMALE	1.331	[1.27, 1.395]	<.001	3
ACUTE KIDNEY INSUFFICIENCY	1.286	[1.214, 1.363]	<.001	NI
CHRONIC PULMONARY DISEASE	1.279	[1.215, 1.347]	<.001	NI
ATRIAL FIBRILLATION	1.172	[1.118, 1.228]	<.001	NI
PNEUMONIA	1.221	[1.117, 1.334]	<.001	NI
NON-ELECTIVE SURGERY	1.084	[1.034, 1.135]	<.001	NI

\*Reference groups: Length of stay < 5 days; had private insurance; discharged home. NI, Not included due to low additive risk

Figure: Plot of Probability of 90-day Readmission by Developed Clinical Point Risk Score:



Notes:

## FOURTH SCIENTIFIC SESSION A - ADULT CARDIAC BREAKOUT

### 26. Bicuspid Aortic Valve Repair: Causes of Valve Failure and Long Term Outcomes

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**Authors:** Sri Harsha Patlolla, \*Hartzell Schaff, \*John Stulak, Hector Michelena, Nishant Saran, Katherine King, \*Joseph Dearani

**Author Institution(s):** Mayo Clinic, Rochester, MN

**Discussant:** Prashanth Vallabhajosyula, University of Pennsylvania Health System, Philadelphia, PA

**Objectives:** Repair of bicuspid aortic valve (BAV) for aortic regurgitation (AR) has favorable early and midterm outcomes, but impact of natural disease progression on durability of repair is uncertain. Further, it is unclear if prosthetic replacement yields similar or superior outcomes. We investigated long-term results of BAV repair and compared these outcomes to patients with BAV and AR undergoing aortic valve replacement (AVR) after propensity and age adjustment.

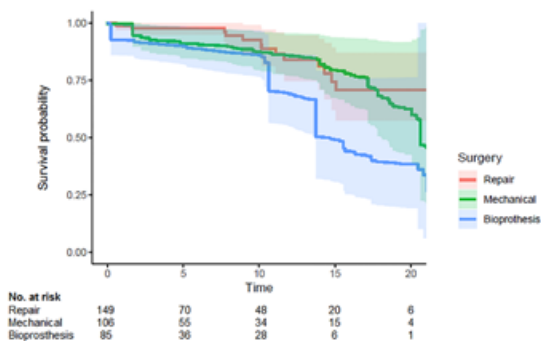
**Methods:** Between Jan 1993 and Jan 2017, 149 patients underwent repair of BAV. Mean age at BAV repair was  $41.7 \pm 13.3$  years. Subsequent AVR was required in 31 patients. Indication for reoperation was AR in 20 (64.5%) and aortic stenosis in 11 (35.5%) patients. For comparison to AVR, propensity score was utilized for predicting valve repair based on preoperative and operative characteristics using gradient boosting machine model and estimated the average treatment effect among those having repair for outcomes. Cox proportional hazard regression was used to compare the effect of replacement versus repair.

**Results:** Causes of late valve dysfunction in patients undergoing subsequent AVR (n=31) included cusp calcification or fibrosis (n=19, 61.3%), repair failure (n=5, 16.2%), and cusp prolapse (n=2, 6.4%) with intact repair. In the remaining 5 (16.1%) patients, AVR was done for moderate valve dysfunction as a concomitant procedure to avoid future operation. Survival at 10, and 15 years after BAV repair was 92.8% and 74.5%, respectively. Cumulative incidence of reoperation after BAV repair was 8.7%, 31.8% and 53.2% at 5, 10 and 15 years, respectively. Bioprosthetic AVR (n=85) had higher late mortality compared to BAV repair (n=149); HR 2.78, 95% CI 1.22-6.36; P=0.01, but late mortality following mechanical AVR (n=106) was similar (HR 1.32, 95% CI 0.60-2.91; P=0.49). Incidence of reoperation after bioprosthetic AVR was similar to incidence of reoperation after BAV repair; however, mechanical AVR showed significant advantage (HR 0.13, 95% CI 0.04-0.36, P<0.001).

**Conclusions:** Disease progression with calcification or fibrosis are the most common causes of valve failure after BAV repair, and thus, refinements in patient selection and operative techniques are unlikely to have a major impact on late durability. Clinical outcomes of BAV repair for AR appear superior to bioprosthetic AVR.



Kaplan-Meier estimator weighted by the propensity score estimated for the average treatment effect among those treated with repair



Notes:

## FOURTH SCIENTIFIC SESSION A - ADULT CARDIAC BREAKOUT

### 27V. A Transcatheter Solution for Pure Aortic Insufficiency

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**Authors:** James Edelman<sup>1</sup>, \*Christian Shults<sup>2</sup>, Lowell Satler<sup>3</sup>, I. Itsik Ben-Dor<sup>3</sup>, Toby Rogers<sup>3</sup>, Ron Waksman<sup>3</sup>, \*Vinod Thourani<sup>2</sup>

**Regulatory Disclosure:** This presentation will describe the use of the Jena Valve, a device that has an FDA status of Investigational.

**Author Institution(s):** <sup>1</sup>Medstar Heart and Vascular Institute, Washington, DC; <sup>2</sup>MedStar Heart and Vascular Institute/ Georgetown University School of Medicine, Washington, DC; <sup>3</sup>MedStar Washington Hospital Center, Washington, DC

**Objectives:** Severe aortic insufficiency (AR) represents >10% of patients with clinically significant valvular heart disease. The standard of care for treatment of AR is aortic valve replacement (AVR). However, unlike for the treatment of aortic stenosis and mitral regurgitation, there is no commercially available transcatheter solution for patients who are inoperable, or high risk for surgery. In this Video, we show the first implantation of a transcatheter device for the treatment of pure AR in the United States.

**Methods:** The Jena Valve uses locators, placed in the nadirs of the sinuses of valsalva (SOV), with fluoroscopic guidance. These locators optimize valve height, and serve to 'clip' the native valve leaflets against the body of the prosthesis once the valve is deployed. This secures the valve in the absence of calcium and prevents paravalvular leak. The valve is delivered via percutaneous common femoral artery access. We perform the procedure with conscious sedation, in the cardiac catheterization laboratory. A transthoracic echocardiogram is performed 'on-table' prior to decannulation of the large-bore sheath.

**Results:** 2 cases are presented. A 75 years old male with severe, symptomatic AR was deemed high-risk for surgery. He had undergone previous CABG, had an impaired left ventricle [(LV); ejection fraction (EF) 40%], FEV1 45% predicted and was frail. His STS predicted risk of mortality score was 7.9%. Iliofemoral access and aortic root anatomy was satisfactory for the device. The procedure was performed using general anesthesia with transesophageal echocardiogram as it was the first device implanted in the US. The locators were placed in the nadirs of the SOV before deployment of the valve. There was trace AR at the conclusion of the case and the patient was discharged on day 2, after placement of a permanent pacemaker. By 6 months he was in NYHA I.

A 52 years old man with symptomatic, severe AR was deemed high-risk for surgery due to advanced motor neuron disease. He had an impaired LV with EF 35%. The procedure was performed with conscious sedation, in a technique otherwise similar to that of the first case. The procedure was successful, with only trace AR after valve deployment. He had an uncomplicated admission, and had no symptoms at 30 day follow-up.

**Conclusions:** The Jena Valve is being investigated in a single arm trial for the treatment of AR. The device may be a solution for patients with severe aortic insufficiency that are unable to undergo surgery.

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**Notes:**

### 28. Outcomes Following Thoracic Metastasectomy in Patients With Metastatic Germ Cell Tumors

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**Authors:** Raul Caso, Gregory Jones, Kay See Tan, Darren Feldman, Samuel Funt, Victor Reuter, Manjit Bains, \*David Jones

**Author Institution(s):** Memorial Sloan Kettering Cancer Center, New York, NY

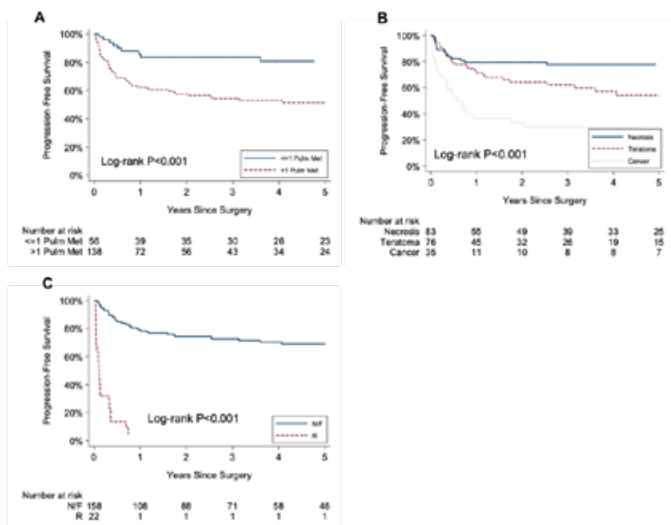
**Discussant:** \*Joe B. Putnam, Jr., Baptist MD Anderson Cancer Center, Jacksonville, FL

**Objectives:** Germ cell tumors (GCTs) are a common cancer in men between the ages of 15 and 35 years. We reviewed our experience and oncologic outcomes in patients with metastatic GCTs following post-chemotherapy thoracic metastasectomy.

**Methods:** We performed a retrospective review of a prospectively maintained database of patients that underwent thoracic metastasectomy for metastatic GCTs at our institution. The primary objective was to identify factors associated with progression-free survival (PFS) and overall survival (OS). PFS and OS were estimated using the Kaplan-Meier approach, and factors associated with PFS and OS were identified using Cox regression.

**Results:** Between 2000 and 2018, 194 patients (median age 29 years, range 13-66) with metastatic GCTs (3.6% seminoma, 96.4% NSGCT) underwent thoracic metastasectomy. Median follow-up was 3.9 years (95%CI 3.3-4.9). Primary disease sites included testes (97.4%) and retroperitoneum (2.6%). Common induction regimens were BEP (57%) and EP (30%). 76% underwent an RPLND. 87% had normal/falling preoperative tumor markers. The most common approach was a posterolateral thoracotomy (48%); 40% underwent a thoracoscopic approach. Surgical sites included: pulmonary only (69%), mediastinal only (23%), and combined pulmonary and mediastinal (8%). 95% had an R0 resection. Final pathology included: necrosis (43%), teratoma (39%), viable non-teratomatous GCT (cancer; 18%). No intraoperative mortalities occurred. 88% had normal/falling postoperative tumor markers. 30-day complications were 7%. There were three 90-day deaths (1.5%). Estimated 5-year PFS and OS were 60% (95%CI 52-67) and 84% (95%CI 77-89), respectively. Multivariable analysis identified multiple pulmonary metastases ( $P=0.019$ ; **Figure 1A**), total metastasis sites ( $P=0.004$ ), teratoma ( $P=0.001$ ) and viable cancer ( $P<0.001$ ) on final pathology (**Figure 1B**), and rising postoperative tumor markers ( $P<0.001$ ; **Figure 1C**) as predictive of shorter PFS. Rising preoperative tumor markers ( $P=0.007$ ), viable cancer on final pathology ( $P=0.001$ ), and rising postoperative tumors markers ( $P=0.001$ ) were independently associated with worse OS on multivariable analysis.

**Conclusions:** Post-chemotherapy thoracic metastasectomy in select patients with metastatic GCTs at a high-volume center is associated with a low morbidity, mortality, and encouraging overall survival. In this contemporary cohort, high tumor burden, multiple pulmonary metastases, teratoma and viable malignancy on final pathology, and rising postoperative tumor markers were independently associated with shorter PFS after thoracic metastasectomy. These findings justify aggressive surgical management of select patients with residual metastatic disease following chemotherapy.



Notes:

## FOURTH SCIENTIFIC SESSION A - THORACIC BREAKOUT

### 29. Re-Resecting to a Negative Margin After an Initial Positive Esophagectomy Margin Enhances Progression Free Survival

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**Authors:** Sahar Saddoughi<sup>1</sup>, Kyle Mitchell<sup>2</sup>, Kristin Fruth<sup>1</sup>, Mark Allen<sup>1</sup>, \*K. Robert Shen<sup>1</sup>, Francis Nichols<sup>1</sup>, Scott Harmsen<sup>1</sup>, \*Stephen Cassivi<sup>1</sup>, Dennis Wigle<sup>1</sup>, Jim Taswell<sup>1</sup>, Taofic Mounajjed<sup>1</sup>, \*Garrett Walsh<sup>2</sup>, \*Reza Mehran<sup>2</sup>, \*Wayne Hofstetter<sup>2</sup>, \*Stephen Swisher<sup>2</sup>, Jack Roth<sup>2</sup>, \*Boris Sepesi<sup>2</sup>, \*Ara Vaporicyan<sup>2</sup>, \*David Rice<sup>2</sup>, \*Mara Antonoff<sup>2</sup>, \*Shanda Blackmon<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Mayo Clinic, Rochester, MN; <sup>2</sup>University of Texas, MD Anderson Cancer Center, Houston, TX

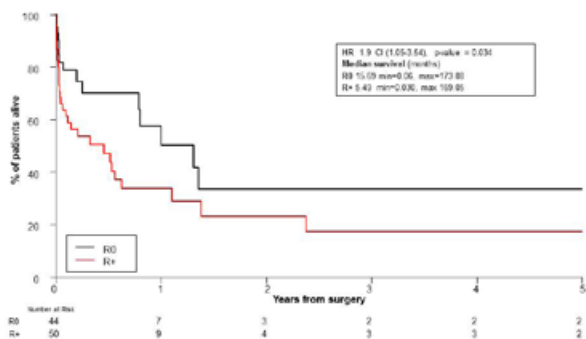
**Discussant:** \*Daniela Molena, Memorial Sloan Kettering Cancer Center, New York, NY

**Objectives:** There is heterogeneity with regard to how thoracic surgeons manage intraoperative positive esophagectomy margins. A recent survey demonstrated that thoracic surgeons are less likely to re-resect a positive gastric margin. To address this problem, we sought to determine the effect of re-resection of intraoperative positive frozen section margin on overall and progression-free survival in esophageal cancer patients.

**Methods:** Data from two high volume institutions was merged from 1994-2017 identifying patients with an intraoperative initial positive frozen section margins after esophagectomy. Patient characteristics, intraoperative data, postoperative outcomes, and survival/recurrence data were collected and analyzed. Associations of resection status with overall survival and disease free survival were assessed using a Cox model. Multiple variable Cox models were assessed including resection status along with the additional covariates of pathology, path stage, and patient age at esophagectomy.

**Results:** Our esophagectomy database with 4,131 patients had 94 patients with an intraoperative positive margin. Through re-resection, 44 patients were converted to an R0 resection (46.8%). Overall survival was significantly longer for patients in the R0 vs. R+ groups ( $p=0.04$ ) with median survival of 13 months (0.06-173.88) for R0 and 3.4 months (0.02-169.05) for R+ groups. In a multi variable analysis for overall survival squamous cell pathology and advanced stage were independently associated with decreased overall survival. Progression free survival (PFS) was also statistically significant between R0 vs R+ groups (0.034). Median PFS for R0 was 15.69 months (0.06-173.88) and median PFS for R+ was 5.5 (0.03-169.05). In a multivariable analysis for PFS, margin status was an independent predictor of survival (HR 3.13,  $p=0.03$ ).

**Conclusions:** Patients with intraoperative positive margin who are converted to R0 have significant increase in PFS and was found to be an independent predictor of survival in esophageal cancer.



Notes:

## FOURTH SCIENTIFIC SESSION A - THORACIC BREAKOUT

### 30V. Resection and Reconstruction of Primary Adenoid Cystic Carcinoma of the Trachea

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**Authors:** Domenico Galetta, Lorenzo Spaggiari

**Author Institution(s):** European Institute of Oncology, Milan, Italy

**Objectives:** Adenoid cystic carcinoma (ACC) is the second most common malignant tumor of the airway. Complete surgical resection of tracheal or carinal ACC remains the treatment of choice and is associated with long survival. This video illustrates the imaging studies and the surgical techniques adopted in 5 different tumor locations.

**Methods:** First two patients: upper and lower tracheal ACC; they underwent en bloc tracheal resection followed by end-to-end tracheal anastomosis through a cervico-sternal and posterolateral thoracotomy, respectively. Third case: ACC of left tracheo-bronchial angle; reverse Barclay carinal resection through a trans-sternal, trans-pericardial approach was accomplished. Fourth patient: ACC involving right tracheo-bronchial angle and carina; lateral wall of trachea and carina were resected; the main right bronchus was shaped as a "flute-beack" and anastomized to trachea and main left bronchus. Fifth: ACC involving the lower left tracheal wall and main right bronchus with the carina was removed by right tracheal sleeve pneumonectomy.

**Results:** On 48 tracheal resections performed for airway neoplasms, 5 (10.4%) were for ACC. No operative neither major postoperative complications occurred and all patients obtained an excellent surgical result, survival, and disease free survival ranging from 1 to 75 months. Only one patient had regional nodal involvement by tumor. Postoperative radiotherapy (PR) was administered in 3 patients who presented microscopic R1 disease.

**Conclusions:** ACC of the trachea and carina has a good long-term prognosis if treated by surgical resection. Surgical technique must be individualized according with tumor location. Patients with tumor infiltration of the surgical margins should receive PR.



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**Notes:**

## FOURTH SCIENTIFIC SESSION A - THORACIC BREAKOUT

### 31. A Pathway for Obstructing Esophageal Cancer Facilitates Care

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**Authors:** John Pagteilan<sup>2</sup>, \*Nicholas Tingquist<sup>1</sup>, \*Jason Muesse<sup>2</sup>, Kevin Sexton<sup>2</sup>, \*Matthew Steliga<sup>1</sup>

**Author Institution(s):** <sup>1</sup>University of Arkansas, Little Rock, AR; <sup>2</sup>University of Arkansas for Medical Sciences, Little Rock, AR

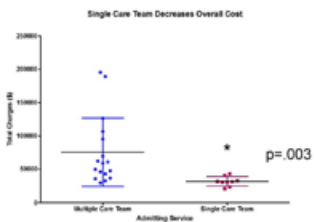
**Discussant:** \*Subrato J. Deb, University of Oklahoma Health Sciences Center, Oklahoma City, OK

**Objectives:** Patients presenting with dysphagia due to suspected advanced esophageal cancer had previously received inefficient and uncoordinated care due to the lack of ownership of this disease process. Within our institution, the thoracic surgical team began admitting and managing all cases of suspected advanced esophageal cancer using a clinical pathway. Our aim is to share the details of this pathway for managing obstruction or near-obstruction due to suspected advanced esophageal cancer and the impact on patient care.

**Methods:** A clinical pathway was implemented for patients with suspected advanced esophageal cancer where the thoracic surgery service performed endoscopy to make a diagnosis, managed the obstruction with stents or enteral feeding access, and placed ports for chemotherapy access. Following IRB approval, retrospective data was obtained for patients admitted for suspected esophageal cancer with the subsequent diagnosis of esophageal obstruction for 18 consecutive months. Data was gathered and analyzed to compare overall length of stay, hospital charges, professional charges, and overall cost. Student's t test was used for comparison of length of stay and charges before and after implementation of protocols for managing suspected advanced esophageal cancer.

**Results:** A total of 29 patients were admitted with dysphagia and/or esophageal obstruction and were diagnosed with locally advanced esophageal cancer. Previously, a historic cohort of 17 (58.6%) patients were managed on a medical service with a multiple care team cohort to address the suspected esophageal obstruction with diagnostic and therapeutic interventions. After developing a clinical pathway, twelve (12/29, 41.4%) patients were managed exclusively by the thoracic surgery service with all procedures being performed by a single care team with protocols for managing advanced esophageal cancer. The mean length of stay was 4.4 days when admitted to the thoracic surgery service with a clinical pathway versus 13.5 days ( $p=0.0005$ ) when admitted to a hospitalist service and receiving standard of care. In addition, the mean overall cost was \$43,902 less per patient when admitted to thoracic surgery (\$75,809 vs \$31,907,  $p=0.003$ ).

**Conclusions:** Clinical pathways following surgical resection of esophageal cancer have demonstrated reduced length of stay and cost; however, pathways for surgical management of the initial presentation of advanced esophageal cancer are not well defined. This data demonstrates that a dedicated thoracic surgical team with a focused care pathway for these patients could reduce costs and improve overall care for patients presenting with advanced disease.



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## FOURTH SCIENTIFIC SESSION A - THORACIC BREAKOUT

### 32V. Robotic Sleeve Resection of the Airway: Technical Considerations and Mid-Term Results

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**Authors:** Travis Geraci<sup>1</sup>, Dana Ferrari-Light<sup>2</sup>, \*Robert Cerfolio<sup>1</sup>

**Author Institution(s):** <sup>1</sup>New York University, New York, NY; <sup>2</sup>NYU Langone Health, New York, NY

**Objectives:** Our objective is to report our evolving technique of robotic sleeve resection of the airway and/or lung.

**Methods:** We retrospectively reviewed a single surgeon's prospective database from April 2013 to April 2019.

**Results:** 19 consecutive patients (13 male, 6 female) underwent robotic sleeve resection. Indications were for cancer in all patients. A single patient underwent neoadjuvant therapy. 16 patients had concomitant lobectomy (right upper lobe in 11, right lower lobe in 1, and left upper lobe in 2) and one patient had a pulmonary artery resection. There was one left mainstem bronchus resection and two right bronchus intermedius resections that preserved all of the lung. All patients had an R0 resection. Median operative time was 211 minutes (range 117-348), median blood loss was 20mL (range 10-600) with no transfusions, median number of resected lymph nodes was 23 (range 15-31), and median length of stay was 3 days (range 1-11). Operative details are reviewed. In the last ten operations, we modified our airway anastomosis, using a running self-locking absorbable suture. There were no 30- or 90-day mortalities. Follow-up in all patients was a median of 18 months: no patients had an anastomotic stricture and there were no recurrent cancers.

**Conclusions:** We present one of the largest known case series of patients to demonstrate that robotic sleeve resection of the airway with or without pulmonary resection and/or pulmonary artery resection for lung cancer or malignancy of the airway is safe and effective. It offers outstanding early and late outcomes.

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**Notes:**

## FOURTH SCIENTIFIC SESSION A - THORACIC BREAKOUT

### 33. Analysis of a Statewide Narcotic Reporting Database Identifies High Prevalence of Long-term Opioid Dependence After Resection for Lung Cancer

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**Authors:** Nick Levinsky<sup>1</sup>, Matthew Byrne<sup>1</sup>, Alexander Cortez<sup>2</sup>, Rachel Beaupre<sup>1</sup>, Julian Guitron<sup>1</sup>, Sandra Starnes<sup>1</sup>, Robert Van Haren<sup>1</sup>

**Author Institution(s):** <sup>1</sup>University of Cincinnati College of Medicine, Cincinnati, OH;

<sup>2</sup>Cincinnati Research on Outcomes and Safety in Surgery (CROSS), Cincinnati, OH

**Discussant:** \*Hugh M. van Gelder, Bayfront Health St. Petersburg, St. Petersburg, FL

**Objectives:** The national opioid epidemic is a public health crisis, and preoperative opioid use has been associated with worse postoperative pain control. Thoracic surgery has also been associated with high incidence of new persistent opioid use (NPOU). The purpose of this study was to describe preoperative opioid dependence and to evaluate clinical factors associated with NPOU following thoracic surgery.

**Methods:** Retrospective review of an institutional database of lung cancer resections from 4/2015-4/2018 was performed. Hospital records and the Ohio Automated Rx Reporting System (OARRS) were reviewed. OARRS is a statewide database recording all filled opioid prescriptions in the preceding 5 years. Patients were stratified as either chronic (>120 day supply) or intermittent (<120 day supply) opioid users or opioid naïve (no opioids 12 months prior to surgery) based on OARRS. New persistent opioid use (NPOU) was defined as an opioid naïve patient with continued opioid use 90-180 days postoperatively. Opioid dosing was recorded as milligram morphine equivalents (MME).

**Results:** Of the 113 patients undergoing resection during they study period, 14.2% (n=16) were chronic preoperative opioid users, 30.1% (n=34) were intermittent opioid users, and 55.7% (n=63) were opioid naïve. Groups were of similar age, race, sex, surgical approach, and pathologic stage (all p>0.05). Chronic users had higher daily inpatient opioid use compared to intermittent users and opioid naïve (66mg [29.8-143.1] vs 26.3mg [6.3-54.4] vs 10mg [2.5-27.6], p<0.001). Epidural use and adjunctive pain control medications were similar among groups. Perioperative complications and length of stay were similar between chronic, intermittent, and naïve groups. Subset analysis of opioid naïve patients showed a 12.8% (n=8) incidence of NPOU. Those with NPOU were more likely to undergo thoracotomy and had higher average daily inpatient opioid use compared to opioid naïve without persistent use (Table). 28% (n=32) of all patients were opioid dependent 90-180 days after lung cancer resection.

**Conclusions:** Nearly a third of patients are opioid dependent after lung cancer resection. This is due to both preexisting opioid use and NPOU. Improved strategies are needed to prevent chronic pain and opioid dependence after lung cancer resection, especially with thoracotomy.

**Factors Associated with New Persistent Opioid Use**

Characteristic	New Persistent Opioid Users (n=8), median (IQR), n (%)	Opioid Non-Users (n=55), median (IQR), n (%)	P
Age	67 (55-71)	67 (61-73)	0.457
Female Sex	5 (62.5%)	26 (52.7%)	0.604
Race			0.692
White	7 (87.5%)	45 (81.8%)	
Black	1 (12.5%)	10 (18.2%)	
CAD	6 (75.0%)	10 (18.2%)	<b>0.002</b>
Thoracotomy	5 (62.5%)	14 (25.5%)	<b>0.047</b>
Average daily inpatient opioid, MME	34.5 (15.2-59.3)	8.8 (2.1-24.9)	<b>0.031</b>

CAD: coronary artery disease  
IQR: interquartile range

**Notes:**

## FOURTH SCIENTIFIC SESSION A - CONGENITAL BREAKOUT

### 34. Incidence of Reintervention Following Aortic Arch Repair Using a Tailored Autologous Pericardial Patch

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**Authors:** Harris Glenn, **Muhammad Owais Abdul Ghani**, Muhammad Aanish Raees, Chevis Shannon, George Nicholson, \*David Bichell

**Author Institution(s):** Vanderbilt University Medical Center, Nashville, TN

**Discussant:** \*Mark S. Bleiweis, University of Florida, Gainesville, FL

**Objectives:** Several congenital cardiac conditions require surgical repair of the aortic arch, such as hypoplastic left heart syndrome and interrupted aortic arch. Aortic arch reobstruction is a common complication following aortic repair, with rates of reintervention varying from 0 to 51%, depending on the pathology. While post-repair aortic arch geometry influences the need for reintervention, the effect of a tailored, autologous pericardial patch on aortic arch geometry, growth and reintervention rates has not been studied. As such, this study aims to determine the reintervention rate in children undergoing aortic arch repair using a tailored autologous pericardial patch at our center.

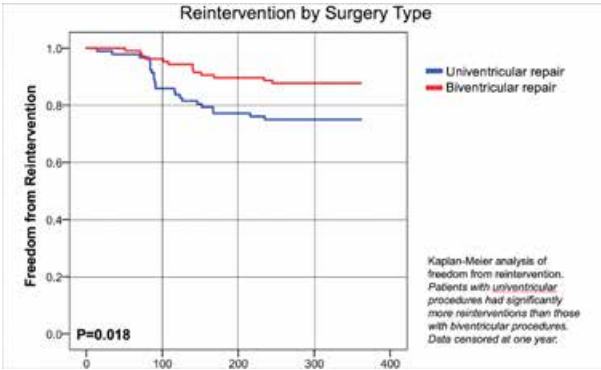
**Methods:** We performed a retrospective, descriptive chart review study, analyzing records from all patients at our center less than 18 years old, undergoing first aortic arch repair, under cardiopulmonary bypass, via a median sternotomy, between January 2012 and December 2016. Each record was reviewed for aortic arch reinterventions, including surgical and catheter mediated, for a minimum of one year of follow-up. Patients were divided into groups based on Univentricular or Biventricular physiology. Our dataset was analyzed for normality using the Shapiro-Wilk Test, and non-parametric statistical methods were used. All continuous variables were represented as median with interquartile range, and categorical variables were expressed as percentages. Kaplan-Meier survival analysis was performed, and log-rank test used for comparative analysis between groups. IBM SPSS version 23 (IBM, SPSS Statistics for Macintosh, Version 23.0) was used to perform all statistical analysis and generate a survival distribution.

**Results:** We identified 200 patients meeting inclusion criteria. The median age, height and weight at surgery were 7 days (4-13), 49.5 cm (47-52), and 3.39 kg (2.8-3.8) respectively. There were a near equal number of male and female patients (50.5% vs 49.5%) in our cohort. 106 (55.2%) of our patients had surgery under moderate hypothermia, while the rest received deep hypothermic circulatory arrest. Aortic arch reinterventions occurred in 38 (19%) of our cohort, with the majority being exclusively catheter mediated (29/38, 76.3%). Most patients requiring catheter reintervention received one procedure (25/34, 73.5%), most commonly a balloon angioplasty (30/34, 88.2%). Kaplan-Meier analysis showed a higher rate of reinterventions in the univentricular group as compared to the biventricular group (Chi Square: 5.6,  $p = 0.018$ ). At the end of the follow up period 75% of the univentricular group was free from reintervention as compared to >80% of the biventricular group.



**Conclusions:** The use of a tailored autologous pericardial patch for aortic arch repair is non-inferior to other methods of arch repair, when compared to literature. The univentricular group showed a higher rate of reinterventions as compared to the biventricular group. Further study is necessary to describe the growth pattern and geometry of the augmented aortic arch over time, and how this relates to clinical status, hemodynamic characteristics, and morbidity.

Patients with Reintervention	Univentricular (n=92)	Biventricular (n=108)
<b>Number of Reinterventions</b>		
Catheter mediated	23 (25%)	15 (14%)
Surgical	16 (17%)	13 (12%)
Both	3 (3%)	1 (1%)
Both	4 (4%)	1 (1%)
<b>Catheter reintervention frequency</b>		
One catheter reintervention	14 (15%)	11 (10%)
Additional catheter reintervetnsions	6 (7%)	3 (3%)
<b>Catheter reintervention type</b>		
Balloon angioplasty	16 (1%)	14 (13%)
Stenith	1 (1%)	0 (0%)
Both	3 (3%)	0 (0%)



**Notes:**

## FOURTH SCIENTIFIC SESSION A - CONGENITAL BREAKOUT

### 35V. Resuscitating the PTFE Graft-to-Innominate Artery After Neonatal Arch Reconstructions: Straightforward Access for Arterial Cannulation During Stage II Palliation or Pulmonary Artery Debanding + Complete Repair in Infancy

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**Authors:** \*Ali Dodge-Khatami<sup>1</sup>, Jannika Dodge-Khatami<sup>1</sup>, Robert Hanfland<sup>1</sup>, \*Raina Sinha<sup>2</sup>, \*Jorge Salazar<sup>3</sup>

**Author Institution(s):** <sup>1</sup>UT Health at Houston/ Children's Memorial Hermann Hospital, Houston, TX; <sup>2</sup>University of Texas Health Science Center at Houston, Houston, TX; <sup>3</sup>McGovern Medical School at UTHealth, Houston, TX

**Discussant:** James M. Hammel, Children's Hospital and Medical Center, Omaha, NE

**Objectives:** To demonstrate a simple, safe and expeditious technique for arterial cannulation during redo sternotomy at infancy, after prior neonatal aortic arch surgery (arch patch augmentation/DKS anastomosis (n=66), Norwood stage I (n=49), hybrid comprehensive stage I+II (n=8) and interrupted aortic arch (n=8)). For antegrade cerebral perfusion (ACP) during neonatal arch reconstruction, a 3.5mm PTFE graft-to-innominate artery is routinely used for arterial cannulation (n=131). After decannulation, when properly prepared prior to chest closure, the remnant graft may be resuscitated months later and used during stage II palliation for uni-ventricular hearts or pulmonary artery (PA) debanding + complete intra-cardiac repair in biventricular defects.

**Methods:** At the end of neonatal arch surgery using a 3.5mm PTFE graft-to-innominate artery for ACP, the graft is decannulated, clipped flush to the artery, thoroughly milked to avoid clot with a second clip placed at a few centimeters, and tacked to the upper sternal edge to facilitate retrieval in the lower neck region. Months later, after redo sternotomy, full heparinization, the clips are removed, the graft de-aired/resuscitated, and re-cannulated. In larger 3-6 month old infants at stage II palliation or complete repairs, either an 8 or 10F cannula may still fit into the initial 3.5mm graft, to allow for full flow bypass.

**Results:** During sternal re-entry for stage II palliation or complete biventricular repair in 87 infants 3-6 months later, the technique was highly reproducible, and used successfully in 85/87 patients (97.7%). In two patients where the clips had not been placed flush enough to the artery prior to chest closure, the graft was thrombosed at its distal (innominate artery) end, and could not be resuscitated, leading to standard ascending aortic cannulation. There were no clinically detectable neurologic or thrombo-embolic events.

**Conclusions:** Months post-operatively, clipped ACP graft resuscitation is reproducible, without thrombo-embolism, and avoids the need for dissection of a patched DKS/aorta. In case of unexpected malignant arrhythmias or cardiac injury with bleeding during sternal re-entry, it may allow expeditious and life-saving access to cardiopulmonary bypass to recover blood and decompress the heart.

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**Notes:**

## FOURTH SCIENTIFIC SESSION A - CONGENITAL BREAKOUT

### 36. Bidirectional Glenn Procedure in Patients Less Than 3 Months of Age: A 14 Year Experience With Stage II Palliation

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**Authors:** Melita Viegas, Carlos-Eduardo Diaz, Mario Castro-Medina, Luciana Da Fonseca Da Silva, \*Victor Morell

**Author Institution(s):** UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA

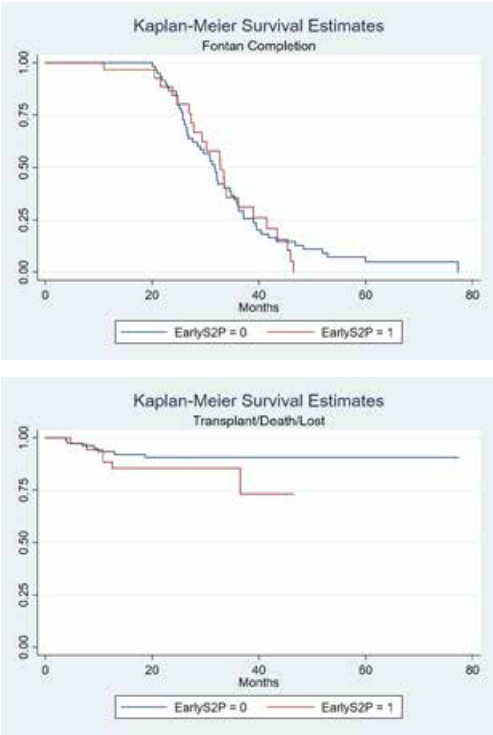
**Discussant:** \*Kristine J. Guleserian, Nicklaus Children's Hospital, Miami, FL

**Objectives:** Contradictory data exists regarding the implications of surgical factors, such as the timing of stage 2 palliation (S2P). Traditionally, timing of second stage palliation has been between 4 and 6 months of age. Prolonged interstage hospitalizations and interstage home surveillance programs have contributed to a more rapid progression to S2P, either through early identification of single ventricle overload signs and/or hypoxemia or early evaluation of adequate transpulmonary gradient pressures. Our goal is to describe the S2P population and explore the relationships of clinical outcomes and S2P timing in our institution over the last 14 years.

**Methods:** A retrospective analytical observational cohort study was conducted through electronic records that included the S2P population from 2004 to 2018. One hundred fourteen patients undergoing the bidirectional Glenn were included. Stage 1 palliation(S1P) included those patients with history of Norwood Procedure, Damus-Kaye-Stansel anastomosis or Hybrid procedures. Early S2P was defined as bidirectional cavopulmonary anastomosis performed in patients less than 90 days of age (n=36). The data is described as frequency (%) for categorical variables and as median (interquartile range [IQR]) for continuous variables. The univariate analysis that compared patient demographics, echocardiography, catheterization and procedure data were compared using  $\chi^2$ , Fisher's exact test or the Mann-Whitney U test, as appropriate. The Kaplan-Meier method was used for the survival analysis and the outcome variables were compared using the log-rank test.

**Results:** One hundred fourteen patients who underwent S2P at our institution during the study period were included. Eighty-nine percent of S1P were Norwood procedures with MBTS. The median age and weight at S2P was 100 days (IQR 87-119) and 5.1 kg (IQR 4.6-5.5), respectively. There were 36 and 78 patients in the early and non-early S2P groups. The median age in the early group was 79 days (IQR 73-87) and 107 days in the non-early group (IQR 100-124). The youngest and oldest patient at S2P was 54 and 512 days, respectively. The groups were comparable in their baseline characteristics. The early group had a higher interstage percutaneous intervention rate, due primarily to venous collateral embolizations, than the non-early group (p=0.002). Ninety percent of cavopulmonary anastomosis were augmented with a GoreTex patch. There was no difference in mortality rate between the two groups (p=0.3). Kaplan-Meier survival estimates for Fontan completion were the same for both groups, with an overall Fontan completion rate of 76% and 20% of the patients still awaiting stage 3 palliation.

**Conclusions:** The interstage period continues to be high risk for those undergoing single ventricle palliation. In our experience, the S2P performed in <90 days seems to be a viable and safe procedure when indicated, resulting in comparable mortality and Fontan completion rates.



**Notes:**

## FOURTH SCIENTIFIC SESSION A - CONGENITAL BREAKOUT

### 37. Establishing Biventricular Circulation in Interrupted Aortic Arch and Ventricular Septal Defect With Small Aortic Annulus

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**Authors:** Demetrios Mallios, W. Hampton Gray, Winfield Wells, Vaughn Starnes, Ram Kumar Subramanyan

**Author Institution(s):** University of Southern California, Los Angeles, CA

**Discussant:** \*Jorge D. Salazar, UT Houston, Children's Hermann Memorial, Houston, TX

**Objectives:** In patients with interrupted aortic arch and ventricular septal defect (IAA/VSD), we have shown that a native aortic annulus of greater than 4.5mm can function adequately as the systemic semilunar valve. When the aortic annulus is smaller and incapable of supporting systemic outflow, either aortopulmonary amalgamation or replacement of the left ventricular outflow tract (LVOT) with pulmonary autograft (Ross procedure) can be performed to create stable systemic outflow. We sought to analyze factors and outcomes associated with these two surgical approaches.

**Methods:** We retrospectively identified all patients who underwent surgical repair for IAA/VSD at our institution between 1998 and 2017. Of these, 36 patients had small, native aortic annulus that was unsuitable for systemic outflow. Patient demographics, along with clinical and operative data, were retrospectively collected for this cohort. Data were analyzed using SAS 9.4, and findings are presented as median and interquartile range.

**Results:** Aortopulmonary amalgamation was performed at 7 (4-12) days in 23 patients (Group I). A primary Yasui repair with ventricular septation was performed in 3 of these, and a Norwood-type repair in the other 20. Seventeen of these 20 underwent staged biventricular conversion at 10 (7-12) months, while remaining 3 were palliated to Fontan. In contrast, 13 patients (Group II) underwent Ross at 12 (6-27) days. Compared to Group I, Group II patients had smaller VSD (3.5 vs. 4.9mm,  $p<0.001$ ) that was more often remote from the semilunar valves (31% vs. 17%,  $p=0.02$ ). Operative mortality occurred in 1 (4%) Group I at the time of biventricular conversion, and 2 (15%) Group II during Ross. After 4.5 (3.2-6.8)-year-follow-up, there has been 1 additional mortality in Group I and two in Group II, all unrelated to cardiac disease. Four patients each in Group I (17%) and Group II (31%) have required RVOT re-intervention.

**Conclusions:** When native aortic annulus in IAA/VSD is unsuitable for systemic outflow, size and location of the VSD can be used to tailor surgical approach to establish biventricular circulation. Intermediate term outcomes of biventricular repair with aortopulmonary amalgamation or Ross procedure are favorable.

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**Notes:**

### 38. Autograft Failure After the Ross Procedure and its Reoperation

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**Authors:** Yuki Nakayama, Takeshi Shinkawa, Goki Matsumura, Ryogo Hoki, Kei Kobayashi, Hiroshi Niinami

**Author Institution(s):** Tokyo Women's Medical University, Tokyo, Japan

**Discussant:** \*Ross M. Ungerleider, Driscoll Children's Hospital, Corpus Christi, TX

**Objectives:** It has been reported that the Ross procedure provides excellent hemodynamics, low risk of infective endocarditis, possible autograft growth in children, and no need for anticoagulation. However, the survivors may develop long-term problems including autograft regurgitation with or without autograft dilatation, coronary artery stenosis and right ventricle to pulmonary artery conduit failure. The purpose of this study is to assess the incidence and risk factors of autograft failure after the Ross procedure and to review surgical outcomes of reoperation for autograft. Autograft failure was defined as more than moderate autograft regurgitation or autograft diameter of more than 45mm.

**Methods:** This is a retrospective study of patients undergoing Ross procedure with full-root technique from 1993 to 2019. One hospital death, 1 late death and 5 patients with unknown autograft status were excluded, and 72 patients were included in this study. Preoperative diagnosis included 27 pure aortic regurgitations, 17 aortic stenosis, 26 combined lesions, and 2 mechanical valve malfunctions. Median age at the operation was 12.1 (0.4 – 43.6) years, including 42 children less than 15 years old. Concomitant Konno incision was performed in 14 patients (19.4%). Six patients (8.3%) had greater than mild autograft regurgitation at the hospital discharge.

**Results:** During median of 13.2 years follow-up, autograft failure were found in 24 patients (33.3%), of which 13 had more than moderate autograft regurgitation, 5 had autograft diameter of more than 45mm and 6 had both. The freedom from autograft failure at 10 and 20 years after the Ross procedure were 79.6% and 48.7%. Multivariate analysis identified greater than mild autograft regurgitation at the hospital discharge as a risk factor for autograft failure. Total of 24 reoperations were performed for 22 patients (30.6%) during the follow-up. Among 24 reoperations, 16 were autograft related reoperations, including 12 aortic valve replacements, 3 aortic root replacements and 1 Konno procedure at median of 7.9 (0.2- 18.9) years after the Ross procedure. Freedom from autograft reoperation at 10 and 20 years after the Ross procedure were 84.4% and 59.9%. All patients who underwent the autograft reoperation survived and in good health status at median of 5.4 (0.4 -22.5) years after reoperation.

**Conclusions:** About one third of patients were found with autologous failure, and the autograft regurgitation at the hospital discharge was identified as risk factor. About 20% of patients after the Ross procedure required the autograft reoperation. However, the surgical outcome of autograft reoperation was satisfactory.



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**Notes:**

## FOURTH SCIENTIFIC SESSION A - CONGENITAL BREAKOUT

### 39. Are Surgeons Still Needed in Transcatheter Aortic Valve Replacement

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**Authors:** Govinda Paudel<sup>1</sup>, \*Christopher Knott-Craig<sup>1</sup>, John Sun<sup>1</sup>, Jonathan Rho<sup>1</sup>, Tiffany Street<sup>2</sup>, Xinhua Yu<sup>3</sup>, \*Umar Boston<sup>2</sup>

**Author Institution(s):** <sup>1</sup>University of Tennessee Health Science Center, Memphis, TN; <sup>2</sup>Le Bonheur Children's Hospital, Memphis, TN; <sup>3</sup>University of Memphis, Memphis, TN

**Discussant:** \*Ross M. Ungerleider, Driscoll Children's Hospital, Corpus Christi, TX

**Objectives:** Bicuspid aortic valve (BAV) is a risk factor for poor outcome after Ross Operation (RO) in adults. We aimed to assess the impact of preoperative aortic valve leaflet morphology on re-intervention rates on both the neo-aorta and pulmonary valve in children undergoing RO.

**Methods:** Children <18 years old who underwent RO from October 2004-October 2017 were retrospectively studied. Outcomes were compared between those with BAV and tri-leaflet aortic valve (TAV). Pre- and post-operative echocardiograms at various time points were reviewed. Primary end-points of freedom from neo-aortic, pulmonary or combined all cause re-intervention were compared between groups. In addition, neo-aortic annular dilation, progression of neo-aortic and pulmonary valve dysfunction ( $\geq$  moderate stenosis or regurgitation) were also compared. Statistical analysis was performed using JMP software.

**Results:** Of 29 patients who underwent RO (male: 69%, mean age: 9.6  $\pm$  1.3 years), 1 was excluded from analysis due to indeterminate aortic valve leaflet morphology. Nineteen (67.8 %) patients had BAV and 9 (32.1%) had TAV. Surgical indication was aortic stenosis (AS) in 5 (17.9%), regurgitation (AR) in 9 (32.1%) and mixed disease in 14 (50%) patients. Preoperatively AR ( $\geq$  moderate) was more prevalent in TAV compared to BAV group (100% vs 72%, p: 0.03) while AS ( $\geq$  moderate) was equally prevalent (56% vs 78%, p: 0.24). Freedom from combined neo-aortic and pulmonary valve re-intervention was 88.9% in TAV vs 52.6% in BAV (p: 0.05) with a similar average follow-up of 56.5 and 65.9 months respectively (p=0.64). Two patients in the BAV group had neo-aortic re-intervention compared to none in the TAV group.

Table 1 shows the comparison of Ross outcome between the groups.

**Conclusions:** The Ross operation in children with tri-leaflet morphology appears to have a lower combined neo-aortic and pulmonary valve reintervention rate. Furthermore, tri-leaflet morphology did not negatively impact neo-aortic function or durability despite a higher incidence of preoperative AR compared to BAV patients.

Table 1: Ross outcome between BAV and TAV group

Outcome variables Mean+/- standard error of mean/Proportion	BAV	TAV	P value	No of patients (BAV/TAV)
Neo-aortic annular dilation (mm/m2)	-2.02+/- 1.6	-3.54+/- 1.1	0.54	15/7
Neo-aortic annular dilation rate (mm/m2/year)	0.96+/- 0.79	-0.83+/- 0.29	0.15	15/7
Freedom from all cause re- intervention	52.6%	88.9%	0.05	19/9
Freedom from neo-aortic re-intervention	89.5%	100%	0.20	19/9
Freedom from pulmonary re-intervention	63.2%	88.9%	0.14	19/9
Pulmonary valve dysfunction	47.1%	33.3%	0.5	17/9
Neo-aortic valve dysfunction	15.8%	0%	0.11	19/9

Notes:

## FOURTH SCIENTIFIC SESSION B - ADULT CARDIAC BREAKOUT

### 40. Contemporary Experience With the Use or Repair of Homografts in 97 Proximal Aortic Repairs

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**Authors:** **D\***Joseph Coselli<sup>1</sup>, Hiruni Amarasekara<sup>2</sup>, Matt Price<sup>2</sup>, Susan Green<sup>2</sup>,  
\*Ourania Preventza<sup>2</sup>, \*Scott LeMaire<sup>2</sup>

**Commercial Relationships:** \*J. Coselli: Consultant/Advisory Board: Medtronic, Terumo Aortic, W. L. Gore; Ownership Interest: Terumo Aortic; Research Grant: Abbott, Cytosorbents, Edwards Lifesciences, Medtronic, Terumo Aortic, W. L. Gore

**Author Institution(s):** <sup>1</sup>Baylor College of Medicine, Texas Heart Institute, Houston, TX;  
<sup>2</sup>Baylor College of Medicine, Houston, TX

**Objectives:** Although aortic repair relied on homografts in the past, they are now infrequently used. Like all tissue-based substitutes, homografts have uncertain durability. We reviewed our experience with homograft repair of the proximal aorta to better understand its use and durability. Furthermore, we reviewed our open revisions of failed proximal homografts.

**Methods:** During 1997-2018, we performed 81 primary homograft repairs of the proximal aorta (aortic root, ascending aorta, and aortic arch) and 16 open repairs to revise failed aortic root homografts initially performed at outside centers. Infection—defined as mycotic aneurysm, infected pseudoaneurysm, native/prosthetic valve endocarditis, or prosthetic graft infection—necessitated initial homograft replacement in 58 (72%) interventions. Repair of a failed homograft was indicated by aortic valve dysfunction (n=15), aneurysm (n=2), or pseudoaneurysm (n=3); severe calcification was observed in 9 (56%) patients. Kaplan-Meier analysis was used to estimate survival; competing risk analysis assessed the risk of homograft failure, adjusted for death.

**Results:** The median age of 97 patients who underwent repair was 56 [IQR:44-63]; heritable thoracic aortic disease was present in 38 (39%), 69 (71%) underwent redo sternotomy, and 11 (11%) died (Table). Regarding our initial use of 81 homografts, 70 (86%) replaced the aortic root and varying sections of the ascending aorta with 26 (32%) extended into the arch; 10 (12%) were limited to the ascending aorta or arch; and 1 was used as a small patch. There were 9 (11%) early deaths. Survival among homograft patients at 5 years was 54.6±6.7%. There were 5 late reoperations for homograft failure. After adjusting for death in competing risk analysis, the 5-year and 15-year cumulative incidence of homograft failure was 2.7% and 15.9% respectively. After repair of the subset of 16 failed homografts—which involved aortic root replacement (n=11), aortic valve replacement (n=4), and patch repair (n=2)—there were 2 (13%) early deaths.

**Conclusions:** Homografts are typically reserved for complex aortic repair. Life-threatening infection is common, and many repairs necessitate redo sternotomy. Despite these challenges, early and mid-term outcomes are acceptable. Homograft repairs appear reasonably durable and can be revised after degeneration. Further study is needed to better understand their usefulness in challenging scenarios.

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**Notes:**

### 41. Progression of Aortic Insufficiency Following Left Ventricular Assist Device Implantation: Predictors and Impact on Clinical Outcomes

**Authors:** Hiroshi Kagawa, Edgar Aranda-Michel, Robert Kormos, Mary Keebler, Gavin Hickey, Yisi Wang, Michael Mathier, Arman Kilic

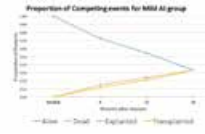
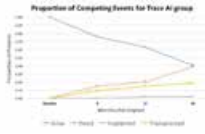
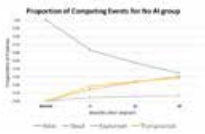
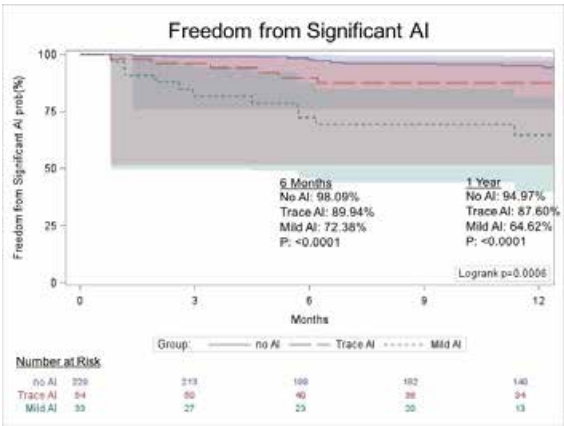
**Author Institution(s):** University of Pittsburgh Medical Center, Pittsburgh, PA

**Objectives:** The natural history and clinical sequelae of aortic insufficiency (AI) after left ventricular assist device (LVAD) implantation remains incompletely understood. The aim of this study was to evaluate the incidence of and risk factors for progression of AI and to correlate this with clinical outcomes after LVAD insertion.

**Methods:** Patients undergoing durable LVAD implantation at a single institution between 2004-2018 were included. Significant AI was defined as more than mild AI. Exclusion criteria included pre-LVAD significant AI, concomitant aortic valve surgery with LVAD, previous aortic valve surgery, and LVAD exchange. Clinical and echocardiographic data were collected at baseline and follow-up. Patients were primarily stratified by degree of pre-LVAD AI into 3 groups: no AI (I), trace AI (II), and mild AI (III). Multivariable Cox regression analysis was used for risk-adjustment.

**Results:** A total of 316 patients underwent durable LVAD implantation during the study period, including 229 (72.5%) group I, 54 (17.1%) group II, and 33 (10.4%) group III. Groups were well-matched in baseline characteristics with patients most frequently being ischemic dilated cardiomyopathy (48.7%; n=154), bridge-to-transplant (55.7%; n=176), and INTERMACS 3 (38.0%; n=120). Median follow-up was 469 days (interquartile range 232-725 days) and similar between groups. A total of 42 (13.3%) patients progressed to significant AI during follow-up. Group III patients had an approximately 3-fold increased unadjusted rate of developing significant AI (I: 10.0% vs II: 13.0% vs III: 36.4%); p=0.002). Kaplan-Meier freedom from significant AI at 1-year post-LVAD ranged from 94.5% in group I to 86.1% in group II to 62.4% in group III (log-rank p<0.001) (**Figure 1**). Predictors of developing significant AI in risk-adjusted analysis included mild preoperative AI, ischemic cardiomyopathy, and shorter duration of LVAD support; preoperative aortic root size and aortic valve opening were not predictive. Competing events analysis demonstrated similar clinical outcomes based on degree of preoperative AI (**Figure 2**). However, those progressing to significant AI had higher mortality rates during LVAD support compared to those who did not (59.5% vs 37.2%; p=0.006).

**Conclusions:** Although a minority of patients supported with an LVAD develop significant AI, this risk is increased in those with mild AI preoperatively. This finding, in conjunction with the increased mortality risk once significant AI develops, suggests that closer follow-up and management of patients with mild preoperative AI may be prudent.



Notes:

## FOURTH SCIENTIFIC SESSION B - ADULT CARDIAC BREAKOUT

### 42. Transfusion in Elective Aortic Root Replacement: Analysis of the STS Adult Cardiac Surgery Database

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**Authors:** Jonathan Hemli<sup>1</sup>, S Jacob Scheinerman<sup>1</sup>, Martin Lesser<sup>2</sup>, Seungjun Ahn<sup>2</sup>, Efsthia Mihelis<sup>1</sup>, Lynda Jahn<sup>3</sup>, Nirav Patel<sup>1</sup>, **Derek Brinster<sup>1</sup>**

**Author Institution(s):** <sup>1</sup>Lenox Hill Hospital/ Northwell Health, New York, NY; <sup>2</sup>Feinstein Institute for Medical Research/ Northwell Health, Manhasset, NY; <sup>3</sup>Northwell Health, Manhasset, NY

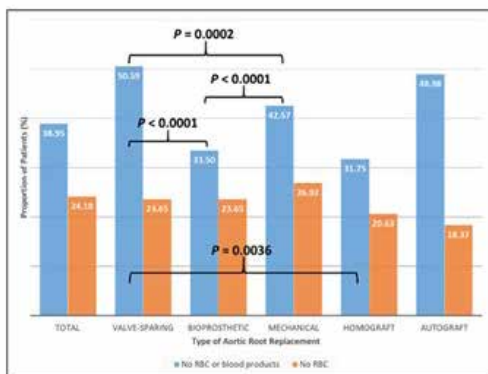
**Objectives:** Data on blood utilization in proximal aortic surgery is limited. We sought to establish quality benchmarks in the pattern of transfusion during elective aortic root replacement.

**Methods:** The STS Adult Cardiac Surgery Database was queried to identify all patients who underwent primary elective aortic root replacement between July 2014 and June 2017. Multivariable negative binomial regressions were utilized to determine whether perioperative transfusion was associated with various demographic and procedural factors. Multivariable logistic regression analysis was performed for clinical outcomes.

**Results:** Of 5559 patients analyzed, 38.95% (n = 2165) received no blood products. Patients who had a valve-sparing root replacement were less likely to be transfused than those who received either composite roots (with bioprosthetic or mechanical valves) or homografts (Figure). Thirty-day mortality for all patients was 2.57% (n = 143). Administration of intraoperative blood products was associated with an increased risk of death at 30 days (odds ratio {OR} 1.833, p = 0.0124), more frequent reoperation for bleeding (OR 1.766, p = 0.0006), more prolonged ventilation (OR 1.935, p < 0.0001), longer postoperative hospital stay (OR 1.056, p < 0.0001), and a higher incidence of new onset dialysis-dependent renal failure (OR 2.088, p = 0.0031). There was no correlation between institutional case volume and perioperative transfusion.

**Conclusions:** Elective aortic root replacement can be performed with acceptable requirements for blood products. Composite root replacement confers a greater likelihood of transfusion than does a valve-sparing procedure. Transfusion is independently associated with more complications after elective aortic root surgery, including 30-day mortality.





Notes:

### 43. Are Surgeons Still Needed in Transcatheter Aortic Valve Replacement

**Authors:** Spencer Melby<sup>1</sup>, \*Puja Kachroo<sup>1</sup>, Marci Damiano<sup>1</sup>, Marc Sintek<sup>1</sup>, Alan Zajarias<sup>1</sup>, John Lasala<sup>1</sup>, Nishath Quader<sup>2</sup>, \*Ralph Damiano<sup>1</sup>, \*Hersh Maniar<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Washington University School of Medicine, St. Louis, MO;

<sup>2</sup>Washington University in St. Louis, St. Louis, MO

**Objectives:** Transcatheter aortic valve replacement (TAVR) has quickly become the most common treatment for aortic stenosis in moderate and high risk patients. Surgeons have held multiple roles within TAVR programs varying from gatekeepers for the procedure, access site specialists, wire-based proceduralists and managers of complications. The objective of this study was to characterize the changes over time within TAVR and its implications for surgeons.

**Methods:** A retrospective review of all TAVR procedures performed at a single institution between 2008-2018 was done. The frequencies of alternative access procedures (non transfemoral) and vascular complications associated with TAVR were assessed. A survey of surgeons within the region was also prospectively administered to better understand the current role of surgeons in their given programs. An intraprocedural grade was given for each surgeon. Surgeons were graded as being:

1. present, but minimally involved
2. involved, but in a limited capacity
3. maximally involved and fully capable with regards to performing the TAVR procedure

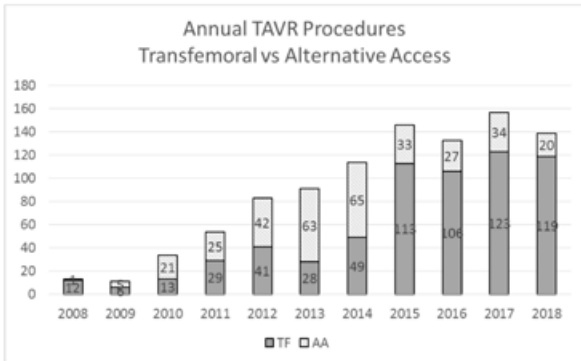
**Results:** A total of 975 TAVR procedures were performed. Alternative access procedures diminished over time as shown (Figure). In 2018 subclavian TAVR was the most common alternative access procedure accounting for 70% (14/20) of alternative access but only 11% (15/139) of overall TAVR procedures.

Prior to 2015, the number of transfemoral procedures was 44% (178/400). Since 2015 transfemoral procedures have significantly increased and account for 80% (461/575) of all procedures,  $p=0.008$ . Totally percutaneous transfemoral procedures began in 2014 and in 2018 92% (108/118) of all TF procedures were done in this fashion.

The annual frequency of vascular complications during the study period varied widely, ranging from 0% (0/29) in 2011 with a maximum of 16% (8/41) in 2012. The average annual frequency of vascular complications during the 10 year study period was 6% (52/639). Vascular complications occurred in 9% (12/119) of transfemoral cases in 2018.

Survey results ( $n=63$ ) for surgeons within the region demonstrated that only 48% (30/63) of surgeons were functioning fully (category 3) within TAVR procedures with 17% (11/63) and 35% (22/63) of surgeons functioning in either a minimal or limited capacity during the TAVR procedure, respectively.

**Conclusions:** The traditional roles for surgeons in TAVR as access specialists or managers of access site complications have diminished and now occur in a small minority of TAVR procedures. There exists a notable deficiency of surgeons performing fully as integrated and capable operators during the TAVR procedure. If surgeons do not increase their wire-based skills and intraprocedural participation in TAVR, their roles will be minimized or eliminated.



Notes:

## FOURTH SCIENTIFIC SESSION B - ADULT CARDIAC BREAKOUT

### 44. Long-Term Economic Follow-Up of Distant Referral for Degenerative Mitral Valve Disease

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**Authors:** Alexander Brescia<sup>1</sup>, Michael Paulsen<sup>2</sup>, Tessa Watt<sup>1</sup>, Liza Rosenbloom<sup>1</sup>, Alexander Wisniewski<sup>3</sup>, Wallace Hopp<sup>4</sup>, \*Steven Bolling<sup>1</sup>

**Author Institution(s):** <sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Stanford University, Stanford, CA; <sup>3</sup>University of Toledo, Toledo, OH; <sup>4</sup>University of Michigan Ross School of Business, Ann Arbor, MI

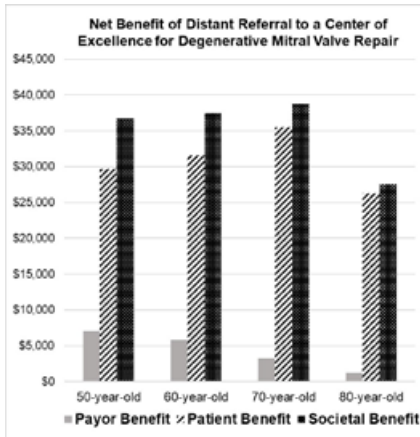
**Objectives:** Mitral valve (MV) repair for degenerative disease has been shown to be superior to MV replacement. However, MV repair rates widely vary between hospitals and individual surgeons. Unfortunately, many patients suffer difficulty with access to care for mitral valve disease. Distant referral for MV repair may increase access to hospitals with higher repair rates, but with potentially increased costs. Therefore, we assessed the economic value and long-term outcomes of distant referral to a mitral valve center of excellence, defined as  $\geq 50$  degenerative MV repairs per year.

**Methods:** Among 746 patients at a single hospital undergoing degenerative MV repair between January 2011-June 2013, low-risk patients were identified and included 104 in-state patients (LOCAL) retrospectively matched to 26 comparable out-of-state patients (DISTANT). Patients with atrial fibrillation and/or undergoing concomitant AVR, CABG, or reoperation were excluded. MV repair rates, outcomes, financial data (including travel expenses), and marginal value of quality adjusted life years collected from institutional data, STS database, and Nationwide Inpatient Sample were utilized to perform a cost-benefit analysis incorporating patient, hospital, and payor perspectives. Long-term follow-up was performed through chart review and telephone interviews.

**Results:** Age, ejection fraction, operative time, blood transfusions, and mitral implant size did not differ between groups. Median total charges were \$76,022 for LOCAL and \$74,171 for DISTANT ( $p=0.35$ ), while median total payments (including travel expenses) were \$57,795 for LOCAL and \$58,477 for DISTANT ( $p=0.70$ ). Payor mix between groups were similar. Short and long-term outcomes were similar between groups (Table), though LOCAL patients had a lower rate of reintervention ( $n=0$  [0%] vs. 2 [7.7%],  $p=0.004$ ). Overall estimated 5-year survival was 95% (94% for LOCAL and 100% for DISTANT; log-rank  $p=0.27$ ). Median follow-up was 6.6 years (interquartile range, 5.8–7.4). Cost-benefit analysis showed a net benefit (savings) through distant referral to a mitral center of excellence ranging from \$1,218–\$7,001 to the payor and \$26,271–\$35,498 to the patient, combining for a \$27,488–\$38,773 societal benefit, depending on patient age (Figure).

**Conclusions:** Local and distant referrals had similar costs and outcomes after long-term follow-up. Cost-benefit analysis suggested that distant referral to a mitral valve center of excellence conferred substantial benefit to payor and patient, driven by high repair rate. These data may inform value-based reimbursement and policy surrounding access to MV repair.

Outcome	Overall, n=130 (%)	In-State, n=104 (%)	Out-of-State, n=26 (%)	P-value
<b>Short-Term Outcomes</b>				
Any complication, n (%)	41 (31.5)	21 (30.8)	9 (34.6)	0.81
Reoperation	1 (0.8)	0 (0)	1 (3.8)	0.20
Transient ischemic attack	1 (0.8)	1 (1.0)	0 (0)	1.00
Atrial fibrillation	30 (23)	26 (25.0)	4 (15.4)	0.44
Renal Failure	0	0	0	
Superficial sternal wound infection	2 (1.5)	2 (1.9)	0 (0)	1.00
Postoperative blood products used	2 (1.5)	2 (1.9)	0 (0)	1.00
Gastrointestinal event	2 (1.5)	2 (1.9)	0 (0)	1.00
Prolonged ventilation	1 (0.8)	0 (0)	1 (3.8)	0.20
Reintubation	1 (0.8)	0 (0)	1 (3.8)	0.20
Other complication	15 (11.5)	9 (8.7)	6 (23.1)	0.08
Readmission to intensive care unit	3 (2.3)	2 (1.9)	1 (3.8)	0.20
Hospital length of stay, median days (interquartile range)	4 (3-5)	4 (3-5)	4 (3-5)	0.50
30-day mortality	0	0	0	
30-day readmissions	3 (2.3)	3 (2.9)	0 (0)	1.00
<b>Long-Term Outcomes</b>				
All-cause mortality	5 (3.8)	5 (4.8)	0 (0)	0.25
Mitral valve reoperation	2 (1.5)	0 (0)	2 (7.7)	0.004
Mean $\pm$ SD grade of mitral regurgitation on latest echocardiogram	0.79 $\pm$ 0.44	0.76 $\pm$ 0.42	0.91 $\pm$ 0.50	0.41



Notes:

## FOURTH SCIENTIFIC SESSION B - ADULT CARDIAC BREAKOUT

### 45. Burden and Impact of Tricuspid Regurgitation in Patients Undergoing Coronary Artery Bypass

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**Objectives:** Clinically significant tricuspid regurgitation (TR) portends a poor long-term survival after cardiac surgery. Current guidelines recommend correction of severe TR in the setting of left sided valve surgery but no specific recommendations exist for patients undergoing coronary artery bypass grafting (CABG). We sought to determine the prevalence of TR in patients undergoing CABG and the impact of TR severity on surgical outcomes.

**Methods:** All patients (n=28,027) undergoing coronary artery bypass grafting in a regional Society of Thoracic Surgery (STS) database (2011-2017) were stratified by severity of preoperative TR. Patients who underwent aortic or mitral valve surgery were excluded. Surgical morbidity and mortality were evaluated using univariate analysis.

**Results:** Of patients undergoing CABG, 4,837 (17%) had mild TR, 800 (3%) had moderate TR, while only 81 (0.29%) had severe TR. TR severity was associated with increased age (68 vs 71 vs 73 years old,  $p<0.0001$ ), higher rates of heart failure (35% vs 53% vs 67%,  $p<0.0001$ ) and preoperative pacemaker (4% vs 7% vs 10%,  $p<0.0001$ ), lower ejection fraction (55 vs 48 vs 40,  $p<0.0001$ ), and higher STS predicted risk of mortality (1.44% vs 2.75% vs 6.15%,  $p<0.0001$ ). Postoperatively, severity of TR was associated with significantly higher rates of renal failure, reoperation, prolonged ventilation, and operative mortality (**Table**). Overall, surgical correction of TR was performed in 45 (0.2%) patients, including just 26 (32%) patients with severe TR. However, those with severe TR who underwent surgical correction trended lower operative mortality than those who underwent CABG alone (7.69% vs 12.73%,  $p=0.700$ ).

**Conclusions:** Severe TR is uncommon in patients undergoing CABG, but occurs in patients with more comorbidities. The mortality in patients with severe TR is not well reflected by the STS score. These data support consideration of tricuspid repair for patients with severe TR undergoing CABG.

**Table** Society of Thoracic Surgeons Predicted Risk of Mortality and Major Morbidity and Mortality in patients Undergoing Coronary Artery Bypass Graft surgery stratified by severity of tricuspid regurgitation.

	None	Mild	Moderate	Severe	<i>p</i>
PROM	0.96 [0.55-1.86]	1.44 [0.77-2.94]	2.75 [1.43-5.40]	6.15 [2.24-11.38]	<0.0001
Stroke	254 (1.15%)	78 (1.61%)	21 (2.63%)	1 (1.23%)	0.0004
Renal Failure	426 (1.93%)	145 (3.00%)	58 (7.25%)	7 (8.64%)	<0.0001
DSWI	54 (0.24%)	19 (0.39%)	1 (0.13%)	0	0.3485
Reoperation	458 (2.07%)	131 (2.71%)	28 (3.50%)	6 (7.41%)	<0.0001
Prolonged Ventilation	1652 (7.48%)	495 (10.23%)	153 (19.13%)	22 (27.16%)	<0.0001
Mortality	344 (1.56%)	132 (2.73%)	58 (7.25%)	9 (11.11%)	<0.0001

Notes:

## FOURTH SCIENTIFIC SESSION B - ADULT CARDIAC BREAKOUT

### 46. National Trends in Racial and Ethnic Differences for CABG versus PCI Treatment of Coronary Artery Disease

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**Authors:** Rodrigo Zea-Vera, Rohan Shah, Qianzi Zhang, \*Subhasis Chatterjee, \*Matthew Wall, \*Todd Rosengart, \*Ravi Ghanta

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**Objectives:** Ensuring equitable access to cardiovascular therapies is a national health care priority. Racial differences in surgical versus interventional management of coronary artery disease have not been well examined. We sought to elucidate the impact of a patient's race on coronary artery disease treatment selection.

**Methods:** We queried the National Inpatient Sample (NIS) from 2002-2014 for patients who underwent isolated coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI) using ICD-9 codes. After accounting for outcome clustering and sampling design, we generated weighted national estimates and stratified outcomes by Caucasian, African-American, Hispanic and Asian race. Our primary outcomes were incidences of CABG vs. PCI in white vs. black patients. Secondary outcomes included in-hospital mortality, complications, length of stay, and costs. Multivariable logistic regression was implemented to determine the impact of race on receiving CABG or PCI after adjusting for patient demographics, comorbidities, and socioeconomic status.

**Results:** Over a 13-year period, 2,055,297 isolated CABGs and 6,361,200 PCIs were performed. Compared with Caucasian patients, African-American patients were younger (66 vs. 61 years), female (44.3% vs. 31.2%) more likely to have Medicaid (11.0% vs. 4.0%), and had higher prevalence of diabetes (38.6% vs. 27.7%), hypertension (78.4% vs. 68.6%), obesity (15.5% vs. 13.1%), renal failure (17.7% vs. 8.4%), prior TIA/stroke (5.3% vs. 3.1%) and Charlson comorbidity index (1.9 vs. 1.5, all  $p < 0.01$ , **Table**). After adjusting for patient demographics, insurance status, comorbidities and the diagnoses of acute myocardial infarction, STEMI and NSTEMI, African-Americans had lower odds of undergoing CABG (odds ratio [OR]= 0.82, 95% confidence interval [CI] 0.79 to 0.85, **Figure**) compared with Caucasians. African-Americans also had higher adjusted odds of death (OR= 1.19, 95% CI 1.09 to 1.30) and costs (beta coefficient= \$5,910, 95% CI \$4,976 to \$6,845, all  $p < 0.01$ ) following CABG compared with Caucasians.

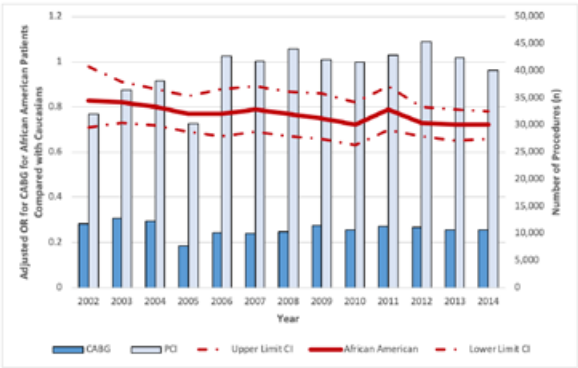
**Conclusions:** After accounting for pre-operative factors, including insurance status, African-American patients less frequently underwent CABG and more frequently underwent PCI compared with Caucasian patients. Racial differences in CABG vs. PCI treatment of coronary artery disease exists on a national level with likely multi-factorial etiologies. Additional measures are required to ensure access to surgical care.



Table: Demographics of Coronary Artery Disease Patients Requiring CABG or PCI Stratified by Race

Variable	White (n= 6,956,926)	Black (n=661,398)	Hispanic (n=603,809)	Asian (n=194,363)	P-Value
<b>Demographics</b>					
Age (Median, IQR)	66 (17)	61 (17)	63 (17)	65 (17)	<0.01*
Female	2,167,260 (31.2)	293,114 (44.3)	200,212 (33.2)	55,822 (28.7)	<0.01*
Payer					<0.01*
Medicare	3,752,655 (54.0)	315,424 (47.8)	280,337 (46.5)	78,531 (40.4)	
Medicaid	276,757 (4.0)	72,654 (11.0)	77,031 (12.8)	28,625 (14.7)	
Private	2,450,520 (35.3)	197,186 (29.9)	172,148 (28.5)	71,241 (36.7)	
Self-Pay	270,499 (3.9)	46,813 (7.1)	44,389 (7.4)	9,895 (5.1)	
<b>Comorbidities</b>					
Diabetes	1,894,909 (27.7)	253,149 (38.6)	253,437 (42.1)	74,546 (38.4)	<0.01*
Hypertension	4,696,150 (68.6)	514,269 (78.4)	442,392 (73.4)	141,636 (73.0)	<0.01*
Liver disease	57,749 (0.8)	7,561 (1.2)	7,407 (1.2)	2,237 (1.2)	<0.01*
Obesity	895,908 (13.1)	101,785 (15.5)	78,333 (13.0)	11,556 (6.0)	<0.01*
Peripheral vascular disorders	774,620 (11.3)	78,258 (11.9)	64,309 (10.7)	15,479 (8.0)	<0.01*
Renal failure	572,678 (8.4)	115,830 (17.7)	78,584 (13.0)	26,861 (13.8)	<0.01*
Prior MI	2,100,674 (30.2)	213,912 (32.3)	150,685 (25.0)	41,554 (21.4)	<0.01*
Prior TIA/Stroke	215,119 (3.1)	35,027 (5.3)	22,873 (3.8)	7,729 (4.0)	<0.01*
Charlson Comorbidity Index	1.5 (1.4)	1.9 (1.6)	1.8 (1.5)	1.6 (1.5)	<0.01*

Figure: Procedure Volume and Adjusted Odds Ratios of Receiving CABG for African Americans Compared with Caucasians from 2002-2014



Notes:

## FOURTH SCIENTIFIC SESSION B - ADULT CARDIAC BREAKOUT

### 47. Cardiac Surgery and Postoperative Allograft Failure in Renal Transplantation Recipients

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**Author Institution(s):** University of Alabama at Birmingham, Birmingham, AL

**Objectives:** Cardiac surgery among renal allograft recipients is relatively safe regarding mortality and morbidity compared to the general cardiac surgery patient population. However, less is known about the impact of cardiac surgery on the functioning renal allograft. This study assessed the incidence and risk factors of postoperative renal failure among renal transplant recipients undergoing cardiac surgery.

**Methods:** We identified the renal transplant recipients with a functional allograft undergoing cardiac surgery by linking the United Network for Organ Sharing (UNOS) Kidney Transplant Database to a cardiovascular surgery database (1992-2008) combined with the STS Adult Cardiac Surgery Database (2008-2018) of a large tertiary referral medical center. Demographics, pre-operative characteristics, operative details and post-operative outcomes were analyzed using the cardiac surgery databases and the allograft-related outcomes were obtained from the UNOS database. Descriptive statistics and multi-phase parametric hazard models were generated to describe and identify risk factors associated with mortality and renal failure. We conducted time-dependent Receiver operating curve (ROC) analyses to identify optimal cut off values of clinical indicators for predicting post-operative renal failure.

**Results:** We identified 186 patients who underwent cardiac surgery at a mean of 6.8 +/- 5.6 years after renal transplantation. The mean age at cardiac surgery was 55 +/- 10 years, and 62% of patients were male, 24% were African American. Surgeries included isolated coronary artery bypass (CAB; 54%, 101/186), isolated valve surgery (28%, 52/186), combined CAB and valve (15%, 27/186), and other (3%, 6/186). Post-operative survival at 1 month, 6 month, 2 years, 5 years, and 10 years was 95%, 86%, 74%, 50%, and 20%, respectively. Risk factors of mortality were older age (10-year increase; HR: 4.5,  $p < 0.01$ ), higher pre-operative creatinine (1 mg/dL increase; HR: 1.6,  $p = 0.02$ ), pre-operative LVEF  $< 55\%$  (HR: 1.75,  $p = 0.02$ ), longer cardiopulmonary bypass time (30-min increase; HR: 1.2,  $p = 0.05$ ), and combined CAB and valve procedures (HR: 2.1,  $p = 0.02$ ). Freedom from graft loss at 1 month, 6 month, 2 years, 5 years, and 10 years was 98%, 96%, 88%, 81%, and 55%, respectively. Higher pre-operative serum creatinine was associated with graft loss after cardiac surgery and ROC analyses identified having a pre-operative serum creatinine  $\geq 1.9$  mg/dL as the optimal cut-off value to predict graft loss (HR: 3.0, 95% CI: 1.5 to 6.9) with a C-statistic of 0.64.

**Conclusions:** Renal transplant recipients have an increased risk of allograft loss after cardiac surgery when the serum creatinine is  $\geq 1.9$  mg/dL. This value may inform shared decision-making with patients in consideration of cardiac surgery.

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**Notes:**

### 48. Monitoring Anticoagulation in Patients on Extracorporeal Membrane Oxygenation: Back to the Basics

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**Authors:** **Julian Dahl**, Jared Beller, Dustin Money, William Chancellor, \*James Mehaffey, Surabhi Palkimas, Matthew Morrisette, Yiyu Zhao, \*Leora Yarboro, \*Nicholas Teman

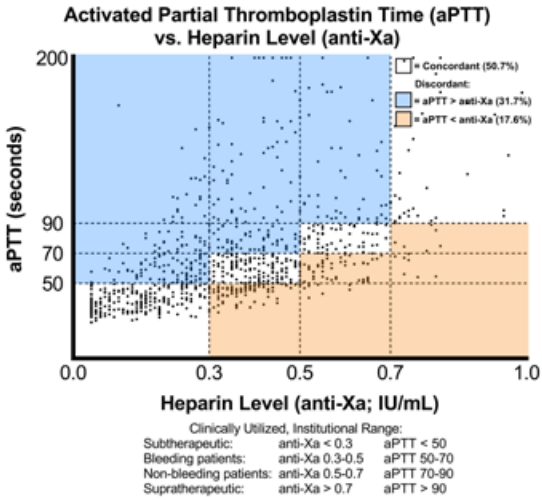
**Author Institution(s):** University of Virginia, Charlottesville, VA

**Objectives:** The optimal method for monitoring of anticoagulation in patients on extracorporeal membrane oxygenation (ECMO) is unknown and practices vary widely among centers. The objective of this study was to assess the relationship between anti-factor Xa level (anti-Xa; IU/mL) and activated partial thromboplastin time (aPTT; seconds) for monitoring intravenous unfractionated heparin (UFH) anticoagulation in adult ECMO patients. We hypothesized that there would be a high degree of variability and discordance between assays.

**Methods:** All adult ECMO patients from 2015 through 2017 were reviewed. Patients with ECMO runs <24 hours, who underwent multiple runs, or who were anticoagulated with bivalirudin were excluded. Time matched pairs of anti-Xa and aPTT were included in the analysis. Paired samples were concordant if both laboratory values were within the same clinically utilized, institutionally determined range (subtherapeutic: anti-Xa < 0.3 & aPTT < 50, guideline for bleeding patients: anti-Xa 0.3-0.5 & aPTT 50-70, guideline for non-bleeding patients: anti-Xa 0.5-0.7 & aPTT 70-90, and supratherapeutic: anti-Xa > 0.7 & aPTT > 90). Appropriate univariate analysis compared concordant and discordant assays. A hierarchical logistic regression model was used to determine factors associated with discordance while accounting for patient level effects.

**Results:** A total of 981 paired anti-Xa and aPTT values from 65 patients were evaluated. Fifty-four (83.1%) patients had at least one discordant pair with median percent discordance of 51.4% among patients with any discordance. Anti-Xa and aPTT were discordant in 484 (49.3%) paired samples with a high degree of variability on linear regression ( $r^2 = 0.33$ , Figure). Among discordant pairs, aPTT was higher compared to the anti-Xa in 64.3% and lower in 35.7%. On univariate analysis, discordance was associated with time since initiation of ECMO (76.1 vs 52.7 hours,  $p < 0.0001$ ), fibrinogen (422.5 vs 393.7 mg/dL,  $p = 0.006$ ), and INR (1.51 vs 1.41,  $p = 0.0003$ ). Discordance was not associated with type of ECMO (Venoarterial vs Venovenous), gender, age, or hematocrit ( $p > 0.05$ ). After risk adjustment, odds of discordance increased with time from initiation of ECMO (OR 1.28 per day,  $p < 0.0001$ ), fibrinogen level (OR 1.002,  $p = 0.044$ ), and INR (OR 3.22,  $p = 0.0008$ ).

**Conclusions:** Half of all anti-Xa and aPTT values were in discordant ranges and discordance is more likely as the time on ECMO increases. The use of either assay in isolation to guide UFH therapy may lead to the over- or underestimation of the degree of anticoagulation in complex ECMO patients.



**Notes:**

## FOURTH SCIENTIFIC SESSION B - ADULT CARDIAC BREAKOUT

### 49. Does Elective Sternal Plating In BMI > 35 Patients Reduce Sternal Complication Rates?

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**Objectives:** Most cardiac surgery is performed via median sternotomy. Complications of this approach represent a source of significant morbidity, mortality, and cost. While an increasing body of literature shows rigid plate fixation has superior outcomes over wire cerclage techniques, a patient population clearly benefitting from initial sternal plating over standard closure has not been identified. Current STS practice guidelines recommend enhanced sternal stabilization in high-risk patients (Level IIB). Yet there remains sparse data on plating as primary sternal closure in the morbidly obese. Our objective is to study the sternal complication rate of plated versus non-plated closure in morbidly obese patients.

**Methods:** A single-center retrospective review was performed of all cardiac surgical patients undergoing median sternotomy from July 2014 to July 2017 (n = 591). Data gathered included diagnosis, co-morbidities, and post-operative outcomes such as superficial and deep sternotomy infection, sternal instability / non-union, prolonged ventilatory support, takeback rates, etc. Patients undergoing partial or "mini" sternotomy (n = 27) were excluded. The outcomes of all patients with BMI ≥ 35kg/m<sup>2</sup> were compared between sternotomies with standard wire cerclage closure versus those with sternal plate reinforcement. Statistical significance was determined by Fisher's test two-tailed P < 0.05.

**Results:** 32.8% of sternotomies (185/564) were performed on patients with BMI ≥ 35kg/m<sup>2</sup>. Of this group, 31.4% (58/185) underwent sternal wire closure with titanium plate reinforcement and 68.6% (127/185) underwent traditional chest closure. The overall sternal complication rate was 4.32% (8/185). The plated group had a sternal complication rate of 5.17% (3/58) while the non-plated group had a complication rate of 3.94% (5/127), reaching no statistically significant difference in complication rates (P = 0.71). This study made no further exclusions based on patient demographics or comorbidities in an effort to examine the sternal plating complication rate of a patient population in a real-world scenario.

**Conclusions:** Traditionally, sternal plating studies have excluded high BMI, COPD, steroid dependence, etc. With the inclusion of all such demographics in this study, sternal plate reinforcement of patients with BMI ≥ 35kg/m<sup>2</sup> produced no difference in post-operative sternal complication rates, potentially increasing the total cost of sternal closure.

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Total BMI ≥ 35 (185)	Complication	No Complication	P-value
Plated 31.4% (58)	5.2% (3)	94.8% (55)	0.71
Non-Plated 68.6% (127)	3.4% (5)	96.1% (122)	

Notes:

### 50. Prolonged Operative Time for Pulmonary Lobectomy Predicts Worse Outcomes and Lower Value

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**Authors:** Travis Geraci<sup>1</sup>, **Dana Ferrari-Light**<sup>2</sup>, Chao Song<sup>3</sup>, Daniel Oh<sup>4</sup>,

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**Objectives:** Our objective is to investigate if total operative time (defined as wheels in to wheels out) reflects surgical team efficiency and is a surrogate for quality and value.

**Methods:** We retrospectively reviewed the Premier Healthcare Database for patients with primary lung cancer who had elective lobectomy from 2013-2016. Patients with operative time greater than 7 hours or less than 1 hour were excluded. Patients with a hospital length of stay greater than 30 days or less than 1 day were also excluded. Multivariate linear regression and logistic regression were used to adjust multiple covariates including age, gender, race, body mass index, comorbidity score, surgeon specialty and volume, hospital type, location, bed size, region, teaching status, payer and surgical approach (open vs. thoracoscopic vs. robotic).

**Results:** There were 19,651 patients: 6,714 had open thoracotomy, 8,289 underwent video-assisted thoracoscopic surgery (VATS), and 4,648 had a robotic approach. For all lobectomies, incremental increases in operative time were associated with longer lengths of stay, higher costs (including total cost, operative costs, and non-operative costs), more in-hospital complications, and increased 30-day readmission rates. Moreover, separate analyses for each surgical approach (open, thoracoscopic and robotic) showed similar statistically significant results independent of platform.

**Conclusions:** Longer operative time for pulmonary lobectomy is associated with progressively worse outcomes regardless of surgical approach. The correlation between operative time and value represents important opportunities to improve and measure teamwork, system efficiency, and competence to improve the care of patients with lung cancer.



Outcomes	Type	Effect Size (Per 15 min OR time increasing)	Baseline (3 hours OR duration)	P-Value
<b>Crude</b>				
Length of Stay	Difference (Null=0)	0.07 days (0.06, 0.08)	6.05 days (5.98, 6.13)	<.0001
Total Cost	Difference (Null=0)	\$877 (838, 916)	\$23483 (22235, 22731)	<.0001
No-operative room cost	Difference (Null=0)	\$498 (462, 534)	\$15721 (16492, 16949)	<.0001
Operative room cost	Difference (Null=0)	\$379 (360, 398)	\$5762 (5790, 5824)	<.0001
In-hospital complications	Odds Ratio (Null=1)	Odds Ratio 1.04 (1.03, 1.05)	Odds 0.62 (0.60, 0.64)	<.0001
30 days readmission	Odds Ratio (Null=1)	Odds Ratio 1.07 (1.01, 1.03)	Odds 0.07 (0.06, 0.07)	0.0008
<b>Adjusted*</b>				
Length of Stay	Difference (Null=0)	0.12 days (0.11, 0.13)	5.87 days (5.80, 5.94)	<.0001
Total Cost	Difference (Null=0)	\$893 (852, 933)	\$23420 (22375, 22694)	<.0001
No-operative room cost	Difference (Null=0)	\$515 (479, 554)	\$15648 (16421, 16874)	<.0001
Operative room cost	Difference (Null=0)	\$375 (366, 387)	\$5771 (5711, 5833)	<.0001
In-hospital complications	Odds Ratio (Null=1)	Odds Ratio 1.05 (1.05, 1.05)	Odds 0.62 (0.59, 0.67)	<.0001
30 days readmission	Odds Ratio (Null=1)	Odds Ratio 1.03 (1.01, 1.03)	Odds 0.06 (0.06, 0.07)	0.0005
Adjusted for age, gender, race, payer, comorbidity score, surgical morbidity, body mass index, surgeon specialty, surgeon volume, hospital location, bed size, region, teaching hospital status, and year.				

Notes:

## FOURTH SCIENTIFIC SESSION B - THORACIC BREAKOUT

### 51. Clinical Outcomes of Lung Transplants From Donors With Unexpected Pulmonary Embolism

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**Objectives:** Pulmonary embolism (PE) is unexpectedly detected in some donor lungs during organ procurement for lung transplantation (LT). Anecdotally, such lungs are usually implanted, however, the impact of this finding on recipient outcomes remains unknown. We hypothesized that incidentally detected donor PE is associated with adverse short-term and long-term outcomes in LT recipients.

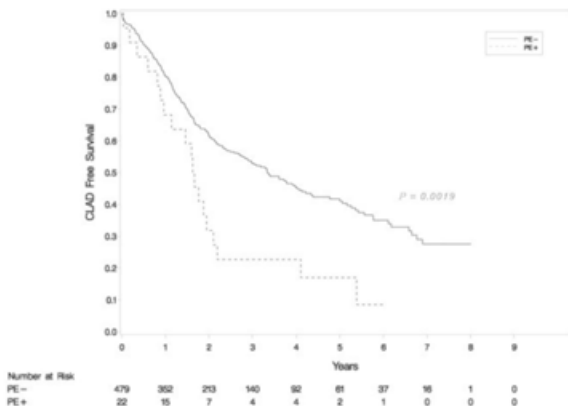
**Methods:** We analyzed a single-center, prospectively maintained database of all donor lung procurements performed by an experienced attending surgeon. Our previously described, standardized approach was used. Antegrade flush with preservative solution was performed via the pulmonary artery and retrograde flush via pulmonary veins. PE was defined as macroscopic thrombus coming out of the pulmonary artery during retrograde flush.

**Results:** Between December 2009 and June 2018, a total of 501 consecutive lung procurements were performed by one procurement surgeon. The incidence of donor PE was 4.4% (22/501). No organs were discarded due to PE. Donors with PE were similar to those without PE in age, gender, smoking history, PaO<sub>2</sub>, and other baseline characteristics (Table). Recipients in the 2 groups were also similar at baseline (Table). The incidence of primary graft dysfunction grade 3 was similar in the PE and non-PE cohorts (4/22, 18.2% vs. 126/479, 26.3%,  $p = 0.40$ ), however PE was associated with higher likelihood of acute cellular rejection (ACR) grade  $\geq 2$  (10/22, 45.5% vs. 120/479, 25.1%,  $p = 0.03$ ).

Multivariate Cox regression modeling revealed that donor PE (hazard ratio, HR, 2.00, 95% confidence interval 1.25-3.20,  $p = 0.004$ ) was associated with higher incidence of chronic lung allograft dysfunction (CLAD) while donor smoker status was protective against CLAD (HR 0.62, 95% CI 0.39-0.96,  $p = 0.03$ ). Kaplan-Meier analysis showed that the CLAD-free survival rate was significantly higher in the recipients from the donors without PE than with PE (5-year CLAD-free survival 46.9% versus 20.4%,  $p = 0.0019$ ) (Figure).

**Conclusions:** Donors with unexpected PE were associated with higher incidence of CLAD after LT. Chronic small airway ischemia resulting from occlusion of small pulmonary arteries that are the only source of airway blood supply after LT is a possible mechanism for this finding.

	All Patients n = 501	PE Absent n = 479	Present n = 22	p-value
<Donor>				
Age (years)	36.2 ± 14.9	36.2 ± 14.9	37.5 ± 15.5	0.69
Male (%)	294 (58.7)	278 (58.0)	16 (72.7)	0.19
Smoking history (%)	59 (11.8)	57 (11.9)	2 (9.1)	1
Best PaO <sub>2</sub> (mmHg)	507.9 ± 71.9	508.4 ± 72.3	498.4 ± 63.3	0.5
Cause of death (%)				0.39
Cerebrovascular stroke	159 (31.7)	152 (31.7)	7 (31.8)	
Head trauma	208 (41.5)	196 (40.9)	12 (54.6)	
Anoxia	111 (22.2)	109 (22.8)	2 (9.1)	
Others	23 (4.6)	22 (4.6)	1 (4.6)	
<Recipient>				
Age (years)	53.9 ± 14.2	53.9 ± 14.3	54 ± 13.1	0.79
Male (%)	291 (58.1)	276 (57.6)	15 (68.2)	0.38
Lung allocation score	47.4 ± 17.8	47.3 ± 17.7	49 ± 20.2	0.94
Underlying disease (%)				0.56
Obstructive lung diseases	101 (20.2)	97 (20.3)	4 (18.2)	
Pulmonary vascular diseases	8 (1.6)	7 (1.5)	1 (4.6)	
Cystic fibrosis	82 (16.4)	80 (16.7)	2 (9.1)	
Restrictive lung diseases	235 (46.9)	225 (47.0)	10 (45.5)	
Others	75 (15.0)	70 (14.6)	5 (22.7)	
Ischemic time (min)	221 ± 63.9	221 ± 63.8	217 ± 66.9	0.63
CMV mismatch	221 (44.1)	207 (43.2)	14 (63.6)	0.08



Notes:

## FOURTH SCIENTIFIC SESSION B - THORACIC BREAKOUT

### 52. Outcomes Following Lobar and Sublobar Resection for Clinical Stage 1 Non-Small Cell Lung Cancer in Women

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**Authors:** William Phillips<sup>1</sup>, Ritu Gill<sup>2</sup>, Emanuele Mazzola<sup>3</sup>, Julee Armitage<sup>4</sup>, Claire de Forcrand<sup>1</sup>, Yolonda Colson<sup>4</sup>, \*Barry Gibney<sup>5</sup>

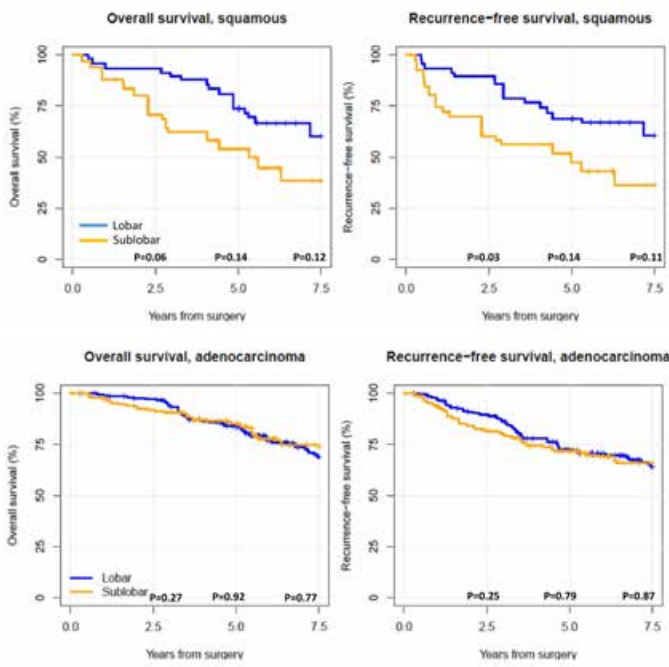
**Author Institution(s):** <sup>1</sup>Brigham and Women's Hospital, Boston, MA; <sup>2</sup>Beth Israel Deaconess Medical Center, Boston, MA; <sup>3</sup>Dana-Farber Cancer Institute, Boston, MA; <sup>4</sup>Massachusetts General Hospital, Boston, MA; <sup>5</sup>Medical University of South Carolina, Charleston, SC

**Objectives:** The use of sublobar resection in clinical stage 1 non-small cell lung cancer (NSCLC) remains controversial. There are sex-specific differences in the distribution of histologic subtypes in NSCLC which may impact overall survival (OS) and recurrence free survival (RFS). We hypothesized that sublobar resection would have equivalent OS and RFS compared to lobar resection in adenocarcinoma, but not in squamous cell carcinoma (SCC).

**Methods:** We performed a retrospective review of a prospectively maintained database of female patients undergoing surgery for clinical stage 1 NSCLC. A propensity score-matched analysis was used to compare patients with adenocarcinoma and SCC who underwent lobar or sublobar resection. After matching, Kaplan-Meier curves were calculated for histology-specific OS and RFS. A multivariable analysis was performed using Cox proportional hazards model.

**Results:** 351 patients (289 adenocarcinoma, 62 SCC) with clinical stage 1 NSCLC met inclusion criteria after matching. 194 patients (162 adenocarcinoma, 32 SCC) underwent lobar and 157 patients (127 adenocarcinoma, 30 SCC) underwent sublobar resection. For SCC, we observed a statistically significant decrease in OS ( $p=0.06$ ) and RFS ( $p=0.03$ ) with a sublobar resection at 2.5 years, although statistical significance was not reached at 5 and 7.5 years. For adenocarcinoma, we observed no statistically significant difference between lobar and sublobar resection on the OS and RFS at 2.5, 5, and 7.5 years. Moderately and poorly differentiated adenocarcinoma showed increased risk of death (hazard ratio [HR] = 2.044,  $p=0.022$  [moderately]; HR 2.276,  $p=0.043$  [poorly]) and recurrence (HR=2.394,  $p=0.001$ ; HR=2.258,  $p=0.025$ ). Tumor grade had less impact for SCC as we observed no statistically significant increase risk of death (HR=0.844,  $p=0.882$  [moderately]; HR 1.258,  $p=0.839$  [poorly]) or recurrence (HR 1.233,  $p=0.852$ ; HR 1.430,  $p=0.750$ ).

**Conclusions:** In women with clinical stage 1 NSCLC, we observed a decrease in OS and RFS for SCC at 2.5 years for sublobar resections and no difference in the OS and RFS for adenocarcinoma based upon resection type. However, moderately to poorly differentiated adenocarcinoma increased the risk of death and recurrence.



Notes:

## FOURTH SCIENTIFIC SESSION B - THORACIC BREAKOUT

### 53. Reoperative Pectus Repair in Adults Using Biomaterials

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**Authors:** D\*Daniel L. Miller

**Commercial Relationships:** D. Miller: Speakers Bureau/Honoraria: Acute Innovations

**Author Institution(s):** WellStar Health System, Marietta, GA

**Objectives:** Reoperation after failed pectus repair, Open or Nuss, is complex and at times not possible. Extensive dissection and sternal stability is required to correct a recurrent pectus defect (PD) or expand the chest of the patient with acquired restrictive thoracic dystrophy (ARTD). Recently, an absorbable bar (polylactid acid - PLA) was developed for rib fracture repair. The advantage of the absorbable bar is that it remains structurally intact for 18 to 24 months and does not require removal. This series is of our experience of using biomaterials for reoperative pectus surgery.

**Methods:** We respectively reviewed the medical records of all patients who were referred to our institution for correction of pectus abnormalities from January 2014 through March 2019; 174 patients were evaluated. Treatment recommended were non-operative (Vacuum Bell or Chest Brace) in 27 patients, primary pectus repair (Open 75, Nuss 10) in 85 and reoperation in 62 (Open 32; ARTD 30). All patients were evaluated with 3-D Reconstruction CT Scans of chest (Sternum, Ribs, Cartilages), Echocardiogram, Pulmonary Function Tests, and review of old operative reports if available.

**Results:** Median age was 38 years old (range, 18 - 72 years); 39 (63%) were men. Open repair was performed previously at a median of 26 years (range 2 - 41); 12 patients (19%) had metal support bars in place and 13 (21%) breast implants. Median pectus index was 4.2 (range 3.2 - 11.7); 50 patients (69%) had an asymmetric defect. The 32 patients who had Open repair for recurrent pectus underwent posterior sternal support with PLA absorbable bars; 20 had a single doublet, 12 had a single triplet. The 30 patients who had ARTD expansion surgery had multiple PLA absorbable bars, a median of 10 bars (range, 8 - 14). Median operative time was 200 minutes (range, 119 - 361 minutes). Median hospital stay was 7 days (range, 4 - 21). Postoperative complications occurred in 22 patients (35%); 14 had a seroma, 4 a pneumothorax, 2 pneumonia, 2 respiratory failure. Late complications occurred in 10 patients (16%), six a wound infection, two a foreign body reaction, and two seroma. Ten patients (16%) required reoperation for incisional and/or soft tissue issues. Median follow-up was 32 months (range, 1 - (range, 1 - 60). None of the patients required reoperation for reoperation for a pectus or ARTD recurrence.

**Conclusions:** Reoperative pectus surgery is complex and requires a detailed preoperative evaluation and plan for correction. Placement of PLA absorbable bars for posterior sternal support and chest cavity expansion provides a safe alternative to a metal bars. Complications are common and are usually soft tissue-related, long-term results are acceptable in this group of patients. Utilization of absorbable PLA bars may be the preferred materials for reoperative pectus and restricted thoracic dystrophy surgery.

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**Notes:**

### 54. Predictors of Use and Survival in Old Donor Lung Transplant: An Analysis of the UNOS Registry

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**Authors:** Ashley Choi<sup>1</sup>, Oliver Jawitz<sup>2</sup>, Vignesh Raman<sup>2</sup>, \*Jacob Klapper<sup>2</sup>, \*Matthew Hartwig<sup>3</sup>

**Author Institution(s):** <sup>1</sup>Duke University School of Medicine, Durham, NC; <sup>2</sup>Duke University Medical Center, Durham, NC; <sup>3</sup>Duke University, Durham, NC

**Objectives:** Older donors are increasingly utilized due to a shortage of donor allografts in lung transplantation. While there are conflicting data on the survival of recipients with older donors, there are no established guidelines on the age of donors selected for transplantation. We aimed to identify predictors of use of older donor allografts using a large national cohort and determine factors associated with improved survival among recipients of older donor allografts.

**Methods:** All adult (age  $\geq 18$ ) donors who donated at least one organ for transplant between 2006 and 2018 were analyzed from the UNOS registry. We performed an unadjusted analysis of lung allograft disposition stratified by donor age and employed multivariable logistic regression to identify factors associated with utilization of older donor lung allografts for transplant. Cox proportional hazards analysis was performed to identify factors associated with mortality in recipients of older donor lungs.

**Results:** A total of 202,477 donors were analyzed and stratified by age (old, age  $> 55$ , n=40,406, 20% vs young, age  $\leq 55$ , n=162,071, 80%). Donor factors associated with lower utilization included male sex (OR 0.88, p<0.05), age (OR 0.85, p<0.001), black (OR 0.60, p<0.001), Hispanic (OR 0.76, p<0.05), cigarette use (OR 0.21, p<0.001), cocaine use (OR 0.69, p<0.05), donation after circulatory death (DCD) (OR 0.16, p<0.001), PaO<sub>2</sub>/FiO<sub>2</sub> (P/F) ratio <350 (OR 0.02-0.26, p<0.001). In recipients of old donor allografts, increasing donor age (HR 1.03, 95% CI 1.01, 1.05), recipient age  $> 47$  (HR 1.03, 95% CI 1.02, 1.04, p<0.001) and male sex (HR 1.19, 95% CI 1.02, 1.39) portended worse survival. Median survival in young (age  $< 47$ ) recipients of old donor lungs was 7.9 years from time of transplantation, as compared with 5.3 years in old (age  $\geq 47$ ) recipients of old donor lungs. The survival difference between the groups was significant (p=0.013).

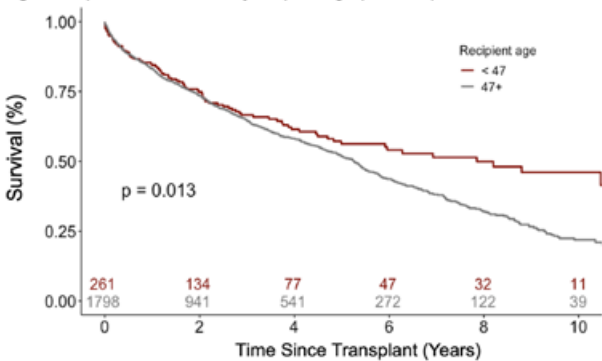
**Conclusions:** Low P/F ratios impact utilization and may be mitigated by appropriate use of ex vivo lung perfusion. Some of these predictors of utilization may not correlate with predictors of outcomes such as DCD. Younger, female recipients of older donor lungs had superior survival. Interventions to optimize donor conditions and careful selection of recipients of older donor allografts may improve utilization without compromising post-transplant survival.



**Table:** Logistic regression of factors predicting the use of old donor allografts for transplant

	Odds Ratio	95% Confidence Interval		p-value
		Lower	Upper	
Male sex	0.88	0.78	0.99	0.036
Donor age (per year)	0.85	0.84	0.86	< 0.001
BMI	0.99	0.98	1.00	0.181
Ethnicity				
White	Ref	Ref	Ref	Ref
Black	0.60	0.51	0.71	< 0.001
Hispanic	0.76	0.63	0.92	0.004
Other	0.59	0.47	0.75	< 0.001
Cigarette use	0.21	0.18	0.24	< 0.001
Cocaine use	0.69	0.54	0.88	0.003
Alcohol abuse	0.91	0.77	1.06	0.230
Hypertension	0.92	0.81	1.04	0.170
Diabetes	0.92	0.79	1.07	0.279
DCD donor	0.16	0.12	0.23	< 0.001
Cause of death				
Anoxia	Ref	Ref	Ref	Ref
Cerebrovascular/stroke	2.40	2.02	2.96	< 0.001
Head trauma	2.09	1.67	2.62	< 0.001
CNS tumor	2.55	1.14	5.74	0.023
Other	2.08	1.23	3.51	0.006
P/F Ratio				
> 350	Ref	Ref	Ref	Ref
300-350	0.26	0.22	0.30	< 0.001
250-300	0.09	0.07	0.12	< 0.001
< 250	0.02	0.02	0.03	< 0.001

**Figure:** Kaplan-Meier survival by recipient age (<47, ≥47)



Notes:

## FOURTH SCIENTIFIC SESSION B - THORACIC BREAKOUT

### 55. The Ideal Approach for Clinical Locally Advanced Esophageal Cancer - Neoadjuvant vs Adjuvant Strategy: An Analysis of 11,364 Patients in the National Cancer Database (NCDB)

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**Authors:** Binhao Huang, Jie Zhang, \*Arjun Pennathur, James Luketich

**Author Institution(s):** University of Pittsburgh Medical Center, Pittsburgh, PA

**Objectives:** Neoadjuvant therapy followed by surgery is recommended for locally advanced esophageal cancer. With the inaccuracies of clinical staging particularly for cT1N+ and cT2Nany tumors, some have proposed surgery followed by adjuvant treatment. Adjuvant therapy has its advantages in that definite surgery can be performed as upfront management, and subsequent treatment could be decided based on more reliable pathological information. This study was to evaluate the efficacy of neoadjuvant followed by surgery vs surgery followed by adjuvant therapy for locally advanced esophageal cancer, and to identify the ideal sequence of treatment for different subgroups particularly in patients with cT1N+ and cT2Nany tumors.

**Methods:** We accessed NCDB (2006-2015) and identified 11,364 patients with cT2-4 or cN+ esophageal cancer, who underwent esophagectomy and additional chemotherapy or radiotherapy. They were divided into three groups: neoadjuvant therapy (NT), adjuvant therapy (AT) and combination therapy of neoadjuvant and adjuvant (CT). Log-rank test and multivariable Cox regression was used to compare overall survival between three groups and subgroups.

**Results:** Among total 11364 patients: 8017 esophageal adenocarcinoma (EAC) and 1643 esophageal squamous cell carcinoma (ESCC), 9660 (85.0%) were treated with NT, 675 (5.9%) with AT and 1029 (9.1%) with CT.

In univariate analysis, NT and CT was associated with significantly better overall survival compared to AT ( $P<0.0001$ , HR=0.84;  $P=0.0004$ , HR=0.83, respectively), and there were no significant differences in OS between NT vs. CT ( $P=0.87$ ).

**Figure A.** In multivariate analysis, NT was independently associated with significantly lower risk of death ( $P<0.05$ ). No significant differences were found between NT and CT in any clinical subgroups ( $P>0.05$ ). There were however, no significant differences noted in survival between the AT group compared to NT group in following subgroups: cT1N+, cT2N-, cT2N+ ( $P=0.335$ ), as well as age under 66, female, Charlson score $>0$  ( $P>0.05$ ). **Table**

For cT1N+ and cT2Nany patients who received adjuvant therapy, survival benefit was observed in those with chemotherapy and chemoradiotherapy ( $P=0.005$ , HR=0.383;  $P=0.010$ , HR=0.4198, respectively), compared to radiotherapy alone. There was no significant difference of overall survival between chemoradiotherapy and chemotherapy alone ( $P=0.476$ ). **Figure B.** Negative rate of surgical margin did not differ among these three groups (88.0%, 80.0% and 83.2%, respectively,  $P=0.512$ ).

**Conclusions:** Compared to adjuvant therapy, neoadjuvant therapy was associated with improved overall survival for most subgroups of locally advanced esophageal cancer. In patients with clinical stages of T1N+, T2N- or T2N+, there was no evident superiority of neoadjuvant therapy over AT. Upfront surgery followed by adjuvant therapy can be considered to be an alternative option in these patients. Further prospective studies are needed to validate these findings.

**Subgroup analysis in multivariate Cox regression model for difference of overall survival in three cohorts**

Subgroups	Strategy	Adjusted HR	95%CI of HR	Adjusted P value
Reference	NT	1.000	1.000	1.000
Age				
≤55	AT	1.158	0.907-1.478	0.241
	CT	1.098	0.911-1.322	0.326
56-65	AT	1.046	0.856-1.278	0.663
	CT	1.009	0.873-1.167	0.903
66-75	AT	1.270	1.054-1.531	0.012
	CT	0.951	0.792-1.141	0.589
>75	AT	2.045	1.482-2.822	0.000
	CT	1.404	0.831-2.372	0.205
Sex				
Male	AT	1.209	1.074-1.362	0.002
	CT	1.023	0.926-1.131	0.652
Female	AT	1.266	0.936-1.712	0.125
	CT	0.958	0.716-1.282	0.774
Charlson				
0	AT	1.281	1.118-1.467	0.000
	CT	1.027	0.920-1.147	0.633
1	AT	1.077	0.862-1.347	0.514
	CT	1.061	0.862-1.307	0.576
≥2	AT	1.213	0.812-1.811	0.345
	CT	0.852	0.555-1.307	0.463
Histology type				
ESCC	AT	1.721	1.325-2.235	0.000
	CT	1.143	0.867-1.507	0.342
EAC	AT	1.144	1.013-1.293	0.031
	CT	1.006	0.909-1.113	0.913
c Stage				
T1N+	AT	0.709	0.330-1.520	0.376
	CT	1.318	0.757-2.295	0.328
T2	AT	1.164	0.959-1.412	0.125
	CT	1.073	0.852-1.351	0.551
T2N0	AT	1.100	0.865-1.400	0.436
	CT	1.262	0.885-1.800	0.199
T2N+	AT	1.211	0.867-1.692	0.261
	CT	1.003	0.737-1.365	0.984
T1+T2	AT	1.096	0.910-1.320	0.335
	CT	1.120	0.907-1.382	0.292
T3+T4	AT	1.300	1.132-1.492	0.000
	CT	0.988	0.888-1.099	0.824

Covariates in Cox model were all categorical variables included age, sex, race, type of insurance, income, education, rurality, patient comorbidity, type of facility and clinical T and N stage.

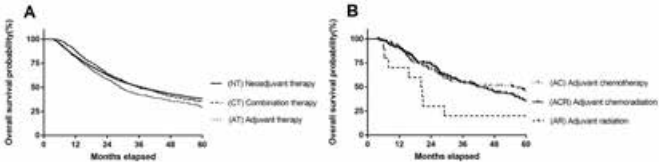


Figure A: Overall survival by treatment strategies as Neoadjuvant Therapy (NT), Adjuvant Therapy (AT) and Combination Therapy (CT). NT vs AT: P=0.2001; NT vs CT: P=0.880; NT vs CT: P=0.87. Figure B: Overall survival by treatment strategies as Adjuvant chemotherapy (AC), Adjuvant radiation (AR) and Adjuvant chemoradiation (ACR) in cT1-2 esophageal cancer. AC vs ACR: P=0.476; HR 0.888 (0.640-1.227); AR vs ACR: P=0.310; HR 2.362 (0.875-6.487); AC vs AR: P=0.003; HR 0.383 (0.125-1.104).

Notes:

### 56. An Assessment of the Opportunity for Clinical Variation Reduction in Propensity Matched Patients Treated for Malignant Pleural Effusion

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**Authors:** \*Richard Freeman<sup>1</sup>, \*Anthony Ascoti<sup>2</sup>, Vijay Nuthakki<sup>3</sup>

**Author Institution(s):** <sup>1</sup>St. Vincent's Health and Hospital System, Indianapolis, IN; <sup>2</sup>St. Vincent Medical Group, Indianapolis, IN; <sup>3</sup>St Vincent Health, Indianapolis, IN

**Objectives:** The potential advantages of clinical variation reduction are improved patient outcomes and cost reduction through optimizing and standardizing care. Malignant pleural effusion (MPE) is a common condition encountered by thoracic surgeons which has significant variation in cost and outcomes. The purpose of this investigation was to assess the opportunity of improving patient outcomes and reducing cost by using a standardized treatment algorithm based on evidenced based care.

**Methods:** Patients treated for an MPE using a standardized treatment algorithm at the study institution over a 2 year period were identified and propensity matched to MPE patients from one of six affiliated hospitals with comprehensive oncology and thoracic surgery services. Matched patients were treated at their physicians' discretion. Factors utilized in the propensity matching included age, performance status and tumor histology. The two cohorts were then compared for interventions, admissions and readmissions, morbidity and pleural effusion associated costs. Patients who desired only comfort/hospice care were excluded.

**Results:** From 2016 through 2018, 60 patients were treated using the standardized algorithm. These patients were propensity matched as described and the two cohorts compared (Table 1). Patients treated with the algorithm experienced significantly fewer hospital admissions, readmissions, interventions and costs while having a comparable procedural morbidity.

**Conclusions:** An evidence based treatment algorithm for MPE produces superior clinical outcomes to individualized therapy while significantly reducing the costs of care. The potential savings for such an algorithm used in the United States with a 30% adoption rate would result in an annual 1.1 billion dollar savings.

	Algorithm Patients	Non-Algorithm Patients	p
N	60	60	
Age (mean yrs)	63±11	59±13	0.07
ECOG performance status (mean)	1.5±0.2	1.4±0.4	0.09
Admissions for pleural effusion (mean)	2±1	3±2	0.0007
Readmissions for pleural effusion (mean)	0.4±0.3	0.9±0.8	<0.0001
Thoracenteses (mean)	2±2	4±2	<0.0001
Bedside pleurodesis	9 (15%)	19 (32%)	0.05
VATS pleurodesis	18 (30%)	21 (35%)	0.69
Tunneled pleural catheter	33 (55%)	20 (33%)	0.03
Procedural associated morbidity	2	5	0.4
Cost (mean dollars)	\$49,000±11,000	\$72,000±19,000	<0.0001

Notes:

### 57. Risk Factors for Non-Home Discharge After Esophagectomy

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**Authors:** Christopher Heid, Mitri Khoury, \*Tracy Geoffrion, Alberto De Hoyos

**Author Institution(s):** University of Texas Southwestern Medical Center, Dallas, TX

**Objectives:** Esophageal resection with restoration of gastrointestinal continuity for cancer is physiologically demanding and associated with various morbidities. While the 30-day mortality rate for esophagectomy remains relatively low, little is known about the risk factors for non-home discharge after this operation. The purpose of this study was to assess the risk factors predictive of non-home discharge after elective esophagectomy.

**Methods:** The 2016-2017 American College of Surgeons NSQIP database was queried for individuals who underwent esophagectomy for a neoplasm. Those who expired within 30-days of their operation or whose index operation was emergent were excluded. Patients were divided into 2 groups: home discharge and non-home discharge, which included individuals who were discharged to a rehabilitation facility, an unskilled or skilled nursing facility, or a different long term acute care hospital. Univariate and multivariate analyses were performed to identify factors predictive of non-home discharge.

**Results:** A total of 1007 patients were included. Of those, 886 (88.0%) patients were discharged home and 121 (12.0%) patients had a non-home discharge. Multivariate analysis demonstrated that patients age 65 to 74 (OR 2.41, 95% CI 1.36-4.27,  $p=0.003$ ) and  $>75$  (OR 6.95, 95% CI 3.43-14.09,  $p<0.001$ ) were more likely to have a non-home discharge. Additionally, non-home discharge was associated with mechanical ventilation  $>48$  hours (OR 3.45, 95% CI 1.24-9.59,  $p=0.02$ ), urinary tract infection (OR 6.79, 95% CI 1.96-23.43,  $p=0.002$ ), and increasing length of stay (OR 1.09, 95% CI 1.05-1.12,  $p<0.001$ ). In contrast, a minimally invasive approach for both the thoracic and abdominal portion of the operation was predictive of a home discharge (OR 0.51, 95% CI 0.27-0.96,  $p=0.04$ ).

**Conclusions:** We identified various factors that were predictive of non-home discharge with a minimally invasive surgical approach being protective of home discharge. Identification of patients at risk for non-home discharge is important to expedite discharge planning. This may decrease hospital stay, reduce cost, and improve outcomes.

Table 1: Multivariate Analysis- Preoperative Characteristics

Variable	OR	95% CI	P-Value
<b>Age, Years</b>			
<65 (Reference)	1.0		
65-74	2.411	1.36-4.27	0.003
≥75	6.95	3.43-14.09	<0.001
<b>Sex</b>			
Male (Reference)	1.0		
Female	1.22	0.63-2.34	0.56
<b>Race/Ethnicity, n (%)</b>			
White	1.0		
Black	2.38	0.53-10.74	0.26
Other	0.61	0.11-3.26	0.56
Unknown	0.48	0.19-1.21	0.12
<b>ASA Class ≥III, n (%)</b>	1.30	0.58-2.91	0.53
<b>Comorbidities, n (%)</b>			
Smoking	0.90	0.49-1.67	0.74
Diabetes Mellitus	1.41	0.80-2.48	0.24
Chronic Obstructive Pulmonary Disease	1.00	0.45-2.26	0.99
Congestive Heart Failure	0.33	0.01-8.55	0.50
Hypertension	1.27	0.75-2.13	0.37
>10% loss body weight last 6 months	0.74	0.40-1.36	0.74
Bleeding Diasthesis	0.83	0.23-2.94	0.77
<b>Steroid Use, n (%)</b>	1.67	0.56-4.96	0.36
<b>Preoperative Functional Status</b>			
Independent (Reference)			
Partially Dependent	4.99	0.41-60.46	0.21
<b>Chemotherapy within 90 days</b>	0.97	0.37-2.56	0.95
<b>Radiation therapy within 90 days</b>	0.93	0.37-2.37	0.93

Table 2: Multivariate Analysis- Operative and Post-Operative Characteristics

Variable	OR	95% CI	P-Value
<b>Operative Time, Minutes</b>	1.00	0.99-1.01	0.20
<b>Minimally Invasive Approach</b>			
Total Open (Reference)	1.0		
Thoracic Only	0.38	0.12-1.22	0.11
Abdominal Only	0.43	0.19-1.01	0.05
Thoracic and Abdominal	0.51	0.27-0.96	0.04
<b>Conversion to Open</b>	2.45	0.92-6.53	0.07
<b>Anastomotic Leak</b>	0.70	0.33-1.51	0.37
<b>Unplanned Reoperation</b>	1.25	0.63-2.52	0.52
<b>Clostridium difficile Colitis</b>	0.46	0.09-2.40	0.35
<b>Surgical Site Infection</b>	1.79	0.77-4.16	0.18
<b>Pneumonia</b>	1.84	0.94-3.61	0.08
<b>Unplanned Intubation</b>	0.92	0.36-2.33	0.86
<b>Pulmonary Embolism</b>	3.66	0.86-15.67	0.08
<b>Deep Vein Thrombosis</b>	1.63	0.49-5.47	0.43
<b>Ventilator &gt;48 Hours</b>	3.45	1.24-9.59	0.02
<b>Acute Renal Failure</b>	0.27	0.01-8.29	0.45
<b>Urinary Tract Infection</b>	6.79	1.96-23.43	0.002
<b>Myocardial Infarction</b>	1.35	0.10-19.19	0.82
<b>Cardiac Arrest Requiring CPR</b>	1.48	0.12-17.96	0.76
<b>Blood Transfusion</b>	1.46	0.73-2.92	0.28
<b>Sepsis</b>	0.44	0.15-1.29	0.14
<b>Length of Stay, Days</b>	1.09	1.05-1.12	<0.001

Notes:

### 58. Rib Plating Offers Favorable Outcomes in Patients with Chronic Non-Union of Prior Rib Fractures

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**Authors:** Kerrie Buehler, Candice Wilshire, Adam Bograd, Eric Vallieres

**Author Institution(s):** Swedish Cancer Institute, Seattle, WA

**Objectives:** Although rib fracture open reduction and internal fixation (ORIF) is an accepted treatment of some acute fractures, there is paucity of literature on its potential to treat chronic non-union fractures. This study evaluates the outcomes and quality of life of patients who underwent ORIF for chronic, symptomatic, non-union rib fractures.

**Methods:** From 1/2011-2/2018, 32 patients were explored for possible ORIF of symptomatic, chronic, non-union rib fractures (> 6 months after injury). After excluding non-English speaking patients (n=1), those where no instability was noted at surgery (n=3), and those deceased at the time of this study (n=4), 24 patients were eligible for evaluation. Telephonic interviews were conducted using a previously published rib fracture pain questionnaire recording patient outcomes and quality of life. The questionnaire included preoperative and postoperative components. Comparative analysis of variables was completed using the Wilcoxon signed rank test and chi-square tests.

**Results:** Seventy percent (19/24) of eligible patients consented and completed the questionnaire at a median time from surgery of 55 months (interquartile range [IQR]: 24-62 months). Median age was 57 years (IQR: 51-63 years) and median body mass index was 32 kg/m<sup>2</sup> (IQR: 26-34 kg/m<sup>2</sup>). Eighty-nine percent (17/19) were male. Injuries were classified as multi-system trauma (n=4) or isolated rib fractures (n=15). There was a significant symptomatic improvement preoperatively versus postoperatively (Figure 1). The median pain severity (on a scale of 1 [none/mild] -10 [severe]) significantly decreased from preoperatively (9, IQR: 7-10) to postoperatively (1, IQR: 0-2); p<0.001. The majority of patients returned to daily activities, were able to work at their pre-injury level, were satisfied with their surgery and would undergo operative management again (Table 1).

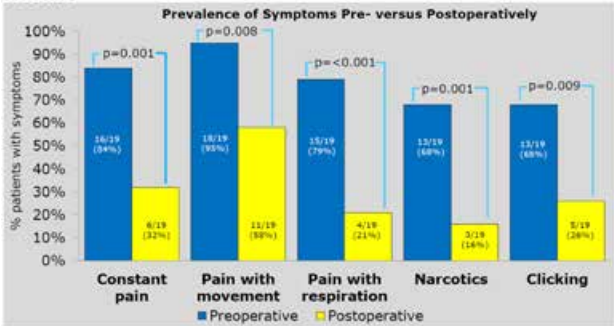
**Conclusions:** Patients who underwent ORIF for chronic non-union rib fractures reported a significant decrease in fracture-associated symptoms and pain severity postoperatively. Additionally, the majority returned to daily activities, work at pre-injury levels and were satisfied with surgery. ORIF should be considered as an option to help patients with symptomatic non-union rib fractures.



**TABLE 1**

Questionnaire Responses: Quality of Life			
	Preoperative	Postoperative	
Variable:	Number (%) (N=19)	Number (%) (N=19)	p- value
Limited in daily activities	19 (100)	8 (42)	<0.001
Able to work at preinjury level (including only isolated rib fractures, n=15)	4 (27)	10 (67)	0.028
Satisfied with surgery	-	17 (89)	-

**FIGURE 1**



Notes:

### 59. Minimum Volume Standards for Surgical Care of Early Stage Lung Cancer: A Cost-Effectiveness Analysis

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**Authors:** \*Melanie Subramanian<sup>1</sup>, Su-Hsin Chang<sup>1</sup>, Zhang Jianrong<sup>2</sup>, Daniel Willis<sup>1</sup>, \*Tara Semenkovich<sup>1</sup>, Brendan Heiden<sup>1</sup>, \*Benjamin Kozower<sup>1</sup>, \*Daniel Kreisel<sup>1</sup>, \*Bryan Meyers<sup>1</sup>, Ruben Nava<sup>1</sup>, \*G. Alexander Patterson<sup>1</sup>, Varun Puri<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Washington University School of Medicine, St. Louis, MO;

<sup>2</sup>Brown School at Washington University, St. Louis, MO

**Objectives:** Multiple stakeholders, including employers and payers, have advocated for minimum volume standards for complex surgical procedures. The Leapfrog Group, one of the largest coalitions of public and private purchasers of healthcare insurance, recommends lung cancer patients to receive surgery at hospitals that perform at least 40 lung resections annually. However, the cost-effectiveness of such recommendations is unknown. To inform health policy, we evaluated the cost-effectiveness of clinical stage I non-small cell lung cancer (NSCLC) patients receiving surgery at Leapfrog and non-Leapfrog hospitals. Cost-effectiveness was evaluated by measuring the incremental cost-effectiveness ratio (ICER), defined as cost per quality-adjusted life-year (QALY) gained.

**Methods:** Decision analysis was performed from the payer perspective with two time horizons: 90-days and 5-years. Outcomes including in-hospital mortality, 90-day and 5-year overall survival, complications, readmissions, and pathologic upstaging were obtained from the literature and a propensity-matched sample from the National Cancer Database. Utility weights used to compute QALYs were obtained from the literature. Inflation-adjusted Medicare allowables were used for treatment costs. We simulated outcomes and costs for the 5-year time horizon using a Markov model with 1-year cycle length. We also evaluated a scenario where payers reimbursed costs for patients requiring long-distance travel to receive care at Leapfrog hospitals.

**Results:** For the 90-day horizon, surgery at a Leapfrog hospital was more costly (\$25,567 vs. \$25,530) but was associated with greater utility (0.185 vs. 0.181 QALYs), resulting in an ICER of \$10,506 per QALY gained. For the 5-year horizon, surgery at a Leapfrog hospital was more costly (\$26,600 vs. \$26,495) but more effective (3.22 vs. 3.12 QALYs), resulting in an ICER of \$1,108 per QALY gained. In the scenario including travel cost, the cost for Leapfrog hospital patients and caregivers requiring long-distance travel and lodging was estimated to be \$1,832. Even if payers reimburse patients for these costs, the ICER was \$20,499 per QALY gained over the 5-year horizon. Using the most conservative willingness-to-pay threshold of \$50,000/QALY, surgery at a Leapfrog hospital remained cost-effective over the 5-year horizon. Multiple 1-way and 2-way sensitivity analyses, where model assumptions were varied across a clinically plausible range, did not alter the model recommendations.

**Conclusions:** Receiving surgical treatment for clinical stage I NSCLC at hospitals that meet Leapfrog volume criteria is cost-effective for the 90-day as well as the 5-year time horizons, and remains cost-effective when travel costs are considered. These conclusions are largely driven by superior cancer-related outcomes at Leapfrog hospitals.

Table 1. Results of Cost-effectiveness Analysis

Time horizon	Strategy	Total Cost (2019\$)	Incremental Cost (2019\$)	Total effectiveness (QALY)	Incremental effectiveness (QALY)	Incremental Cost-Effectiveness Ratio (ICER)
90-day	Leapfrog Hospital	\$25,567	\$37.41	0.185	0.004	\$10,506
	Non-Leapfrog Hospital	\$25,530		0.181		
5-year	Leapfrog Hospital	\$26,600	\$104.67	3.22	0.1	\$1,108
	Non-Leapfrog Hospital	\$26,495		3.12		

Notes:

## FOURTH SCIENTIFIC SESSION B - CONGENITAL BREAKOUT

### 60. Evolution and Current Results of a Unified Strategy for Sinus Venosus Surgery

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**Authors:** Elizabeth Stephens, Michael Monge, Osama Eltayeb, Angira Patel, Gregory Webster, Cynthia Rigsby, \*Carl Backer

**Author Institution(s):** Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL

**Objectives:** Given the recent reports of percutaneous transcatheter closure of sinus venosus atrial septal defects (SVASD), we chose to review our experience with surgical repair of these defects. Additionally, in a prior review of our series from 2007 we noted a high incidence of junctional or low atrial rhythm when using a two-patch technique. Because of this, over the last 15 years our surgical strategy has avoided two-patch repairs and we have used either one-patch repairs or the Warden procedure for selected patients. We review our total experience of single-patch, two-patch, and Warden repairs.

**Methods:** Between 1/1990 – 7/2018, 144 patients <21 years of age underwent repair of SVASD at our institution. Mean age was  $6.7 \pm 5.5$  years with a median age of 4.4 years. Superior SVASD was present in 126 patients and 18 patients had an inferior SVASD. Partial anomalous pulmonary venous connection (PAPVC) was present in 135 patients (94%) with anatomy documented by computed tomography or magnetic resonance imaging. A single autologous pericardial patch placed through a right atrial incision was used for 114 patients (79%), a two-patch technique in 23 patients (16%), and a Warden procedure in 10 patients (7%). The last two-patch repair was performed in 2000.

**Results:** There were no early or late deaths. Since 2010, 39 of 63 patients (62%) were extubated in the operating room. Median length of stay was 4 days. Low atrial or junctional rhythm requiring temporary pacing occurred in 2 of 63 patients (3%). This compared to 12 of 22 patients (55%) with low atrial or junctional rhythm after the two-patch repair in our prior review ( $p < 0.001$ ). There was one reoperation for recurrence of a large inferior SVASD. On echocardiogram follow-up no patient had pulmonary vein stenosis. Three patients had very mild superior caval vein narrowing with mean echocardiogram gradients of 4–6mmHg. One patient who had the Warden procedure required a balloon dilation of the superior caval vein 2 years postoperatively and a stent 3 years later. Median length of follow-up in all patients is 8.3 years.

**Conclusions:** The great majority of patients with SVASD and PAPVC can be successfully repaired with a single patch of autologous pericardium. Given our earlier experience of increased incidence of non-sinus rhythm using the two-patch technique, we transitioned in the year 2001 to using either a single pericardial patch or the Warden procedure with improved maintenance of normal sinus rhythm.

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**Notes:**

## FOURTH SCIENTIFIC SESSION B - CONGENITAL BREAKOUT

### 61. Right Ventricular Outflow Tract Reconstruction in Patients With Truncus Arteriosus: A 37-Year Experience

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**Authors:** Jeremy Herrmann<sup>1</sup>, Emilee Larson<sup>1</sup>, Christopher Mastropietro<sup>1</sup>, Mark Rodefeld<sup>1</sup>, Mark Turrentine<sup>1</sup>, \*John Brown<sup>2</sup>

**Author Institution(s):** <sup>1</sup>Indiana University School of Medicine, Indianapolis, IN; <sup>2</sup>Indiana University, Indianapolis, IN

**Objectives:** Truncus arteriosus (TA) is a rare congenital cardiac malformation associated with high mortality within the first year of life in the absence of surgical intervention. Multiple conduits for right ventricular outflow tract (RVOT) reconstruction exist, though the ideal conduit that maximizes survival and minimizes surgical complications and reintervention remains controversial. We aim to evaluate long-term outcomes and compare conduits for RVOT reconstruction in children with TA within our institution.

**Methods:** Records of patients who underwent physiological correction of TA at our institution between 1981 and 2018 were retrospectively reviewed. Primary outcomes included overall survival, freedom from catheter reintervention, and freedom from reoperation. Secondary analyses were performed to evaluate the effect of comorbidity and operation era on survival.

**Results:** One-hundred patients met inclusion criteria. Median follow-up time was 16.5 years (range, 0.2-34.1 years). Actuarial survival at 30 days, 5 years, 10 years, and 15 years was 85%, 72%, 72%, and 68%, respectively. Multivariate analysis identified TA with associated interrupted aortic arch (TA-IAA) as a risk factor for early mortality (HR: 5.4; 95% confidence limit, 1.7-17.4; p = 0.005).

Fifty-eight patients underwent reoperation for RVOT reconstruction for conduit failure (n=55), endocarditis (n=1), or need for aortic valve repair (n=2). Median time to surgical reoperation was 4.6 years (range, 0.4-14.8 years). Multivariate analysis revealed longer freedom from reoperation in patients with the bovine jugular venous conduit (BJVC) compared to the aortic homograft (HR: 3.1; 95% confidence limit, 1.3-7.7; p = 0.02), with no difference compared to the pulmonary homograft. Larger conduit size was associated with longer freedom from reoperation (HR 0.7; 95% confidence limit 0.6-0.9; p < 0.001). No significant association with catheter reintervention was identified.

**Conclusions:** The BJVC is a favorable conduit for RVOT reconstruction in patients with TA. Associated interrupted aortic arch is a risk factor for early mortality in these patients.

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**Notes:**

## FOURTH SCIENTIFIC SESSION B - CONGENITAL BREAKOUT

### 62. Antibiotic Prophylaxis in Children Undergoing Delayed Sternal Closure: Foundations for Standardization of Practice

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**Authors:** John Kennedy, III<sup>1</sup>, Olivia DiLeonardo<sup>2</sup>, \*Jennifer Nelson<sup>2</sup>

**Author Institution(s):** <sup>1</sup>University of Central Florida College of Medicine, Orlando, FL; <sup>2</sup>Nemours Children's Hospital, Orlando, FL

**Objectives:** Delayed sternal closure following congenital cardiac surgery is common, but this technique is associated with an increased risk of infection compared to primary sternal closure. No standardized post-surgical antibiotic prophylaxis protocol exists for these patients. Published reports related to delayed sternal closure are limited by small study sizes and variable prophylactic dosing strategies. This study systematically reviewed the evidence related to antibiotic regimens and delayed sternal closure in children to add insight into the efficacy of potential strategies.

**Methods:** A systematic review was conducted on antibiotic use in delayed sternal closure in children from reports published between January 1990 and December 2018 using the PRISMA protocol. Inclusion criteria required a mean age less than 21 years and specific mention of the drug classes used. Duplicated cohorts, case reports, adult-only studies, and letters to the editor were excluded. Patient characteristics, antimicrobial prophylaxis regimens, and post-operative infection rates were collected. The incidence rates of surgical site infections, mediastinitis, bloodstream infections, and "any" infection (infection type not otherwise specified) were reported based on the aggregated data.

**Results:** An initial search yielded 155 articles. Fifty-nine articles remained after the title and abstract screening, and twenty remained after the full-text review (Table 1). The 20 studies described 22 antibiotic regimens. Eighteen disclosed treatment duration. There were 16 unique drug combinations, 8 unique treatment durations, and no identical regimens.

The most commonly cited antibiotic regimen was cefazolin only (5/22, 23%). The most commonly cited multi-agent regimens were vancomycin and gentamycin (2/22, 9.1%) and cefazolin, vancomycin, and gentamycin (2/22, 9.1%). Prophylaxis was most often discontinued at sternal closure (4/17, 24%) or upon drain removal (4/17, 24%).

Aggregate data revealed an incidence of 7.8% (70/898) for surgical site infection, 6.3% (41/652) for mediastinitis, 23% (38/160) for bloodstream infection, and 28% (22/78) for "any" infection (Table 2). When analyzed by drug-class used, infection rates ranged from 2.2 – 11% for SSI, 0 – 5.9% for mediastinitis, 1.7 – 42% for BSI, and 24 – 37% for "any" infection.

**Conclusions:** Prophylactic antibiotic use is highly variable in patients undergoing delayed sternal closure after pediatric heart surgery, and post-operative infections are common. This study provides a needed starting point for trial design and protocol standardization following delayed sternal closure in this unique surgical population.



**Table 1** – Summary of findings regarding post-surgical prophylactic antibiotic use in pediatric patients undergoing delayed sternal closure

Study (# of patients)	Post-operative Antibiotics	Prophylaxis Duration
Abou Ella et al, 2010 (n=24)	cefazolin ceftazidime vancomycin	until drains removed 0h post-closure 0h post-closure
Adler et al, 2014 (n=155)	cefazolin	until drains removed
Alexi-Meskishvili et al, 1995 (n=113)	cefotaxime piperacillin teicoplanin	72-96h post-closure 72-96h post-closure 24h post-closure
Al-Sehly et al, 2005 (n=4)	cefazolin gentamicin	— —
Bath et al, 2016 (n=29)	cefazolin	48h post-closure
Das et al, 2011 (n=21)	cefazolin	24h post-closure
Das et al, 2011 (n=44)	vancomycin gentamicin	24h post-closure 24h post-closure
Elami et al, 1994 (n=36)	cefazolin	168h post-closure
Hakimi et al, 1994 (n=44)	1 <sup>st</sup> gen. cephalosporin penicillin* aminoglycoside	0h post-closure 48h post-closure 48h post-closure
Harder et al, 2013 (n=375)	vancomycin gentamicin	48h post-closure 48h post-closure
Iyer et al, 1997 (n=150)	penicillin aminoglycoside	0h post-closure 0h post-closure
Levy et al, 2013 (n=27)	cefuroxime vancomycin	0h post-closure 0h post-closure
Maher et al, 2007 (n=NA)	cefazolin vancomycin gentamicin	48h post-closure 48h post-closure 48h post-closure
Maher et al, 2007 (n=NA)	cefazolin vancomycin gentamicin	48h after drains pulled 48h post-closure 48h post-closure
McElhinney et al, 2000 (n=114)	cephalexin	—
Netto et al, 2017 (n=51)	ceftazidime gentamicin	24-48h post-closure 24-48h post-closure
Owens et al, 2001 (n=26)	flucloxacillin clindamycin	0h post-closure —
Orker et al, 2012 (n=38)	vancomycin imipenem	until drains removed until drains removed
Ripshagen et al, 2005 (n=60)	cefuroxime vancomycin gentamicin	0h post-closure one dose at closure one dose at closure
Valera et al, 2001 (n=14)	cefazolin	0h post-closure
Vida et al, 2015 (n=16)	teicoplanin	—
Ziemer et al, 1992 (n=42)	flucloxacillin ampicillin aminoglycoside	24h post-closure 24h post-closure 24h post-closure

\* Penicillinase-resistant penicillin

**Table 2** – Aggregated infection rates by protocol

Protocol, # of protocols (# of patients)		Infection Rate %, (infected patients/total patients)			
		SSI	Mediastinitis	BSI	Any
Total, 22 (1383+*)		7.8 (70/898)	6.3 (41/652)	23 (38/160)	28 (22/78)
Single-agent prophylaxis, 7 (385)		2.2 (6/269)	30 (11/36)	—	—
Two-agent prophylaxis, 8 (715)		11 (58/525)	7.0 (28/401)	42 (16/38)	28 (22/78)
Three-agent prophylaxis, 7 (283+*)		5.8 (6/104)	0.93 (2/215)	17 (22/128)	—
Protocols containing:	1st generation cephalosporin, 11 (509+*)	2.2 (7/313)	31 (11/36)	31 (21/68)	—
	2nd generation cephalosporin, 2 (87)	8.3 (5/60)	0 (0/60)	1.7 (1/60)	37 (10/27)
	3rd generation cephalosporin, 3 (188)	—	0.88 (1/113)	—	24 (12/51)
	aminoglycoside, 10 (770+*)	10 (64/629)	5.9 (28/477)	2.9 (3/104)	24 (12/51)
	carbapenem, 1 (38)	—	—	42 (16/38)	—
	glycopeptide, 10 (697+*)	11(48/435)	5.1 (28/548)	30 (36/122)	37 (10/27)
	lincosamide, 1 (26)	—	3.8 (1/26)	—	—
	penicillin, 1 (42)	—	2.4 (1/42)	—	—
	penicillin, penicillinase-resistant, 3 (112)	2.3 (1/44)	2.9 (2/68)	4.5 (2/44)	—
	penicillin, unspecified type, 1 (150)	10 (15/150)	—	—	—
Duration:	penicillin, ureidopenicillin, 1 (113)	—	0.88 (1/113)	—	—
	0 hours after sternal closure, 4 (251)	9.5 (20/210)	0 (0/60)	1.7 (1/60)	37 (10/27)
	1-24 hours after sternal closure, 3 (107)	31 (20/65)	2.4 (1/42)	—	—
	25-48 hours after sternal closure, 4 (499)	11 (44/419)	7.2 (27/375)	4.5 (2/44)	24 (12/51)
	> 48 hours after sternal closure, 2 (139)	—	0.88 (1/113)	—	—
At time of or after drain removal, 5 (217+*)		3.2 (5/155)	13 (20/155)	56 (35/62)	—

\* One study did not disclose the total number of patients who underwent delayed sternal closure

## Notes:

### 63. Efforts to Reduce Infections in Delayed Sternal Closure Patients: A Survey of Pediatric Practice

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**Objectives:** Pediatric patients with sternum left open after cardiac surgery experience a greater risk for sternal wound infection. These infections are costly for programs, payers, patients and their families. Despite efforts by individual programs to reduce infections in patients undergoing delayed sternal closure (DSC), there are no established guidelines that address preventive procedures. The purpose of this study was to determine the practice of pediatric cardiac surgery programs to prevent infection in their DSC patients and if preventive measures were associated with less infections.

**Methods:** A 33 question survey on institutional practices was sent to chief surgeons at pediatric cardiac surgery programs in the United States.

**Results:** Twenty-eight (35%) programs responded. The mean number of pediatric bypass surgeries performed by programs in 2016 was 227 (range 69-872). Data represented 6484 patients < 18 years of age who underwent cardiac surgery with 807 (12%) of those undergoing DSC. One hundred fifty eight (2.4%) of all patients and 51 (6.3%) of the DSC patients developed a sternal wound infection. Patients with DSC who received pre-operative baths were less likely to become infected, 5.9% v. 15.8% (p = .027). Patients in programs with feeding protocols had fewer infections, 5.7% v. 14.8% (p = .008). Closing the sternum but leaving the skin open was associated with more infections, approaching significance, 10.7% v 5.1% (p = .06). In the programs that left skin open after DSC, those programs using wet to dry dressings had more infections than those who used negative pressure dressings, 15.7% v. 6.4% (p = .054). The use of additional precautions for DSC patients over standard precautions did not reach significance. However, a zero SWI rate was reported by the programs that utilized barrier measures, e.g. masks, non-sterile gloves or gowns, for everyone entering the room when compared to those using standard precautions, 0% v. 6.6% (p = .98).

**Conclusions:** The results of this survey of children's cardiac surgery programs describe their practices to reduce infection rates in DSC patients. Patients receiving pre-operative baths and programs with feeding protocols had fewer infections. Programs using preventative measures beyond standard precautions reported no SWI's in DSC patients, though due to small numbers it was not statistically significant. A multicenter project on wound care and closure techniques which might impact this costly complication is needed.

Table 3: Preoperative Measures to Reduce Sternal Wound Infections in Delayed Sternal Closure Patients

Question	DSC N (%)	DSC SWI N (%)	P Value
Is preoperative bath or showering with skin antiseptics prescribed?			
Yes	769 (99%)	45 (5.9%)	0.027
No	30 (5%)	6 (1.0%)	
If preoperative skin antiseptics prescribed, which product is utilized?			
CHG	754 (98%)	45 (6%)	0.329
Other	15 (2%)	1 (6%)	
If CHG prescribed do you have AGE limit for use?			
Yes	375 (48.7%)	16 (6.9%)	0.205
No	379 (50.2%)	19 (5%)	
If CHG prescribed do you have WEIGHT limit for use?			
Yes	95 (12.0%)	2 (2.2%)	0.089
No	659 (87.4%)	43 (6.5%)	
How many preoperative baths are prescribed prior to transport to the operating room?			
One	239 (29.7%)	19 (7.9%)	0.108
Two	477 (59%)	29 (6.2%)	
Three	16 (1.9%)	1 (6.5%)	
More than three	72 (8.9%)	2 (2.7%)	
Are children routinely given steroids before by-pass?			
Yes	424 (52.5%)	29 (6.8%)	0.523
No	385 (47.5%)	22 (5.7%)	
Do children undergo routine screening of their nares for carriage of MRSA?			
Yes	244 (30%)	11 (4.5%)	0.164
No	563 (70%)	40 (7.1%)	
If nares positive do you prescribe topical antibiotic ointment to nares?			
Yes	140 (61.4%)	8 (5.7%)	0.217
No	88 (38.6%)	2 (2.3%)	

Abbreviations: DSC, delayed sternal closure; SWI sternal wound infection; CHG chlorhexidine gluconate; MRSA, methicillin-resistant staphylococcus aureus.

Table 5: Postoperative Measures to Reduce SWI's in Delayed Sternal Closure Patients

Questions	DSC N (%)	DSC SWI N (%)	P value
Where do delayed closure procedures occur?			
Operating Room	66 (8%)	3 (4.5%)	0.536
Intensive Care Unit	741 (92%)	48 (6.2%)	
Average days to closure for patients with sternum left open?			
One day	13 (1.7%)	2 (15.4%)	0.161
Two days	337 (43%)	23 (6.8%)	
Three days	190 (24.3%)	16 (8.4%)	
Four days	79 (10%)	2 (2.5%)	
Five days	162 (20.7%)	8 (4.9%)	
Six or more	0	0	
Additional isolation precautions for those entering room of patients with sternum left open? <sup>1</sup>			
Masks & gloves	15 (1.9%)	0 (0%)	0.998
Masks, gloves and gowns	23 (2.9%)	0 (0%)	
Standard Precautions only <sup>1</sup>	769 (95.2%)	51 (6.6%)	
Which antibiotic is routinely prescribed while the sternum is left open?			
1 <sup>st</sup> generation cephalosporin only	499 (61.8%)	32 (6.4%)	0.998
2 <sup>nd</sup> generation cephalosporin only	103 (12.8%)	4 (3.9%)	
3 <sup>rd</sup> generation cephalosporin only	33 (4%)	3 (9.1%)	
Vancomycin and 1 <sup>st</sup> gen cephalosporin	65 (8%)	2 (3.1%)	
Vancomycin and 2 <sup>nd</sup> gen cephalosporin	50 (6.2%)	2 (4%)	
Vancomycin and gentamycin	31 (3.8%)	8 (25.8)	
(other) Diflucan/Fortaz	26 (3.2%)	0 (0%)	
How long are antibiotics continued after delayed sternal closure?			
24 hrs after chest closure without regard to lines or tubes	227 (28%)	30 (13.2)	0.9
48 hrs after chest closure without regard to lines or tubes	496 (61.4%)	20 (4.0)	
72 hrs after chest closure without regard to lines or tubes	16 (1.9%)	0 (0%)	
Until chest tubes removed	42 (5.2%)	1 (2.4%)	
Antibiotics are stopped day of closure	26 (3.2%)	0 (0%)	
Dressing after delayed sternal closure			
Dermabond	173 (21.4%)	4 (2.3%)	0.998
Sterile dry dressing	413 (51%)	39 (9.4%)	
Negative pressure wound dressing	188 (23.3%)	8 (4.3%)	

### 64. Minimally Invasive, Sternal-Sparing Approaches for Congenital Heart Disease: Versatile, Safe and Effective

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**Authors:** Zoe Hinton<sup>1</sup>, James Meza<sup>2</sup>, Alyssa Habermann<sup>3</sup>, Nicholas Andersen<sup>3</sup>, \*Mani Daneshmand<sup>2</sup>, John Haney<sup>3</sup>, \*Joseph Turek<sup>3</sup>

**Author Institution(s):** <sup>1</sup>Duke University School of Medicine, Durham, NC;

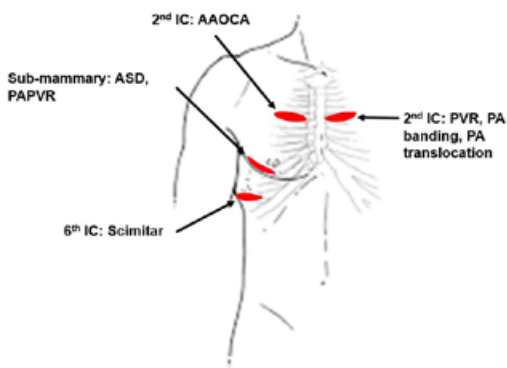
<sup>2</sup>Duke University Medical Center, Durham, NC; <sup>3</sup>Duke University, Durham, NC

**Objectives:** Minimally invasive surgery has been underutilized in the setting of congenital heart disease. We propose the use of a variety of sternal-sparing, minimally invasive incisions including the right sub-mammmary, right 6th intercostal, right and left 2nd intercostal, and bilateral video-assisted port incisions. The aim of this study is to report the outcomes of our experience with mini-incision techniques in congenital cardiac surgery.

**Methods:** A series of 34 patients median age 23 years old (IQR 13 - 48) with congenital heart disease underwent minimally invasive operations. Relevant clinical information was obtained via chart review.

**Results:** This series of patients who underwent a minimally invasive operation demonstrated a median weight of 65 kg (IQR 49 - 83), height (median 162 cm, IQR 155 - 175), and BMI (median 24, IQR 19 - 29). Operations performed through the mini-incision approach included atrial septal defect (ASD) closures, partial anomalous pulmonary venous return (PAPVR) via intracardiac baffle repair or Warden Procedure (cavoatrial anastomosis technique), PA banding (for percutaneous valve deployment), PA translocation, anomalous coronary artery repair, pulmonary valve replacements (PVR), and epicardial pacemaker lead placements. Additionally, 4 of the 34 patients required surgical conversion due to adhesions, poor visualization, body habitus, or non-intramural course of anomalous coronary. In patients requiring cardiopulmonary bypass (cpb), there was a median cpb time of 106 min (IQR 53 - 138). All patients are alive at this time with a median follow-up of 118 days (IQR 23 - 177). (145/150)

**Conclusions:** Although not often applied within congenital heart surgery, we here describe encouraging clinical outcomes over a diverse series of lesions. For this variety of operations in a limited case series, the mini-incision approach proves to be safe and versatile with exceptionally low morbidity and mortality.



**Figure 1:** Mini-incision location by operation. Pulmonary Valve Replacement (PVR), Pulmonary Artery (PA), Anomalous Aortic Origin of Coronary Artery (AAOCA), Atrial Septal Defect (ASD)/Partial Anomalous Pulmonary Venous Return (PAPVR), Scimitar

**Notes:**

## FOURTH SCIENTIFIC SESSION B - CONGENITAL BREAKOUT

### 65. The Intraoperative Use of Recombinant Activated Factor VII in Arterial Switch Operations

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**Authors:** Ziyad Binsalamah<sup>1</sup>, Christopher Ibarra<sup>2</sup>, Zachary Spigel<sup>1</sup>, Jessica Zink<sup>2</sup>, \*Carlos Mery<sup>3</sup>, Erin Gottlieb<sup>2</sup>, \*Charles Fraser<sup>2</sup>, \*Jeffrey Heinle<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Texas Children's Hospital/ Baylor College of Medicine, Houston, TX; <sup>2</sup>Texas Children's Hospital, Houston, TX; <sup>3</sup>University of Texas Dell Medical School, Austin, TX

**Objectives:** Prior studies of the use of recombinant activated factor VII (rFVIIa) have failed to show a clear benefit in the setting of a heterogeneous case mix. We believe that the greatest utility for rFVIIa is during arterial switch operations (ASO) due to the length of suture lines and nature of the operation. Currently, the rate of bleeding complications following ASO is too low to justify a prospective randomized study in the absence of evidence of lack of harm and potential for benefit from rFVIIa. We aimed to evaluate these points in matched retrospective cohorts; to serve as a pilot study.

**Methods:** We performed a retrospective cohort study of patients undergoing ASO from 2012-2017. Nearest-neighbor propensity score matching on age, gender, weight, and associated cardiac defects was used to match 27 controls not receiving rFVIIa to 31 patients receiving rFVIIa. The primary outcomes were thrombotic complication rate to evaluate the safety of rFVIIa. Laboratory coagulation values, chest-tube output volume in the first 24 hours, and volume of blood product administration were evaluated for potential efficacy of rFVIIa. Fisher's exact test was performed to compare categorical variables. Wilcoxon's Rank Sum test was used to compare continuous variables between cohorts.

**Results:** There was not enough evidence to identify a difference in bleeding complications post-operatively between the rFVIIa cohort and controls (10% vs 19%,  $p = 0.45$ ). Additionally, there was not enough evidence to identify a difference in thrombotic complications post-operatively between patients receiving rFVIIa and controls (3% vs 11%,  $p = 0.33$ ). Volume of packed red blood cell transfusion was clinically higher in the rFVIIa cohort ( $337\text{ml} \pm 102$  vs  $386\text{ml} \pm 108$ ,  $p = 0.086$ ). All other intra-operative transfusion volumes were not different between the rFVIIa cohort and controls, including fresh frozen plasma, platelets, and cryoglobulin. Total chest tube output was not different in rFVIIa cohort relative to controls ( $33.6\text{ml} \pm 45.6$  vs  $29.3\text{ml} \pm 23.2$ ,  $p=0.67$ ). Post-operative coagulation levels were lower in rFVIIa cohort relative to controls (PT [ $11.5 \pm 1.79$  vs  $16.2 \pm 1.47$ ,  $p<.0001$ ] and INR [ $0.85 \pm 0.17$  vs  $1.3 \pm 0.14$ ,  $p<.0001$ ]).

**Conclusions:** In spite of a higher post-bypass packed red blood cell transfusion requirement, patients receiving rFVIIa had a similar incidence of bleeding post-operatively. With no difference in thrombotic complications, and improved post-operative laboratory hemostasis, a prospective randomized study is warranted to further evaluate the efficacy of rFVIIa in the ASO population.

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**Notes:**

## FOURTH SCIENTIFIC SESSION B - CONGENITAL BREAKOUT

### 66. Early Results of Less Than 5 mm RV to PA Conduits for Neonatal Palliation of Single Ventricle Lesions

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**Authors:** \*Raina Sinha<sup>1</sup>, \*Ali Dodge-Khatami<sup>2</sup>, \*Jorge Salazar<sup>3</sup>

**Author Institution(s):** <sup>1</sup>University of Texas Health Science Center at Houston, Houston, TX; <sup>2</sup>UT Health at Houston/ Children's Memorial Hermann Hospital, Houston, TX; <sup>3</sup>McGovern Medical School at UTHealth, Houston, TX

**Objectives:** Our programmatic approach to single ventricle (SV) neonatal palliation has evolved to utilizing smaller size conduits for pulmonary blood flow. This is based on Poiseuille's equation in which flow through a vessel is significantly impacted by its diameter, but little is known about the impact of conduit size and adequacy of oxygen delivery. Therefore we sought to compare the early outcomes of < 5 mm vs 5 mm right ventricle to pulmonary artery (RV-PA) conduits in patients with SV lesions undergoing neonatal palliation.

**Methods:** A retrospective review was performed from Sept 2017 to Apr 2019 to identify patients with SV lesions who had neonatal palliation with either a < 5 mm or 5 mm RV-PA connection, constructed using a GORE-TEX graft. Pre, intra, and postoperative patient data were analyzed using Microsoft Excel.

**Results:** A total of 19 patients with SV lesions were operated upon the study time period (Group I, n = 10, < 5 mm conduits) and (Group II, n = 9, 5 mm conduits). Three patients with 5 mm conduits required clipping due to pulmonary overcirculation and therefore were included as part of Group I. Patient characteristics are listed in Table 1. Surgical repairs included stage I palliation with Norwood-Sano in 8 patients in both groups. There were no early (< 30 days) or late mortalities. On multivariate analysis, statistical differences ( $p < 0.05$ ) were noted with median weight of 2.7 kg vs 3.3 kg in Group I and II respectively, and oxygen saturation (SpO<sub>2</sub>) at time of discharge with median of 81% vs 85.5% in Group I and II respectively. There was no statistical difference amongst the groups with respect to length of intubation, length of hospitalization, pre Glenn SpO<sub>2</sub>, and branch PA sizes at time of Glenn operation.

**Conclusions:** When reviewing clinical outcomes of single ventricle neonatal palliation with RV-PA conduits smaller than 5 mm diameter to 5 mm, results were comparable. These findings support that we should consider tailoring the pulmonary conduit size to each patient. A smaller diameter conduit has the potential benefit of protecting against pulmonary overcirculation and systemic steal, however larger patient cohorts are warranted to guide clinical practice.



**Table 1 – Patient Characteristics**

Median values	< 5 mm RV-PA conduit (n = 10)	5 mm RV-PA conduit (n = 9)	p value
Weight (kg)	2.7	3.4	0.04
Age (d)	4.5	5	0.17
Length of Intubation (d)	4.5	5	0.36
Discharge SpO <sub>2</sub> (%)	81	85.5	0.03
Need for RV-PA conduit angioplasty/stent	3/10	2/9	
Age at Glenn (mos)	5.0	6.1	0.58
Pre-Glenn SpO <sub>2</sub> (%)	78	82	0.17
LPA (mm)	4.4	6.3	0.33
RPA (mm)	5.1	4.7	0.82
Length of Follow up (d)	143	381	0.07
Diagnosis: HLHS	6/10	5/9	
AVSD <sub>x</sub>	2/10	4/10	
Other	2/10		
Surgery: Norwood + RV-PA conduit	8/10	8/9	
RV-PA conduit	1/10	1/9	
Unifocalization + RV-PA conduit	1/10		
Mortality	0/10	0/10	

RV-PA – right ventricle to pulmonary artery, LPA – left pulmonary artery, RPA – right pulmonary artery, HLHS – hypoplastic left heart syndrome, U/AVSD – unbalanced atrioventricular septal defect

**Notes:**

### 67. Evaluating Surgical Treatment Strategies for Congenital Hypertrophic Cardiomyopathy: A 30 Year Experience

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**Authors:** \*Damien LaPar<sup>1</sup>, Eliana Al Haddad<sup>2</sup>, Meredith Pesce<sup>3</sup>, David Kalfa<sup>1</sup>, Teresa Lee<sup>1</sup>, Emile Bacha<sup>4</sup>, Warren Zuckerman<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Columbia University College of Physicians and Surgeons, New York, NY; <sup>2</sup>Columbia University Medical Center, New York, NY; <sup>3</sup>New York Presbyterian/Columbia University, New York, NY; <sup>4</sup>Columbia University College of Physicians and Surgeons, Weill Cornell College of Medicine, New York, NY

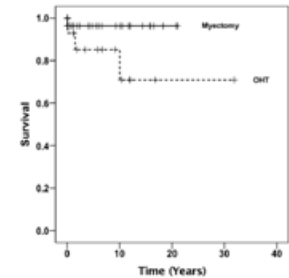
**Objectives:** Hypertrophic cardiomyopathy (HCM) is a known cause of heart failure in children, often requiring surgical intervention or sometimes heart transplantation (OHT). Limited data currently exists evaluating contemporary treatment strategies for pediatric patients with HCM. The purpose of this study was to evaluate treatment strategies, including surgical resection and OHT, and outcomes for pediatric and congenital HCM patients.

**Methods:** All symptomatic HCM patients undergoing septal myectomy or OHT at a single institution were evaluated over a 31-year study period (1986-2017). Operative criteria included severe left ventricular outflow tract obstructive symptoms, NYHA functional class III or IV status, or episodes of sudden death. Univariate and Kaplan-Meier analyses evaluated operative and long-term outcomes for both treatment cohorts.

**Results:** A total of 46 HCM patients underwent septal myectomy (70%, n=32) and/or OHT (30%, n=14). Median study follow-up was 3 years (<1-21]. Median patient age at diagnosis was 3y [0-33], while median age at surgery was 8.3y [0.2-44]. OHT patients underwent more preoperative interventions, including ICD placement and ventricular assist device implantations. Among myectomy patients, median peak LVOT gradient was 84 mmHg [19-140] with an expected significant improvement following resection (37 vs. 84 mmHg, P<0.001). Mortality following myectomy was 2.2% (n=1) and was 6.5% (n=3) following OHT. Among the myectomy cohort, postoperative pacemaker implantation rate was 6.5% (n=3), incidence of <sup>3</sup> moderate mitral regurgitation was 12.5% (n=4), reoperation for sub-aortic stenosis was 12.5% (n=4) at a median of 6.5y [1.3-9.7], and OHT following prior myectomy was 6.5% (n=3) at a median of 0.2y [0.7-9.6]. Importantly, Kaplan Meir actuarial survival was higher among myectomy patients compared to those undergoing primary transplantation; however, myectomy patients had a higher likelihood for surgical reoperation (**Figure**).

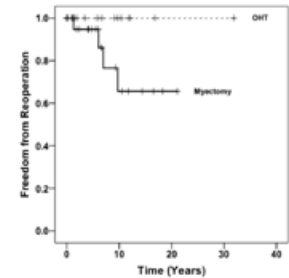
**Conclusions:** Surgical treatment strategies for congenital HCM remain safe and effective in the modern surgical era. Septal myectomy can be performed with excellent mid-long term survival, preserved mitral valve function, and low risk for reoperation. These data suggest that while outcomes for both treatment strategies remain encouraging, OHT should be avoided when possible but, nevertheless, remains an important treatment option for the most severe forms of congenital HCM.

1a)



No. at Risk				
Myeloma	32	10	2	0
OHT	14	6	2	1

1b)



No. at Risk				
Myeloma	32	6	1	0
OHT	14	5	1	1

Notes:

## FOURTH SCIENTIFIC SESSION B - CONGENITAL BREAKOUT

### 68. Valve Sparing Aortic Root Replacement in Teenagers and Young Adults With Aortic Root Aneurysms and Bicuspid Aortic Valves

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**Authors:** Amy Lie<sup>1</sup>, Salil Ginde<sup>2</sup>, Peter Bartz<sup>2</sup>, Michael Earing<sup>2</sup>, Scott Cohen<sup>2</sup>, Jennifer Gerardin<sup>2</sup>, William Johnson<sup>2</sup>, \*Michael Mitchell<sup>2</sup>

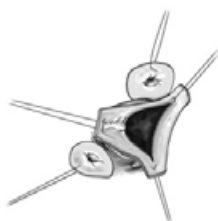
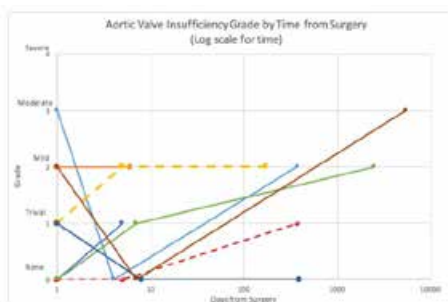
**Author Institution(s):** <sup>1</sup>Medical College of Wisconsin, Milwaukee, WI; <sup>2</sup>Children's Hospital of Wisconsin, Milwaukee, WI

**Objectives:** Valve sparing aortic root replacement (VSARR) is an excellent alternative to composite root replacement in patients with aortic root aneurysm and tricuspid aortic valves (TAVs) because VSARR preserves native tissue, has optimal hemodynamics, avoids the need for lifelong anticoagulation, and has demonstrated long term durable results. Bicuspid aortic valves (BAVs) have been cited as a risk factor, and asymmetric BAVs have been considered by some as a contraindication for VSARR. Minimal longitudinal data exists regarding outcomes in patients with BAV undergoing VSARR. We have employed VSARR in young patients with BAV for over 15 years including patients with asymmetric BAVs.

**Methods:** We sought to critically review this experience and highlight the technical modifications we have instituted and lessons we have learned. All patients who underwent VSARR between 2003 and 2018 in the context of BAVs were reviewed. Structured preoperative, intraoperative, and postoperative variables were collected, and preoperative, discharge, and most recent echocardiograms were re-read by a single expert reviewer blinded to clinical data.

**Results:** 8 patients, mean age 21.25 years (15-36 years) with BAV underwent VSARR, 5 with asymmetric BAVs. 1 patient had greater than mild preoperative aortic insufficiency. Indication for VSARR was aortic root dilation with a mean sinus of Valsalva diameter of  $4.92 \pm 0.19$  cm (z-score  $+6.13 \pm 0.93$ ). Mean follow-up was  $4.07 \pm 5.12$  years (range, 0.47- 14.5 years). There were no operative and no late deaths. There were no reinterventions on the aortic valve and the only cardiac reintervention was a pacemaker 3 weeks post VSARR. At last echo 7 of 8 patients had mild or less insufficiency with 1 patient having moderate insufficiency.

**Conclusions:** VSARR in young patients with BAV is safe and results in valve function and morbidity comparable to best published VSARR data in young adults with TAVs at mid-term follow-up.



Notes:

### 69. Outcomes of Shone's Complex Surgery; A Single Center Experience

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**Authors:** Ahmed Elmahrouk<sup>1</sup>, Mohamed Ismail<sup>2</sup>, Amr Arafat<sup>3</sup>, Tamer Hamouda<sup>4</sup>, Abdelmonem Helal<sup>1</sup>, Ahmed Dohain<sup>5</sup>, Osman Al-Radi<sup>6</sup>, Ahmed Jamjoom<sup>1</sup>

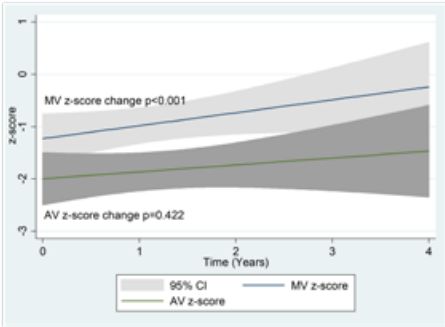
**Author Institution(s):** <sup>1</sup>King Faisal Specialist Hospital & Research Center, Riyadh, Saudi Arabia; <sup>2</sup>Mansoura University, Mansoura, Egypt; <sup>3</sup>Faculty of Medicine Tanta University, Tanta, Egypt; <sup>4</sup>Benha University, Benha, Egypt; <sup>5</sup>Cairo University, Cairo, Egypt; <sup>6</sup>King Abdulaziz University, Jeddah, Saudi Arabia

**Objectives:** Shone's complex is a rare congenital cardiac lesion affecting the mitral valve and left ventricular outflow tract. Studies evaluating the change of mitral and aortic valve z-score post repair are scarce. The objective of this study is to report the early outcomes after Shone's complex repair, the growth of mitral and aortic valve and left ventricular outflow tract (LVOT) over time, reoperation and its type and the long-term survival.

**Methods:** The study included 37 patients who had a surgical intervention for Shone's complex from November 2000 till September 2017 at King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia. The median age was 3.4 months, 11 patients (30.6%) had pulmonary hypertension. The main procedure performed during the first surgical intervention was the repair of the coarctation of the Aorta in 26 patients (70%). Twelve patients had Mitral valve repair and 5 had Mitral valve replacement. Patients were followed by echocardiology and phone calls to confirm patient status. The Kaplan-Meier survival curve was used to plot the overall survival and freedom from the first intervention. Univariable Cox regression analysis was used to test factors affecting the first re-operation. Longitudinal echocardiographic measurements were analyzed at different times including preoperative, 1,2,3 and 4 years follow-up. The changes in Mitral and Aortic valve Z-score and LVOT diameter were analyzed using a mixed effect model.

**Results:** Operative mortality occurred in 1 patient (2.7%) and the median length of ICU and hospital stay were 6.5 and 13 days respectively. Median follow up was 52 (25th- 75th percentile: 22-84) months. Survival at 1, 5 and 10 years were 94.4%, 90%, and 76.9% respectively. Reoperation was required in 13 patients; the second intervention was required mainly for LVOT repair (n=8). Reoperation was significantly associated with small aortic valve z-score (p=0.044). Mitral valve z-score increased significantly over time (0.35/year; p<0.001). The growth of the AV z-score was not evident over time (0.086/year; p=0.422) and the growth was not affected by the presence of bicuspid aortic valve (p= 0.829). The growth of the LVOT diameter was significant over time (0.76mm/ year; p= 0.001). (Figure 1)

**Conclusions:** Repair of Shone's complex has good early and late results. Reoperation is frequently encountered especially in patients with low aortic valve z-score. The growth of the mitral valve and LVOT are more significant compared to the aortic valve.



Notes:

### 70. Medical Illustration in the Era of Cardiac Surgery

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**Authors:** \*Constantine Mavroudis

**Author Institution(s):** Johns Hopkins University School of Medicine, St. Petersburg, FL

**Objectives:** This manuscript reviews the collaboration between clinician and illustrator throughout the ages while highlighting the Era of Cardiac Surgery. Historical notes are based on Professor Sanjib Kumar Ghosh's extensive review, literature searches, and the archives of the Johns Hopkins Department of Art as related to Medicine in Baltimore. Personal communications were explored with medical illustrators and medical practitioners, many of whom are colleagues and trainees, to further chronicle the history of medical illustration and education in the era of cardiac surgery.

**Methods:** Medical illustrators use their talents and expressive ideas to demonstrate procedures and give them life. These methods are: (1) Hovering technique; (2) Hidden anatomy, ghosted views, or transparency; (3) Centrally focused perspective; (4) Action techniques to give life to the procedure; (5) Use of insets to highlight one part of the drawing; (6) Human Proportionality using hands or known objects to show size; and (7) Step by step educational process to depict the stages of a procedure. Vivid examples showing these techniques are demonstrated.

**Results:** The result of this observational analysis underscores the importance of the collaboration between clinician and illustrator to accurately describe intricate pathoanatomy, three-dimensional inter-related anatomic detail, and complex operations. While there are few data to measure the impact of the atlas on medical education, it is an undeniable assertion that anatomical and surgical illustrations have helped to educate and train the modern-day surgeon, cardiologist, and related health care professionals.

**Conclusions:** While new technologies of medical imaging are extant and developing rapidly, these methods are the “cameras” of anatomical reproduction. The camera, CT Scan, MRI, reconstructed heart models, and arteriograms are clearly important for diagnosis, operative planning, and therapeutic interventions; however, they do not “illustrate”. Illustration focuses, interprets, emphasizes, directs, cautions, explains, and in the most fundamental way, teaches. The association between medical illustrator and clinician has ancient roots. There is no substitute for human interaction, spatial interpretation, and medical education in its most robust form, illustration.



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**Notes:**

## FOURTH SCIENTIFIC SESSION C - ADULT CARDIAC BREAKOUT

### 71. Impact of Endovascular False Lumen Embolization on Thoracic Aortic Remodeling in Chronic Dissection

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**Authors:** Kyle Miletic<sup>1</sup>, Bogdan Kindzelski<sup>2</sup>, Kevin Hodges<sup>2</sup>, Jocelyn Beach<sup>2</sup>, Michael Tong<sup>2</sup>, \*Faisal Bakaeen<sup>2</sup>, Douglas Johnston<sup>2</sup>, Eric Roselli<sup>2</sup>

**Author Institution(s):** <sup>1</sup>Cleveland Clinic Foundation, Cleveland, OH; <sup>2</sup>Cleveland Clinic, Cleveland, OH

**Regulatory Disclosure:** This presentation describes the off-label use of the Zenith Flex AAA Endovascular Iliac plug to occlude the false lumen of a chronic aortic dissection. This presentation describes the off-label use of the Penumbra Coil to occlude the false lumen of a chronic aortic dissection.

**Discussant:** D\*Bradley G. Leshnower, Emory University, Atlanta, GA

**Commercial Relationships:** Speakers Bureau/Honoraria: Medtronic

**Objectives:** Persistent retrograde false lumen (FL) perfusion after thoracic endovascular aortic repair (TEVAR) for chronic dissection is a common mode of treatment failure. Thrombosis of the FL is associated with favorable reverse remodeling. Endovascular techniques to embolize the thoracic FL have been described. Objectives of this study are to describe false lumen embolization (FLE) strategy, assess aortic remodeling and survival.

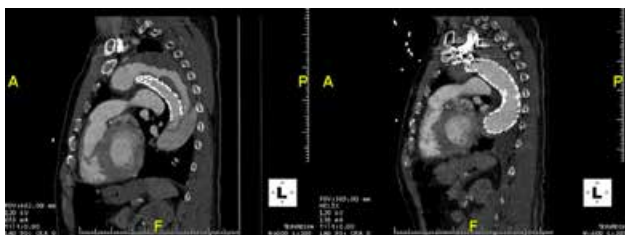
**Methods:** From 1/2009 to 12/2017, 51 patients with chronic dissection underwent FLE. 37(73%) had chronic dissection after acute type A dissection, the remainder were isolated type B. Embolization devices included a combination of: iliac plug (29 patients), embolization coil (19 patients), or nitinol plug (3 patients). Median number of devices used was 3 (range 1-14). Computed tomography was performed before discharge, at 3 months, and annually. Complete response was defined as: FL thrombosis with 10% decrease in diameter and 10% increase in true lumen diameter. Disease progression was defined as persistent FL flow with 10% increase in aortic diameter.

**Results:** All patients had angiographically successful FLE. There were two perioperative deaths in the early study period due to acute rupture and visceral ischemia. There was no permanent paraplegia or renal failure and one perioperative stroke. Median follow-up was 2 years. Aortic dimensions before and after FLE are noted in the table. 16 patients had complete aortic reverse remodeling (Figure). Nine patients had disease progression. All of these patients underwent repeat FLE with complete thrombosis in four and open surgical repair in the remaining five. Twenty six patients had an indeterminate response, defined as complete FL thrombosis without changes in aortic dimensions, however none have yet required open repair. Those with reverse remodeling had an average decrease of 11±5 mm in maximal diameter at follow-up. Six patients had complete FL obliteration. At last follow-up, 42 (82%) patients were alive. Of the late deaths, 3 were related to aortic pathology; the remainder were unrelated.

**Conclusions:** FLE is an effective endovascular adjunct to TEVAR promoting reverse aortic remodeling in select patients with chronic aortic dissection and persistent retrograde FL perfusion.

## Change in Aortic Dimensions

Diameter	Pre-FLE (mm)	Post-FLE (mm)	P value
Max Aortic	64.2±12	61.0±13	0.03
True Lumen	24.7±10	33.7±8	<0.001
False lumen	36.7±12	25.6±15	<0.001



Notes:

## FOURTH SCIENTIFIC SESSION C - ADULT CARDIAC BREAKOUT

### 72. Coronary Ostia Management During Aortic Root Replacement: Is the Modified Cabrol Reattachment Inferior to the Carrel Button?

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**Authors:** Akiko Tanaka<sup>1</sup>, **Zain Al Rstum**<sup>2</sup>, Nicolas Zhou<sup>1</sup>, Kenton Rommens<sup>3</sup>, Harleen Sandhu<sup>3</sup>, Charles Miller<sup>1</sup>, \*Hazim Safi<sup>1</sup>, \*Anthony Estrera<sup>1</sup>

**Author Institution(s):** <sup>1</sup>McGovern Medical School at UTHealth, Houston, TX; <sup>2</sup>The University of Texas Health Science Center at Houston, Houston, TX; <sup>3</sup>University of Texas Health Science Center at Houston, Houston, TX

**Discussant:** \*Luca A. Vricella, University of Chicago, Chicago, IL

**Objectives:** We retrospectively reviewed outcomes after aortic root replacement to evaluate the feasibility and durability of modified Cabrol technique.

**Methods:** We analyzed retrospective data from 379 patients who underwent aortic root replacement during 1991 and 2017, and separated to two groups: mCabrol group (N=80), patients who had one or both coronary ostia reimplanted using a modified Cabrol technique; Carrel group (N=299), patients who had both coronary ostia reimplanted using a Carrel patch technique. 43 (54%) of mCabrol group had imaging available.

**Results:** Baseline characteristics were similar in two groups except for the mCabrol group had more prior repair of type A aortic dissection, infection, redo-sternotomy, and emergent operation (mCabrol vs. Carrel: prior type A repair, 38% vs. 4%,  $p<.001$ ; infection, 14% vs. 3%,  $p<.001$ ; redo, 73% vs. 17%,  $p<.001$ ; emergent, 26% vs. 17%,  $p=0.052$ ). 30-day/In-hospital mortality was 18% (14/80) in mCabrol group and 8% (25/299) in Carrel group ( $p<0.001$ ). Survival rate in mCabrol was 72.5 +/- 5.2% at 5-year and 64.6 +/- 5.9% at 10-year, and those in Carrel group was 86.9 +/- 2.3% at 5-year and 80.8 +/- 2.5% at 10-year (Figure, Log-Rank  $p=0.005$ ) After propensity adjustment, age>70 years, chronic kidney disease, prior CABG, intraoperative circulatory assist device, and emergent surgery were independent predictor for both 30-day mortality and long-term mortality, but modified Cabrol technique was not (30-day:  $p=0.254$ , long-term: 0.326). Of 43 patients who had imaging available (median time to image 37 months, interquartile range 0-71 months, maximum 274 months) to evaluate for patency, no Cabrol graft had occlusion, and there were 1 pseudoaneurysm at the proximal anastomosis requiring redo operation and 1 coronary artery aneurysm formation in patient with a Marfan syndrome.

**Conclusions:** Modified Cabrol can be performed without increasing mortality risk in short- and long-term with excellent patency.

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**Notes:**

## FOURTH SCIENTIFIC SESSION C - ADULT CARDIAC BREAKOUT

### 73. Further Evidence for Abandoning Lumbar Drain Placement for Isolated Descending Thoracic Endovascular Aortic Repair

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**Authors:** Soraya Voigt<sup>1</sup>, Jatin Anand<sup>1</sup>, Vignesh Raman<sup>2</sup>, Oliver Jawitz<sup>2</sup>,

\*Ryan Plichta<sup>1</sup>, \*Jeffrey Gaca<sup>1</sup>, Richard McCann<sup>1</sup>, \*G. Chad Hughes<sup>2</sup>

**Author Institution(s):** <sup>1</sup>Duke University, Durham, NC; <sup>2</sup>Duke University Medical Center, Durham, NC

**Discussant:** **D**\*Himanshu J. Patel, University of Michigan Cardiovascular Center, Ann Arbor, MI

**Commercial Relationships:** Consultant/Advisory Board: Medtronic, Terumo, W. L. Gore & Associates

**Objectives:** The utility of lumbar cerebrospinal fluid (CSF) drainage for prevention of spinal cord ischemia (SCI) after thoracic endovascular aortic repair (TEVAR) remains unclear with prior systematic reviews finding no benefit. Our group has previously (2013) published an institutional algorithm restricting use of preoperative lumbar drains to patients deemed to be at high-risk of SCI and demonstrating low rates of SCI in nondrained patients. Based on our prior data, our institutional algorithm has evolved with preoperative drain placement avoided in all patients undergoing isolated descending +/- arch TEVAR. This study evaluates the updated algorithm in a contemporary cohort.

**Methods:** Patients who underwent TEVAR for descending aortic +/- arch pathology between 2/2012 and 9/2018 at a single referral center were identified from a prospectively maintained institutional aortic surgery database. Patients with thoracoabdominal aneurysm undergoing hybrid abdominal debranching procedures were excluded, as were patients with preoperative SCI. The algorithm mandates that all patients in whom the left subclavian artery (LSCA) is fully covered with no preservation of antegrade flow undergo revascularization. Somatosensory and motor evoked potential monitoring is used in all elective cases and selectively in urgent/emergent cases. Permissive hypertension is used in the 30-day postoperative period with preoperative anti-hypertensive medications only being resumed for persistent systolic blood pressure >150 mm Hg. The primary endpoints were incidence of temporary or permanent SCI or need for delayed drain placement.

**Results:** N=226 patients (n=114 degenerative aneurysm, n=90 acute or chronic dissection, n=17 trauma, n=5 other) underwent descending +/- arch TEVAR during the study interval. 81% had endograft coverage below T6 (zone 5). 2 patients (0.9%) had a CSF drain placed prior to TEVAR in violation of the protocol, whereas the remainder (n=224; 99.1%) did not receive a preoperative drain. The LSCA was fully covered in 105 patients (47%), all of whom underwent LSCA revascularization (n=99) or had preservation of antegrade flow via branch stent (n=6). Following this algorithm, the incidence of temporary or permanent SCI was 0%. No patient required postoperative CSF drain placement.

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**Conclusions:** A restrictive lumbar CSF drainage algorithm, which avoids the known potentially serious risks of drain placement, and includes permissive hypertension and LSCA revascularization in the setting of endograft coverage for descending +/- arch TEVAR appears safe with a 0% incidence of SCI in 224 consecutive patients treated over a 6.5 year interval. We recommend a multi-center randomized controlled trial to further evaluate this algorithm.

**Notes:**

## FOURTH SCIENTIFIC SESSION C - ADULT CARDIAC BREAKOUT

### 74V. Aortic Valve Repair and Selective Sinus Remodeling for Aortic Root Aneurysm

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**Authors:** \*Richard Downey<sup>1</sup>, Scott Weaver<sup>2</sup>, \*J. Scott Rankin<sup>3</sup>, \*Vinay Badhwar<sup>3</sup>

**Author Institution(s):** <sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Corazon Medical, Columbus, OH; <sup>3</sup>West Virginia University, Morgantown, WV

**Objectives:** The development of aortic valve ring annuloplasty has simplified aortic valve repair for aortic root aneurysm, allowing selective remodeling of only the abnormal sinuses.

**Methods:** A 47-year-old male has mild heart failure and an expanding 5.2 cm ascending aortic aneurysm. His sinuses also are involved, with a 6.3 cm aortic root aneurysm, but sinus enlargement is markedly asymmetric. He has Grade 4 aortic valve insufficiency, and his ventricle and coronaries are normal. His aortic annulus is dilated at 30 mm, and the sinus to sinus diameter is 6.3 cm. However, the right- and non-coronary sinuses are primarily involved, and his left-coronary sinus is normal. Recently, it has been shown that normal sinuses in this setting tend to be stable long-term if selectively preserved. Thus, we chose to replace only the aneurysmal right and non-coronary sinuses. The annulus sizes to 30 mm. The commissure-to-commissure free-edge lengths of the coronary leaflets suggest a 23-mm aortic annuloplasty ring, which is sutured under the annulus with 9 mattress sutures. After knot tying, one needle is passed downward and laterally through the pledget – away from the leaflet – and tied with 6 more knots. This “lateral suture fixation” prevents knot untying and leaflet contact with the suture tails.

**Results:** Leaflet coaptation is tested by simulated “pressurization” of all 3 leaflets simultaneously with closed DeBakey forceps. The leaflets are vertical, meet well in the midline, and have equivalent effective heights. The normal sinus circumference at the commissural tops should be just a little larger than the leaflet free-edge lengths. The right sinus is almost twice that circumference, and the non-coronary sinus also is much larger. However, the left sinus is normal. The non-coronary and right sinuses are excised and the right coronary button developed. A Valsalva graft that is 7 mm larger than the annuloplasty ring is chosen, and three 120 degree tongues are developed. Running sutures connect the tongues to the sinus remnants, and the right coronary button is implanted into the graft. Post-bypass, the leaflets exhibit excellent effective height, and move well with no residual leak and a mean valve gradient of 7 mmHg. The reconstructed aortic root looks good, and the left coronary sinus remains normal in size.

**Conclusions:** Geometric ring annuloplasty is a simple and effective technique for aortic valve repair during aortic aneurysm surgery. Selective sinus remodeling could simplify and standardize surgery for aortic root aneurysm.



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**Notes:**

## FOURTH SCIENTIFIC SESSION C - THORACIC BREAKOUT

### 75. Signet Ring Cell Histology Confers Worse Overall Survival in Treated Esophageal Adenocarcinoma

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**Authors:** Andrew Tang<sup>1</sup>, Jesse Rappaport<sup>1</sup>, Siva Raja<sup>2</sup>, \*Alejandro Bribriesco<sup>2</sup>, Hafiz Umair Siddiqui<sup>1</sup>, Daniel Raymond<sup>2</sup>, Davendra Sohal<sup>1</sup>, Sudish Murthy<sup>2</sup>, Usman Ahmad<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Cleveland Clinic Foundation, Cleveland, OH; <sup>2</sup>Cleveland Clinic, Cleveland, OH

**Discussant:** D\*Wayne Hofstetter, University of Texas, MD Anderson Cancer Center, Houston, TX

**Commercial Relationships:** Research Grant: Johnson and Johnson; Other Research Support: Nestle Corp.; Speakers Bureau/Honoraria: Baxter Healthcare

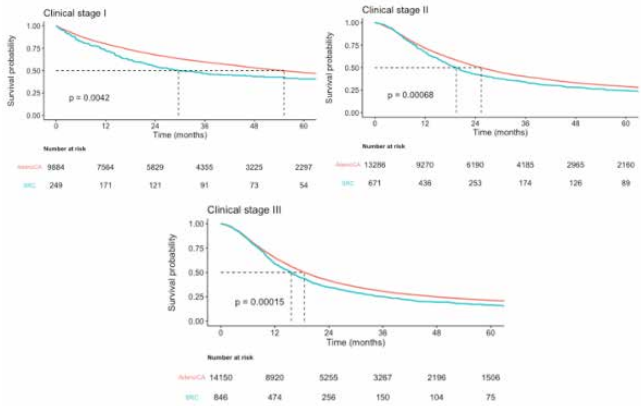
**Objectives:** Signet ring cell (SRC) histology is regarded as a poor prognostic factor for esophageal cancer patients. The primary objectives of this study were to understand the stage-specific treatment differences and survival outcomes of patients with and without SRC histology.

**Methods:** From 2004 to 2016, 140,324 patients were diagnosed with esophageal and gastroesophageal junction (GEJ) cancers in the National Cancer Database. Demographics, tumor variables, treatment characteristics and overall survival were studied. Frequency comparisons were made for pathologic upstaging, downstaging, complete response, and positive margins using the Chi-squared test. Survival was shown by the Kaplan Meier method. The log-rank test was used to determine non-parametric survival differences.

**Results:** During the study period, 3,825 patients were diagnosed with SRC and 87,326 patients with adenocarcinoma (AC) without SRC. SRC patients comprised between 2.4% to 3% of esophageal cancers per year across the study period. There were no differences in age, gender, race, or Charlson Deyo comorbidity index. SRC patients were less likely to present with early stage disease (cStage I: 10.2% vs 17.8% for AC  $p<0.001$ ). SRC patients were more likely to have pathologic upstaging (27.8% vs 17.5%,  $p<0.001$ ). Less pathologic downstaging was noted in SRC patients after neoadjuvant therapy (35.6% vs 47.3%,  $p<0.001$ ). A higher number of SRC patients had positive margins following resection (Table 1). Importantly, in a stage-matched comparison, median survival for SRC patients was worse than for AC patients (Figure 1).

**Conclusions:** SRC has worse survival than AC, even for stage I patients. Worse biology and higher rates of incomplete resection in SRC should steer patients away from undergoing limited resection, such as endoscopic submucosal dissection, even when identified at very early stages. In future esophageal cancer staging iterations, consideration for separating SRC from AC appears indicated because of their vastly different clinical behavior and response to therapy.

	Signet Ring Cell		Adenocarcinoma		
	Total	N (%)	Total	N (%)	p
Upstaged (cStage I)	245	68 (27.8%)	6689	1171 (17.5%)	<0.001
Downstaged after Neoadjuvant Therapy (cStage II-III)	379	135 (35.6%)	6626	3134 (47.3%)	<0.001
Complete Response after Neoadjuvant Therapy (cStage II-III)	379	24 (6.3%)	6626	424 (6.4%)	1.000
Positive Margins (cStage I-III)	457	58 (13.6%)	10320	592 (6.1%)	<0.001



Notes:

### 76. VATS Lobectomy is Not Dead— Improved Long-Term Postoperative Quality of Life Metrics After VATS Lobectomy Compared to Robotic-Assisted Lobectomy

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**Authors:** Aaron Williams<sup>1</sup>, Tyler Grenda<sup>1</sup>, Lili Zhao<sup>1</sup>, Ben Biesterveld<sup>1</sup>, Umar Bhattachi<sup>1</sup>, \*Philip Carrott, Jr.<sup>2</sup>, William Lynch<sup>1</sup>, Jules Lin<sup>1</sup>, Kiran Lagisetty<sup>1</sup>, \*Andrew Chang<sup>3</sup>, Rishindra Reddy<sup>1</sup>

**Author Institution(s):** <sup>1</sup>University of Michigan, Ann Arbor, MI; <sup>2</sup>Baylor College of Medicine, Houston, TX; <sup>3</sup>University of Michigan Health System, Ann Arbor, MI

**Discussant:** \*Allan Pickens, Emory University Hospital Midtown, Atlanta, GA

**Objectives:** Robotic-assisted thoracic surgery (RATS) lung lobectomy has emerged as an alternative minimally invasive approach to video-assisted thoracoscopic surgery (VATS). Patient-reported outcomes (PROs) comparing these approaches have been limited. We hypothesized that quality of life (QoL) and fear of recurrence (FoR) reporting would be similar following VATS and RATS for early-stage non-small cell lung cancer.

**Methods:** A retrospective review of prospectively collected data was performed from a single, high-volume academic center. Patients undergoing VATS and RATS lobectomies for Stage I and II non-small cell lung cancer from 2014 to 2018 were evaluated. The European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ-C30), EORTC Quality of Life Questionnaire in Lung Cancer (QLQ-LC13), and Fear of Recurrence (FoR) survey were administered preoperatively, postoperatively, and at 6 and 12 months after lung resection. Raw scores underwent linear transformation (0-100 scale). After adjusting for pre-and postoperative parameters, linear mixed effects models were used for QLQ and FoR score comparisons.

**Results:** 239 patients (139 VATS and 80 RATS) were included. Except for postoperative myocardial infarction (MI), demographics, preoperative characteristics, including FEV1 and DLCO, pathologic staging, and postoperative outcomes were not statistically different between groups (Table). The incidence of postoperative MI was significantly higher in the RATS group (3.7% vs. 0%;  $p = 0.04$ ). VATS patients reported higher QLQ-C30 summary scores postoperatively ( $79.2 \pm 1.3$  vs.  $72.8 \pm 1.6$ ;  $p = 0.003$ ) and at 12 months ( $85.3 \pm 2.1$  vs.  $79.0 \pm 2.5$ ;  $p = 0.05$ ) compared to RATS patients (Figure). Global Health scores at 6 months ( $76.8 \pm 2.4$  vs.  $66.5 \pm 3.1$ ;  $p = 0.01$ ) and Social Functioning scores postoperatively ( $80.0 \pm 2.4$  vs.  $66.4 \pm 2.8$ ;  $p = 0.004$ ) and at 12 months ( $87.2 \pm 3.7$  vs.  $74.5 \pm 4.5$ ;  $p = 0.03$ ) were also higher for VATS patients. VATS patients also reported decreased QLQ-LC13 symptom summary scores postoperatively ( $12.8 \pm 1.2$  vs.  $19.5 \pm 1.6$ ;  $p = 0.008$ ), decreased dyspnea at rest postoperatively ( $7.4 \pm 2.0$  vs.  $15.5 \pm 2.1$ ;  $p = 0.007$ ), and decreased dyspnea with stair activity at 6 ( $30.3 \pm 3.3$  vs.  $47.1 \pm 4.3$ ;  $p = 0.002$ ) and 12 months ( $26.3 \pm 4.2$  vs.  $44 \pm 5.2$ ;  $p = 0.01$ ) compared to RATS patients. VATS patients also reported lower FoR summary scores at 6 months ( $68.1 \pm 1.3$  vs.  $72.6 \pm 1.7$ ;  $p = 0.04$ ) after lung resection.

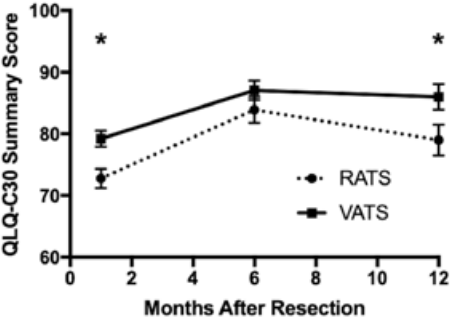
**Conclusions:** VATS patients report improvement in select QoL and FoR measures following lobectomy for early-stage lung cancers. There were no measures where RATS was favored over VATS. Further work is required to evaluate socioeconomic factors and patient billing, operative technique, and additional PROs comparing VATS and RATS lobectomy.

**Table. Demographics, Preoperative Characteristics, Pathologic Staging, and Select Postoperative Outcomes.**

Variable	RATS (n=80)	VATS (n=139)	P-value
Age (years)	66 ± 1.2	66.7 ± 0.85	0.67
Female sex (%)	54	53	0.86
FEV1, Actual (L)	2.4 ± 0.1	3.0 ± 0.6	0.32
FVC, Actual (L)	3.3 ± 0.2	3.9 ± 0.6	0.49
DLCO, Predicted	77.6 ± 2.7	81.7 ± 1.9	0.21
Smoking Pack Years	36.4 ± 3.9	31.7 ± 2.7	0.82
Pathologic Staging			
T1	56 (70%)	86 (62%)	0.57
T2	17 (21%)	37 (27%)	0.48
T3	7 (9%)	16 (11%)	0.56
N0	77 (96%)	132 (95%)	0.94
N1	3 (4%)	7 (5%)	0.94
Operative Time (min.)	217 ± 9.7	185 ± 7.1	0.01
Length of Stay (days)	3.9 ± 0.3	4.6 ± 0.3	0.06
30-Day Readmission	4 (5%)	6 (4.3%)	0.81
Any Postoperative Event	31(38.7%)	52 (37.4%)	0.84
Air Leak	6 (7.5%)	10 (7.2%)	0.93
Atrial Arrhythmia	7 (8.8%)	15 (10.7%)	0.62
Ventricular Arrhythmia	0 (0%)	2 (1.4%)	0.53
Ileus	2 (2.5%)	1 (0.7%)	0.55
Myocardial Infarction	3 (3.8%)	0 (0%)	<b>0.04</b>
Pneumonia	3 (3.8%)	2 (1.4%)	0.35
Respiratory Failure	0 (0%)	2 (1.4%)	0.53
Other Pulm. Event	3 (3.8%)	7 (5%)	0.74
UTI	0 (0%)	2 (1.4%)	0.53
Reoperation	1 (1.3%)	3 (2.1%)	0.99
ICU Admission	1 (1.3%)	2 (1.4%)	0.99
Death at 30 Days	0 (0%)	0 (0%)	0.99

Data are presented as count (frequency) or mean ± standard error unless specified otherwise.

**Postoperative QLQ-C30 Summary Score**



Notes:

## FOURTH SCIENTIFIC SESSION C - THORACIC BREAKOUT

### 77V. Basilar Thoracoscopic Segmentectomy for Lobar & Extralobar Sequestration With Bochdalek Hernia Repair

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**Authors:** \*Shanda Blackmon, **Johnathan Aho**, Sahar Saddoughi

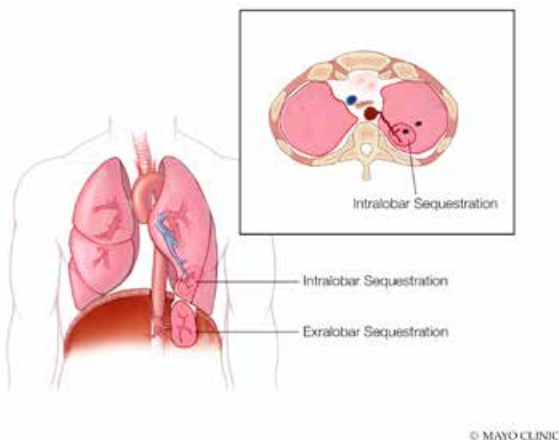
**Author Institution(s):** Mayo Clinic, Rochester, MN

**Objectives:** The objective of this video was to demonstrate minimally invasive parenchymal-sparing repair of a patient with a Bochdalek hernia and both intralobar as well as extralobar sequestrations.

**Methods:** Utilizing three thoracoscopic ports, a parenchymal-sparing resection was utilized.

**Results:** Through a thoracoscopic approach, the herniated omentum was resected. The extralobar sequestration was resected with aortic collateral artery and systemic vein both stapled. The intralobar sequestration was then resected with aortic collateral artery and pulmonary vein, and a basilar segmentectomy was performed. The Bochdalek hernia was repaired using interrupted 1-0 prolene sutures. A review with detailed illustrations of the different types of congenital hernias follows. The patient had an uneventful recovery.

**Conclusions:** Contemporary treatment for sequestrations is typically a VATS or robotic anatomic resection. Pulmonary sequestrations usually get their blood supply from the thoracic aorta. Intrapulmonary sequestration drains via pulmonary veins. Extra pulmonary sequestration drains to the IVC.



**Notes:**

## FOURTH SCIENTIFIC SESSION C - THORACIC BREAKOUT

### 78. Lymph Node Assessment in Surgery for Limited Stage Small Cell Lung Cancer

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**Authors:** A. Justin Rucker, Vignesh Raman, Oliver Jawitz, \*Thomas D'Amico, \*David Harpole

**Author Institution(s):** Duke University Medical Center, Durham, NC

**Discussant:** \*Stephen C. Yang, Johns Hopkins Medical Institutions, Baltimore, MD

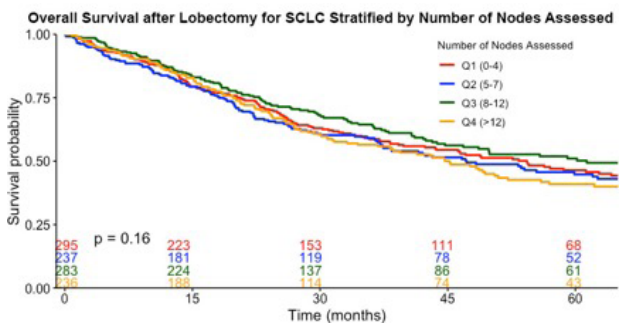
**Objectives:** The National Comprehensive Cancer Network guidelines recommend surgery for limited stage small cell lung cancer (SCLC). However, there is no literature on the minimum acceptable lymph node retrieval in surgery for SCLC. We hypothesized that an increased number of assessed lymph nodes would be associated with improved survival and increased pathologic nodal upstaging in patients with limited stage SCLC.

**Methods:** The National Cancer Database (NCDB) was queried for adult patients undergoing lobectomy for limited stage (cT1-2N0M0) SCLC from 2003-2015. Patients with neoadjuvant therapy and unknown survival, staging, and nodal assessment were excluded. The number of lymph nodes assessed was studied both as a continuous variable and as a categorical variable stratified into quartiles (Q1: 0-4 nodes; Q2: 5-7 nodes; Q3: 8-12 nodes; Q4: >12 nodes) based on distribution. The primary outcome was overall survival and the secondary outcome was pathologic nodal upstaging. Kaplan-Meier and Cox Proportional Hazards models were used to analyze survival. Multivariable logistic regression was used to examine nodal upstaging.

**Results:** A total of 1051 patients met study criteria. A median of 7 nodes were assessed (interquartile range 4-12). Patients in the highest quartile were more likely to be treated at an academic center (47% vs. 26%) compared to patients in the lowest quartile. The median survival in quartiles 1, 2, 3, and 4 was 54 (95% confidence interval [CI] 42-69), 47 (95%CI 37-77), 61 (95%CI 45-88), and 45 (95%CI 37-56) months, respectively (Figure). In multivariable analysis, a retrieval of 8-12 nodes was associated with a significant survival benefit (hazard ratio [HR] 0.73; 95%CI 0.55-0.98); the other quartiles were not associated with a significant difference in survival. When the number of nodes examined was modeled as a continuous variable, it was not associated with a difference in survival (HR 0.99; 95%CI 0.98-1.01). The overall rate of pathologic nodal upstaging was 19%. The rate of upstaging in Q1, Q2, Q3, and Q4 was 16%, 14%, 18%, and 27%, respectively. Modeled as a continuous variable, the number of lymph nodes assessed was significantly associated with nodal upstaging in multivariable regression (odds ratio [OR] 1.04; 95%CI 1.01-1.06). When examined by quartile, only Q4 (>12 nodes) was independently associated with upstaging (OR 1.87; 95%CI 1.12-3.14).

**Conclusions:** In this study, an assessment of 8-12 lymph nodes was associated with improved survival following lobectomy for limited stage SCLC. The number of retrieved lymph nodes was also independently associated with pathologic nodal upstaging. A minimum of 8 nodes should be sampled during lobectomy for SCLC.





**Notes:**

### 79. Mid-Term Outcomes of a Novel Trans-Conal Approach to Anomalous Aortic Origin of Left Main Coronary Artery Arising From Right Coronary Sinus With Extended Trans-Septal Course

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**Authors:** Hani Najm<sup>1</sup>, Tara Karamlou<sup>1</sup>, Munir Ahmad<sup>2</sup>, Saad Hasan<sup>1</sup>, \*Robert Stewart<sup>1</sup>, Joanna Ghobrial<sup>1</sup>, David Majdalany<sup>1</sup>, Yezan Salam<sup>3</sup>, Gosta Pettersson<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Cleveland Clinic, Cleveland, OH; <sup>2</sup>Cleveland Clinic Foundation, Cleveland, OH; <sup>3</sup>Alfaisal University, Riyadh, Saudi Arabia

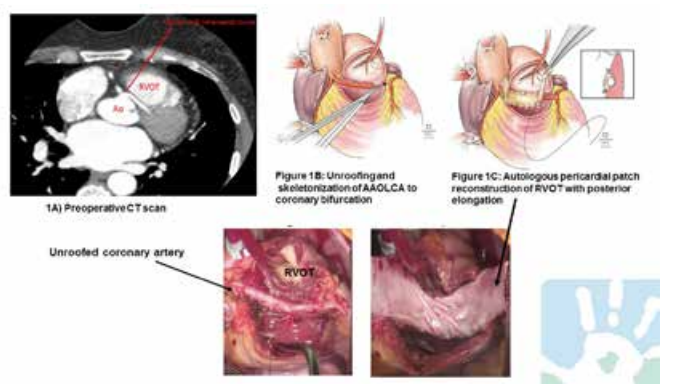
**Discussant:** \*Kristine J. Guleserian, Nicklaus Children's Hospital, Miami, FL

**Objectives:** Anomalous aortic origin of the left coronary artery (AAOLCA) may be associated with a high risk of sudden cardiac death. AAOCLA with an extended trans-septal course behind the right ventricular outflow tract (RVOT) is a rare variant that poses challenges not addressed by current surgical techniques. We have utilized a novel trans-conal approach that provided an effective solution in five consecutive patients. We characterize this entity, the operative technique, and clinical course of this unique group.

**Methods:** Retrospective review of a single-surgeon experience was conducted for patients undergoing trans-conal repair of trans-septal AAOLCA since we first developed the technique in 2018. Preoperative characteristics, imaging, operative details, and postoperative course were abstracted. Summary statistics appropriate for the normality and type of data were utilized to describe the population and outcomes.

**Results:** Five consecutive patients with main LCA (n=3) or left anterior descending artery (n=2) arising from the right aortic sinus with extended trans-septal course were identified. Median age was 48 (range 40-62) years, and four were female. Typical angina symptoms were universally reported. Two patients had prior coronary artery bypass grafting to the left coronary system several years preceding presentation. AAOLCA with trans-conal course was confirmed in all patients by computed tomography angiography as the initial test (Figure 1A). All patients had normal left ventricular ejection fraction (58±5). Two patients had dobutamine stress echocardiography or PET demonstrating anterolateral ischemia. Three patients underwent cardiac catheterization with intravascular ultrasound (IVUS) and instantaneous wave-free ratio (iFR) that confirmed a flow-limiting lesion. Importantly, 2 of these patients had negative provocative non-invasive testing for ischemia. Mean iFR preoperatively was 0.59±0.23. Trans-conal unroofing with elongation of the RVOT was performed in all patients (Figures 1B -C). Median post-operative hospital length of stay was 6 (range 5-12) days. No mortality or major complications occurred during a median follow-up of 8 months. Postoperative evaluation in all patients demonstrated anatomically patent unroofed AAOLCA with improved iFR (0.89±0.09, P=0.06). All patients are in NYHA Class 1 with excellent exercise tolerance.

**Conclusions:** Trans-conal unroofing of AAOLCA with trans-septal course repaired with posterior extension of RVOT is an effective surgical technique with excellent mid-term outcome for this anatomically challenging entity. Multimodality provocative testing is critical to fully evaluate these lesions as individual studies may be misleading. IVUS with iFR is clinically useful to confirm the hemodynamic significance of specific lesions in equivocal cases.



Notes:

### 80. Anomalous Origin of the Right Coronary Artery From the Pulmonary Artery: Analysis of 192 Published Cases With a Proposed Classification System

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**Authors:** Timothy Guenther<sup>1</sup>, Curtis Wozniak<sup>2</sup>, Gary Raff<sup>1</sup>

**Author Institution(s):** <sup>1</sup>University of California Davis, Davis, CA; <sup>2</sup>University of California San Francisco, San Francisco, CA

**Discussant:** Julie Brothers, The Children's Hospital of Philadelphia, Philadelphia, PA

**Objectives:** Anomalous origin of the right coronary artery from the pulmonary artery (ARCAPA) is a rare congenital cardiac defect with an estimated prevalence of 0.002%. A rare cause of a left to right shunt, this condition has been diagnosed in both children and adults with symptoms ranging from an asymptomatic murmur to sudden cardiac death. Numerous case reports of ARCAPA have been published, though little is known about this rare condition. The aim of our study was to characterize all available published cases of ARCAPA to better understand and classify this rare congenital cardiac defect.

**Methods:** A thorough literature search was performed using Pubmed, Google Scholar, and our institutional library database (powered by Primo). Keywords searched were: "anomalous origin of the right coronary artery from the pulmonary artery" and "coronary artery anomalies." To be included for analysis, we required the ARCAPA case report to describe relevant details of presenting symptoms, pre-operative work-up, other associated cardiac anomalies, or management. A classification system based on the patient's age and presence of symptoms was created to further characterize this cardiac defect.

**Results:** A total of 197 cases of ARCAPA were identified in 167 case reports. There was a slight male predominance (55%, n=102) and the average age of presentation was 24. (Fig.1) Thirty seven percent (n=74) of patients were asymptomatic at the time of diagnosis and most commonly identified during work-up of a murmur. (Fig.2) In symptomatic patients, angina and dyspnea were the most common presenting symptoms (21%, n=42 and 17%, n=33, respectively). The condition was most commonly diagnosed with coronary angiography (42%), but a diagnosis was also obtained using echocardiogram (27%), cardiac CT (16%), cardiac MRI (2%), intra-operatively (6%), and at autopsy (7%). An average Qp:Qs shunt of 1.76:1 was observed (n=28). A concomitant cardiac lesion was observed in 26% of cases (n=52), aorto-pulmonary window being the most common (n=23). Most cases were repaired surgically (83%, n=140) and re-implantation of the right coronary artery onto the aorta was the most common method of repair.

**Conclusions:** ARCAPA represents a rare and clinically heterogeneous congenital cardiac lesion that is diagnosed in patients of all ages. Given its rarity, evaluation of published case reports serves as the best avenue to understand the pathophysiology and treatment strategies of this uncommon condition.

Fig.1 Distribution of Cases of ARCAPA by Age at the Time of Diagnosis

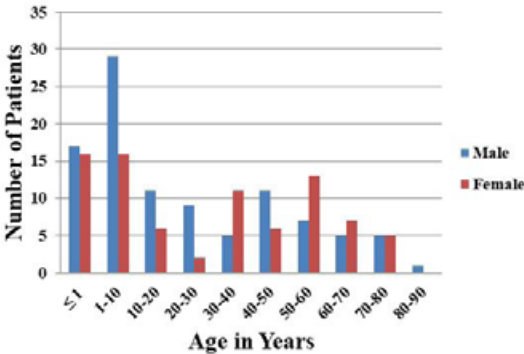
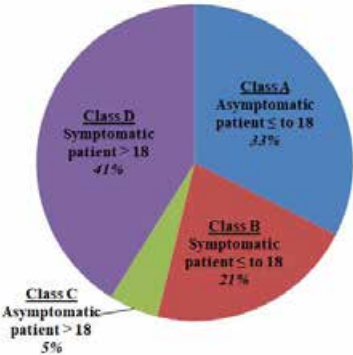


Fig.2 Distribution of Cases Based on Our Proposed Classification System



Notes:

### 81V. Right Video-Assisted Thoracoscopic Surgical Division of Aberrant Right Subclavian Artery and Right Subclavian-Carotid Transposition

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**Authors:** Christian Ghincea<sup>1</sup>, Yuki Ikeno<sup>1</sup>, Michael Weyant<sup>2</sup>, John Mitchell<sup>3</sup>,  
\*Muhammad Aftab<sup>2</sup>, \*Thomas Reece<sup>2</sup>

**Author Institution(s):** <sup>1</sup>University of Colorado, Aurora, CO; <sup>2</sup>University of Colorado Denver, Aurora, CO; <sup>3</sup>University of Colorado School of Medicine, Aurora, CO

**Discussant:** Alberto Pochettino, Mayo Clinic, Rochester, MN

**Objectives:** Video-assisted thoracoscopic surgical (VATS) division of congenital vascular rings has been demonstrated to be a safe technique in the setting of right-sided or double aortic arch, requiring a left-thoracic approach. Here we present a case of aberrant right subclavian artery (RSCA) division via right VATS and subclavian-carotid transposition.

**Methods:** A healthy 26-year-old male presented with intermittent shortness of breath and dysphagia. Computed tomography demonstrated aberrant retro-esophageal RSCA forming a vascular ring around the upper trachea and esophagus, causing compression. Patient was evaluated by Cardiothoracic surgery for elective repair. He was taken to the operating room, intubated using a double lumen endotracheal tube, and positioned left-lateral decubitus. Five VATS ports were placed for entry to the right hemithorax. The lung was deflated and retracted caudally, allowing easy visualization of the RSCA appearing posterior to the esophagus, superior to the azygous vein. The mediastinal pleura was opened and the RSCA was carefully dissected free from its origin on the aorta to the thoracic inlet using blunt dissection and bipolar energy. An umbilical tape was passed around the artery for ease of manipulation and an intercostal vein was divided to provide proximal exposure. When the artery was adequately mobilized, it was divided using the vascular stapler as flush to the aortic take-off as possible; the RSCA stump was well pressurized suggesting healthy collateral flow. The right hemithorax was then irrigated, hemostasis was ensured, and a single chest tube was placed. The trocars were removed, lung re-inflated, and incisions closed.

**Results:** Having completed the intra-thoracic portion of the procedure, the patient was repositioned supine with the neck extended and rotated left. A 4cm vertical incision was made superior to the right clavicle between the heads of the sternocleidomastoid. The dissection was carried down into the thoracic outlet and the right common carotid artery (RCCA) was dissected free. The RSCA was easily identified and brought into the neck with ample length proximally. An end-to-side RSCA-RCCA anastomosis was performed after heparinization. The incision was closed once hemostasis was obtained. The patient was extubated uneventfully and transferred to the inpatient hospital for recovery. There were no complications. The chest tube was removed postoperative day 1 and patient was discharged postoperative day 4. He was doing well 1 month after surgery with resolution of symptoms.

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**Conclusions:** In conclusion, right VATS division of aberrant RSCA and RSCA-RCCA transposition is a safe, feasible, and well tolerated strategy to addressing this vascular anomaly.

**Notes:**

## FOURTH SCIENTIFIC SESSION C – ADULT CONGENITAL BREAKOUT

### 82V. Bentall and Redo-Konno Operation for an Adult With Aortic Para-Prosthetic Leak With Root Aneurysm

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**Authors:** Takeshi Shinkawa, Yuki Nakayama, Ryogo Hoki, Kei Kobayashi, Tomohiro Nishinaka, Hiroshi Niinami

**Author Institution(s):** Tokyo Women's Medical University, Tokyo, Japan

**Discussant:** \*Joseph A. Dearani, Mayo Clinic, Rochester, MN

**Objectives:** The Konno operation was developed in 1975 to enlarge the aortic annulus and to implant the large enough prosthesis for children with valvular and subvalvular aortic stenosis. However, the reoperation for aortic prosthesis was not completely avoidable, and the redo-Konno septoplasty might be necessary in those reoperations.

**Methods:** The case was 39-year-old gentleman who had Konno operation with 23mm mechanical valve 30 years ago. He was referred for hemolytic anemia and congestive heart failure symptoms. The further evaluations showed para-aortic prosthesis leak with moderate regurgitation, left ventricular outflow tract obstruction with peak pressure gradient of 46 mmHg, right ventricular outflow tract obstruction with peak pressure gradient of 55 mmHg, and aortic root dilatation with root diameter of 60mm. It seemed that the aortic prosthesis was detached from the Konno septoplasty patch with large pannus formation, and the right ventricular outflow tract patch was severely calcified and shrunk.

**Results:** The reoperation was performed through redo median sternotomy and with regular cardiopulmonary bypass. After opening the ascending aorta and coronary buttons harvest, the aortic prosthesis was found to have partial detachment from the severely calcified Konno septoplasty patch. The aortic prosthesis and the majority of the Konno patches on interventricular septum, right ventricular outflow tract and ascending aorta were removed. The new bovine pericardial patch was used to redo Konno septoplasty. A 28mm Valsalva graft with 25mm mechanical valve was anastomosed to the posterior aortic annulus and to the anterior new Konno septoplasty patch, and the ascending aorta was reconstructed with Valsalva graft after coronary re-implantation. The bovine pericardial septoplasty patch was extended to the right ventricular outflow tract. The patient was currently in NYHA class I. The postoperative imaging showed no left ventricular outflow tract obstruction, good function of mechanical valve, and nicely reconstructed ascending aorta.

**Conclusions:** The Bentall with redo-Konno operation seemed to be an excellent option for the patient with para-prosthetic leak with aortic root dilatation after Konno operation or similar situations.



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**Notes:**

### 83. Hospital Cost and Resource Utilization Are Similar for ECMO Irrespective of Cannulation Strategy

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**Authors:** Karen Walker, Kunal Kotkar, Marci Damiano, \*Ralph Damiano, \*Marc Moon, Akinobu Itoh, Muhammad Masood

**Author Institution(s):** Washington University School of Medicine, St. Louis, MO

**Discussant:** Jeremiah W. Hayanga, University of Pittsburgh Medical Center, Pittsburgh, PA

**Objectives:** CMS decreased reimbursement rates for peripheral VA and VV ECMO in October 2018. Limited data are available describing the hospital cost and clinical resources required to support ECMO patients. We hypothesize that resource utilization and hospital cost are related to survival and unrelated to ECMO cannulation strategy.

**Methods:** A prospective database was queried to identify all patients supported on ECMO between March 1, 2017 and October 31, 2018. Exclusion criteria were: cannulation and transfer from referring hospitals, organ transplant recipients requiring ECMO, and temporary right ventricular support. The cohort was stratified into three groups based on initial cannulation strategy: central VA ECMO, peripheral VA ECMO and VV ECMO. Clinical outcomes included 30 day survival, days supported on ECMO, total and ICU length of stay (LOS), days on ventilator, and need for hemodialysis. Total hospital cost was determined. A subgroup analysis was performed after stratifying for survival.

**Results:** 29 patients were supported on central ECMO, 72 on peripheral ECMO, and 37 on VV ECMO (Table 1). 30 day survival was 48% for central vs 37% for peripheral vs 51% for VV. Hospital costs were: \$187,848 for central vs \$178,070 for peripheral vs \$172,994 for VV,  $p = 0.91$ . Mean LOS was 25.8 days for central vs 21.5 for peripheral vs 26.2 for VV,  $p = 0.49$ . Mean ICU LOS was 14.1 for central vs 12.8 for peripheral vs 7.7 for VV,  $p = 0.25$ . Mean days on ECMO was 6.5 for central vs 6.2 for peripheral vs 7.8 for VV,  $p = 0.38$ . Mean ventilator days was 13.0 for central vs 8.2 for peripheral vs 10.0 for VV  $p = 0.06$ . Hemodialysis was utilized in 41% central, 47% peripheral, and 41% VV patients,  $p = 0.75$ . Hospital cost and resource utilization were greater for survivors (Table 2).

**Conclusions:** ECMO cannulation strategy has minimal impact on resource utilization and hospital cost. Resource utilization and hospital cost are impacted by survival status. Our data do not support the recent changes to Medicare reimbursement rates for ECMO.

Table 1: Demographics and ECMO Indication

	Central VA (n = 29)	Peripheral VA (n = 72)	VV (n = 37)	P-value
Mean age	56.6	53.5	43.8	<0.01
Male	62%	69%	57%	0.40
Post-cardiotomy cardiogenic shock	96.5% (28/29)	20.3% (15/72)	--	
Cardiogenic shock	--	26.4% (19/72)	--	
Decompensated HF	--	9.7% (7/72)	--	
AMI	--	15.2% (11/72)	--	
Myocarditis	--	1.3% (1/72)	--	
PE	--	6.9% (5/72)	--	
Mixed cardiorespiratory failure	3.4% (1/29)	15.2 (11/72)	5.4% (2/37)	
Post-cardiotomy ARDS	--	--	13.5% (5/37)	
ARDS	--	4.7% (1/72)	81.0% (30/37)	

Table 2: Resource Utilization and Hospital Cost Stratified by Type of ECMO and Survival

	Survivors				Non-Survivors			
	Central VA (n = 12)	Peripheral VA (n = 28)	VV (n = 32)	P value	Central VA (n = 16)	Peripheral VA (n = 44)	VV (n = 20)	P value
Total Hospital Cost, mean	\$258,142	\$270,013	\$190,815	0.16	\$133,985	\$119,561	\$157,847	0.50
Total length of stay, mean	40.0	39.1	35.5	0.87	34.2	30.3	17.5	0.29
ICU length of stay, mean	19.0	20.8	20.8	0.88	18.1	7.6	13.0	0.23
Days on ECMO, mean	7.0	7.4	8.6	0.72	6.2	5.5	7.1	0.54
Days on ventilator, mean	16.0	9.4	10.5	0.08	10.6	7.4	9.6	0.46
Hemodialysis	85.1%	32.1%	41.1%	0.07	37.5%	56.8%	40%	0.27

Notes:

### 84. High Center Volume May Partially Mitigate the Increased Mortality Associated With Pre-Transplant Admission Status in Lung Transplant Recipients

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**Authors:** Neel Ranganath<sup>1</sup>, Travis Geraci<sup>2</sup>, Stacey Chen<sup>1</sup>, Deane Smith<sup>1</sup>, Bonnie Lonze<sup>3</sup>, Melissa Lesko<sup>1</sup>, Luis Angel<sup>1</sup>, Zachary Kon<sup>1</sup>

**Author Institution(s):** <sup>1</sup>NYU Langone Health, New York, NY; <sup>2</sup>New York University, New York, NY; <sup>3</sup>NYU Langone Transplant Institute, New York, NY

**Discussant:** **D\***Matthew G. Hartwig, Duke University, Durham, NC

**Commercial Relationships:** Research Grant: Mallinckrodt, Torax Medical; Speakers Bureau/Honoraria: Intuitive Surgical

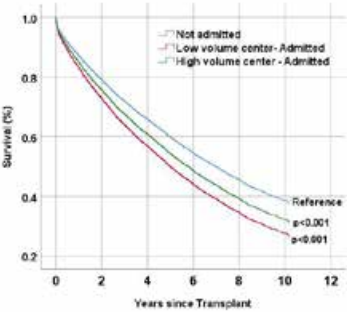
**Objectives:** Lung allocation scores (LAS) were designed to optimize the utilization of pulmonary allografts based on anticipated pre-transplant survival and post-transplant outcome. Candidates expected to have high waitlist mortality but robust post-transplant survival receive the highest priority for lung allocation. Hospital admission status, not included in the LAS, has not been comprehensively investigated with regards to organ allocation. The objective of this study was to determine if hospital admission status is an independent predictor of post-transplant mortality and determine if transplant center volume mitigates this survival disadvantage.

**Methods:** All consecutive adult lung transplants provided by the Scientific Registry of Transplant Recipients were retrospectively reviewed (2007-2017). Pediatric transplants, multi-organ transplants, and isolated lobar transplants were excluded. Group stratification was performed based on admission status at the time of transplantation. Low volume centers were defined as centers performing fewer than 26 lung transplantations per year. Recipient demographics and outcomes were compared between groups. A cox proportional hazard regression of 13 recipient covariables, including LAS and hospital admission status, was used to determine independent predictors of post-transplant mortality. A p-value of <0.05 was pre-determined to be statistically significant.

**Results:** During the study period, 20% (3,747/18,416) of recipients were admitted to the hospital at the time of transplantation (Table). Admitted recipients were younger (median 55 vs 60 years), more likely to have received a prior lung transplantation (9.5% vs 3.0%), more likely to be in primary diagnosis group C (22% vs 10%), and less likely to be in group A (13% vs 34%). Compared to non-admitted recipients, LAS were significantly higher (median 70 vs 38) and waitlist times significantly shorter (median 27 vs 73 days). Admitted recipients were more likely to receive a double lung transplantation (79% vs 66%) and had higher rates of prolonged mechanical ventilation (57% vs 31%), higher rates of post-transplant dialysis (12% vs 5%), and longer post-transplant lengths of stay (median 22 vs 15). Pre-transplant admission to a low volume center (HR 1.352, p<0.001) or high volume center (HR 1.190, p<0.001) conferred significantly worse survival compared to non-admitted patients (Figure).

**Conclusions:** Hospital admission status is predictive of post-transplant mortality independent from the LAS and the factors from which it is calculated. However, admission to a high volume center appears to partially mitigate the deleterious effect of pre-transplant hospital admission on recipient survival. Additional studies are required to determine if recurrent pre-transplant hospital admissions portend poor waitlist survival.

Table 1: Recipient demographics and outcomes for admitted vs. not admitted patients who receive lung transplantation			
Variables	Admitted, n=3,747 (20.3%)	Not admitted, n=14,869 (79.7%)	p-value
Age (years), n=13,456 (100%)	37 [34-41]	45 [32-61]	<0.001
Male gender, n=13,418 (100%)	2284 (16.9%)	8797 (59.0%)	0.002
BMI ≥30, n=11,366 (99.6%)	902 (7.9%)	2289 (20.1%)	0.002
Primary diagnosis, n=13,338 (91.6%)			<0.001
Group A	483 (3.6%)	4974 (34.1%)	
Group B	282 (2.1%)	374 (2.6%)	
Group C	818 (6.1%)	1102 (7.5%)	
Group D	2216 (16.8%)	1747 (11.7%)	
Diabetes, n=13,296 (99.4%)	1577 (12.6%)	2428 (16.4%)	<0.001
Creatinine ≥ 1.6, n=13,179 (99.0%)	170 (1.3%)	483 (3.2%)	<0.001
Dialysis, n=13,100 (99.4%)	71 (0.5%)	28 (0.2%)	<0.001
Chronic steroid use, n=1,497 (97.6%)	7144 (48.0%)	647 (4.3%)	<0.001
Previous lung transplant, n=13,456 (100%)	154 (1.1%)	474 (3.2%)	<0.001
Prior lung surgery, n=13,183 (99.2%)	104 (0.8%)	889 (6.0%)	<0.001
Days on waitlist, n=13,418 (100%)	27 [3-152]	71 [23-109]	<0.001
Mean P-A pressure (mmHg), n=14,869 (97.2%)	27 [23-31]	31 [25-31]	<0.001
FEV1 (%), n=13,072 (98.1%)	31 [21-72]	34 [21-71]	0.580
Procedure type, n=13,456 (100%)			<0.001
Single left	408 (3.0%)	272 (1.8%)	
Single right	370 (2.8%)	220 (1.5%)	
Double	2069 (15.2%)	964 (6.5%)	
Underused graft, n=13,390 (99.4%)	258 (1.9%)	1476 (9.9%)	<0.001
Overused graft, n=13,390 (99.4%)	878 (6.5%)	3460 (23.3%)	0.002
Cold ischemia time (min), n=13,390 (99.4%)	118 [25-187]	284 [215-187]	<0.001
LAS, n=13,418 (100%)	70 [41-82]	31 [34-47]	<0.001
Center volume ≥ 20 cases/year, n=13,418 (100%)	891 (6.6%)	1614 (11.5%)	0.009
Outcomes			
Post Tx hospital LOS, n=13,179 (99.7%)	22 [14-102]	11 [11-54]	<0.001
Post Tx dialysis, n=13,360 (99.4%)	447 (3.3%)	712 (4.8%)	<0.001
Post Tx prolonged mechanical ventilation, n=13,786 (99.6%)	2000 (14.5%)	4311 (29.0%)	<0.001
Post Tx stroke, n=13,347 (99.6%)	106 (0.8%)	298 (2.0%)	0.003



Notes:

### 85. Comparison of Heart Transplantation Survival Outcomes of HIV Seropositive Recipients to Seronegative Recipients Using Propensity Score Matching

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**Authors:** \*Julie Doberne<sup>1</sup>, Oliver Jawitz<sup>2</sup>, Vignesh Raman<sup>2</sup>, Benjamin Bryner<sup>1</sup>, Jacob Schroder<sup>1</sup>, \*Carmelo Milano<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Duke University, Durham, NC; <sup>2</sup>Duke University Medical Center, Durham, NC

**Discussant:** \*Keki R. Balsara, Vanderbilt University Medical Center, Nashville, TN

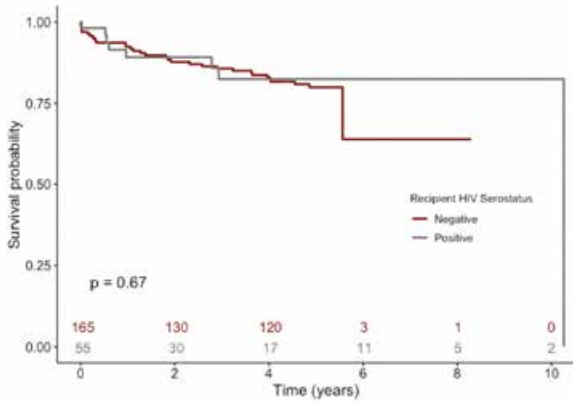
**Objectives:** In the era of combined antiretroviral therapy, HIV seropositive patients have reduced mortality from infection by HIV and increased morbidity from end stage organ failure of the liver, kidneys, and heart[1]. The rate of systolic left ventricular dysfunction is greater than twofold higher in the HIV seropositive population than in the non-infected population[2]. HIV seropositivity is still considered a contraindication to transplant recipient candidacy at most centers, although it has been done in selected centers[3]. Since then, the number of HIV seropositive heart transplantation recipients has been scant[4].

**Methods:** The purpose of this study was to compare survival outcomes of heart transplantation in selected HIV seropositive recipients to propensity matched HIV seronegative recipients. Clinical data from all HIV positive recipients of heart transplantation and corresponding propensity-matched HIV-negative recipients were extracted from the UNOS Thoracic Dataset from 2005-2018. Multi-organ transplant, prior transplant, recipient age <18, and those records missing survival data were excluded. We performed 3:1 propensity score matching to compare pre- and postoperative characteristics of the recipients. Survival was compared using Kaplan Meier survival analysis and Cox proportional hazards modeling.

**Results:** Fifty-five HIV seropositive recipients and a corresponding 165 HIV seronegative recipients were identified. There was no significant difference in gender, age, BMI, pre-transplant status, preoperative medical therapy, ABO blood type, or days on waitlist. There was significantly different representation of ethnic groups among the donors, with blacks comprising a larger proportion of the HIV positive recipient group as opposed to negative (52.7% vs. 21.2%;  $p < 0.001$ ). There were no significant differences among the characteristics of the donors. There were no HIV positive donors. There was no difference in survival of HIV positive recipients [1-year survival 89.1% (95% CI 80.5-98.7%), 5-year survival 82.4% (71.0-95.6%)] versus HIV-negative recipients [1-year survival 92.4% (88.3-96.6%), 5-year survival 79.9% (73.6-86.6%),  $p = 0.67$ , Figure 1]. Recipient HIV-positivity was not shown to be a significant covariate in predicting survival in a Cox proportional hazards model ( $p = 0.53$ ).

**Conclusions:** Short and moderate term survival following heart transplantation is similar in selected HIV seropositive and HIV seronegative recipients, although data are still extremely limited due to small cohort size. This analysis suggests that HIV-positive recipients should not be excluded from transplant candidacy solely based upon HIV serostatus.

Figure 1. Kaplan Meier Survival Analysis of HIV-Positive and HIV-Negative Heart Transplant Recipients.



Notes:

### 86. Nighttime Operation is Associated With Adverse Outcomes After Lung Transplantation

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**Authors:** Zhizhou Yang<sup>1</sup>, Tsuyoshi Takahashi<sup>2</sup>, Christy Hamilton<sup>1</sup>, \*Melanie Subramanian<sup>1</sup>, \*Bryan Meyers<sup>1</sup>, \*Benjamin Kozower<sup>1</sup>, \*G. Alexander Patterson<sup>1</sup>, Ruben Nava<sup>1</sup>, Michael Pasque<sup>1</sup>, Ramsey Hachem<sup>1</sup>, Chad Witt<sup>1</sup>, Patrick Aguilar<sup>1</sup>, Derek Byers<sup>1</sup>, \*Daniel Kreisel<sup>1</sup>, Varun Puri<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Washington University School of Medicine, St. Louis, MO;

<sup>2</sup>Barnes-Jewish Hospital, St. Louis, MO

**Discussant:** John Dunning, Tampa General Hospital, Tampa, FL

**Objectives:** Previous studies in the field of organ transplantation have shown a possible association between nighttime surgery and adverse postoperative outcomes. We aim to determine the impact of nighttime lung transplantation on postoperative outcomes, overall cost, and long-term survival.

**Methods:** We performed a single center retrospective cohort analysis of adult lung transplant (LT) recipients who underwent LT between January 2006 and December 2017. Data were extracted from our institutional Lung Transplant Registry and Mid-America Transplant services database. Re-transplants and combined heart-lung transplants were excluded. Patients were classified into two strata (daytime 5AM to 6PM; nighttime 6PM to 5AM) based upon time of incision. Postoperative outcomes and overall cost of transplantation were examined by multivariate regression. Kaplan-Meier analysis and multivariate Cox model were used to examine 5-year survival.

**Results:** Of the 740 patients included in this study, 549 (74.2%) patients underwent daytime transplantation (DT) and 191 (25.8%) patients underwent nighttime transplantation (NT). Multivariate analysis revealed an increased risk of having any major adverse event in NT with marginal significance (nighttime 70.2% vs. daytime 61.2%; adjusted OR = 1.42; 95% CI, 0.99 – 2.07; P = 0.059). No significant difference in 30-day and 1-year mortality was observed. Length of hospitalization and overall cost for NT and DT were similar. NT was associated with lower 5-year survival in both Kaplan-Meier analysis (P = 0.027) and multivariate Cox model (HR = 1.37; 95% CI, 1.02 – 1.86; P = 0.038).

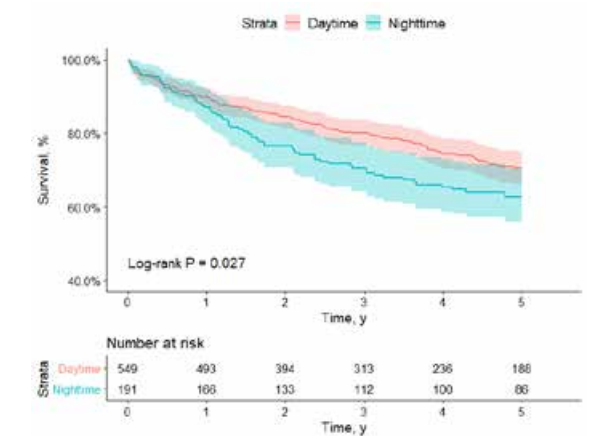
**Conclusions:** NT was associated with decreased 5-year survival and likely higher risk of major postoperative adverse events. Our findings suggested potential benefits of delaying nighttime lung transplantation to daytime and underscored the need of further evaluation to find institution-specific practices that maximizes patient safety.



**Table 1** Multivariate Cox model for 5-year overall survival.

	Proportional HR (95% CI)	P value
Nighttime	1.37 (1.02 – 1.87)	0.038
Recipient age	1.00 (0.99 – 1.02)	0.615
LAS	1.00 (0.99 – 1.01)	0.798
BMI		0.066
Underweight (BMI < 18.5)	1.38 (0.91 – 2.10)	
Overweight (25 ≤ BMI < 30)	0.88 (0.63 – 1.23)	
Obese (BMI ≥ 30)	0.52 (0.27 – 1.01)	
Hypertension	1.28 (0.93 – 1.77)	0.132
Preoperative ECMO/MV	1.60 (0.93 – 2.76)	0.088
Donor ventilation days	0.94 (0.87 – 1.01)	0.082
Donor chest trauma	1.53 (0.98 – 2.40)	0.063
Operation after 2009	0.69 (0.50 – 0.95)	0.023

Abbreviations: BMI, body mass index; CI, confidence interval; ECMO, extracorporeal membrane oxygenation; HR, hazards ratio; LAS, lung allocation score; MV, mechanical ventilation.



Notes:

# FIFTH SCIENTIFIC SESSION

## 87. Blades of Glory: An Unsung Capitol Giant

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**Authors:** Alexander Yang<sup>1</sup>, \*Stephen Yang<sup>2</sup>

**Author Institution(s):** <sup>1</sup>George Washington University School of Medicine, Washington, DC; <sup>2</sup>Johns Hopkins Medical Institutions, Baltimore, MD

**Body of History Abstract:** Blades may not be the first name that comes to mind when one considers the most influential pioneers in the culture of thoracic surgery. Sadly, this name may only show up as a footnote in a research article; or as an artifact from a bygone era, only to surface as the name given to a cohort of oblivious medical students undergoing their surgical rotation at GWSMHS, all of them unaware of a remarkable legacy that is coupled with this simple name: Brian Brewer Blades.

The fortuitously named Dr. Blades was born in a small town in Kansas of no more than 25 citizens, and his simple beginnings bore no indication of the incredible legacy that he would develop over the coming years, eventually becoming the 37th president of the American Association for Thoracic Surgery. For all the recognition and acclaim he gained from his peers through the years, Dr. Blades would never shed his small-town charm as he remained an avid outdoorsman and fondly recalled the days when he would accompany his father, also a doctor, on house calls via the only transportation available at the time: a horse and buggy.

In 1932, Dr. Blades graduated cum laude and Alpha Omega Alpha from the Washington University School of Medicine in St. Louis. Shortly after, Blades found himself at Bellevue Hospital in New York City completing his surgical residency. During this period, Blades survived a harrowing experience during which he suffered acute respiratory arrest due to "Ludwig Angina." He received an emergency tracheostomy in an elevator, an event that would change him both physically, forever altering the sound of his voice, and mentally, sending him down the path that would define his career.

During World War II, Blades enrolled in the army, initially serving in the North African Army Medical Corps, and eventually becoming a surgical consultant to the Army's surgeon general for which he was Legion of Merit award. Over a 4 year period from 1942 to 1946, Blades and a team of surgeons embarked on a series of 350 pulmonary resections without a single death, a feat in its own right.

After the war, Dr. Blades was appointed as professor and chairman of the George Washington University Department of Surgery. He also became the first full-time faculty member at the school, and was given the monumental task of re-hauling GW from a volunteer to full-time faculty hospital.

Consulting Blades' work as a clinical investigator, he wrote a textbook, Surgical Diseases of the Chest, that served as one of the most popular and important surgical textbooks of its day. Blades also published an article with Dr. Edward Kent in 1940 outlining the procedure of individual ligation of hilar vessels in the setting of lobar lung resections; a procedure that would improve the outcomes of pulmonary resection almost overnight throughout the world.

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However, Blades believed that his most important responsibility came as an educator. His pure love for the art of lecturing and educating medical students, nurses, residents, and just about anyone willing to listen was extremely apparent during his tenure at GW. The culture of teaching and comprehending almost certainly left an invaluable mark on all those fortunate to have been taught by him. Over the course of these years, Dr. Blades trained a multitude of surgeons who are famous in their own right such as Drs. Donald Effler and Floyd Loop.

Dr. Brian Brewer Blades is remembered fondly by his colleagues and family as a man of true integrity and classically liberal intellect and mentality. He truly is an unsung hero whose contributions to the field of thoracic surgery cannot be quantitatively measured. This intellectual giant implicitly helped shape the field into what it is today simply with an open mind and a blade in his hand.

**Notes:**

# FIFTH SCIENTIFIC SESSION

## 88. The First and Only Carolyn Reed

*Unless otherwise noted in this program book or verbally by the speakers, speakers have no relevant financial relationship to disclose and will only be presenting information on devices, products, or drugs that are FDA approved for the purposes they are discussing. Presenters and discussants listed with a **D** next to their name have indicated that they have a financial or other relationship with a healthcare-related business or other entity to disclose.*

**Authors :** **D\***Shanda H. Blackmon

**Commercial Relationships:** \*S. Blackmon: Consultant/Advisory Board: Olympus;  
Research Grant: Medtronic, truFreeze

**Author Institution(s):** Mayo Clinic, Rochester, MN

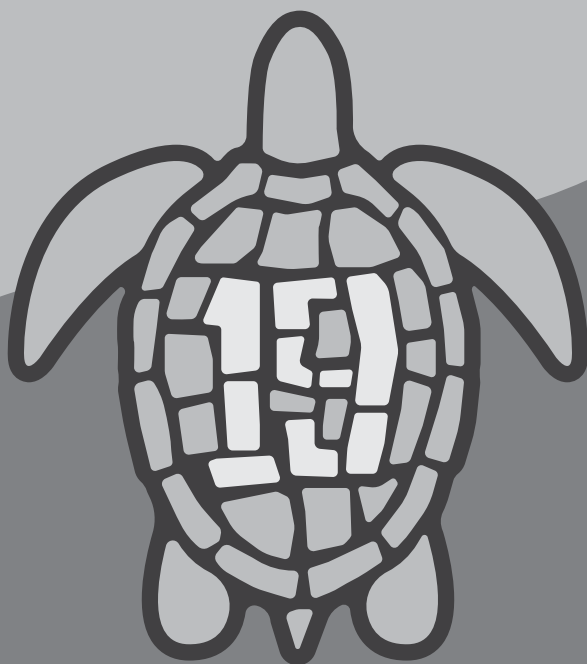
**Body of History Abstract:** Although it has already been seven years since Carolyn Reed passed away from pancreatic cancer, her voice and memory are still strong within the members of the Southern Thoracic Surgical Association (STSA). She continues to live beyond memory in the form of a Thoracic Surgery Foundation grant that honors her, the legacy of residents she has trained, those she has mentored, and her research. Carolyn was the first female faculty member in the MUSC Department of Surgery, achieving the rank of Professor with Tenure in 1997. She was a vigorous advocate for women in surgery, and the first ever President of a major national organization when she was elected as the President of the Southern Thoracic Surgical Association. She served on the Council of the American Association for Thoracic Surgery, and was posthumously elected as President of the Society of Thoracic Surgeons.



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**Notes:**





# SCIENTIFIC E-POSTERS\*

\*Electronic posters will be on display in the meeting space foyer on Thursday and Friday

# ADULT CARDIAC SURGERY POSTERS

## AC-P1. Predictors of New Persistent Opioid Use After Aortic and Mitral Valve Surgery

**Authors:** Kathleen Clement<sup>1</sup>, Joseph Canner<sup>1</sup>, Glenn Whitman<sup>2</sup>, \*Jennifer Lawton<sup>3</sup>, Michael Grant<sup>1</sup>, Marc Sussman<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Johns Hopkins University School of Medicine, Baltimore, MD; <sup>2</sup>Johns Hopkins University, Baltimore, MD; <sup>3</sup>Johns Hopkins, Baltimore, MD

**Objectives:** Deaths from prescription opioid overdose are dramatically increasing, and no studies have evaluated new persistent opioid use after heart valve surgery. This study quantifies the amount of outpatient opioids prescribed and evaluates the incidence and risk factors for new persistent opioid use after aortic valve replacement (AVR), mitral valve replacement (MVR), and mitral valve repair (MVR).

**Methods:** Insurance claim data from commercially insured opioid-naïve patients who underwent AVR, MVR, or MVR from 2014 to 2016 in the Truven Health Marketscan Database were evaluated. New persistent opioid use was defined as patients who filled an opioid prescription in the perioperative period and continued to fill opioid prescriptions between 90 and 180 days after surgery. Multivariable logistic regression was used to determine the preoperative and operative factors associated with new persistent opioid use.

**Results:** Among 3,404 opioid-naïve patients undergoing AVR, MVR or MVR, 2,480 (72.9%) filled opioid prescriptions in the perioperative period, and 188 (5.5%) had new persistent opioid use. New persistent opioid users filled opioid prescriptions for significantly more opioids (375 vs. 250 morphine milligram equivalents,  $p<0.001$ ) and for a longer day supply (7.5 vs. 5.0 days,  $p<0.001$ ) in the perioperative period than patients with no persistent opioid use respectively. Living in the Southern United States (OR 1.91, CI 1.42-2.58,  $p<0.001$ ), chronic kidney disease (OR 1.80, CI 1.00-3.24,  $p=0.049$ ), and increased amount of opioids prescribed in the perioperative period (OR 1.009, CI 1.006-1.012,  $p<0.001$ ) were independently associated with new persistent opioid use.

**Conclusions:** New persistent opioid use is a significant complication after aortic and mitral valve surgery in patients with private insurance. Variation in regional susceptibility and opioid prescribing suggests that standardization may help prevent this complication.



## New Persistent Opioid Use After Aortic and Mitral Valve Surgery

U.S. Opioid-Naïve  
Patients Who  
Underwent AVR,  
MVR or MVr  
N=3,404  
(2014-2016)



New Persistent  
Opioid Use  
**5.5%**  
N=188

### Risk Factors for New Persistent Opioid Use

Living in  
Southern U.S.



**OR 1.91**  
95% CI 1.42-2.58  
P < 0.001

Chronic Kidney  
Disease



**OR 1.80**  
95% CI 1.00-3.24  
P = 0.049

Opioids Prescribed in  
Perioperative Period



**OR 1.009\***  
95% CI 1.006-1.012  
P < 0.001  
For Every 10 MME ↑\*

Notes:

# ADULT CARDIAC SURGERY POSTERS

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Abstract Withdrawn 10/13/2019. Please refer to the STSA mobile application for the most current information.



# ADULT CARDIAC SURGERY POSTERS

## AC-P2. Minimal Invasive Versus Conventional Coronary Artery Bypass Grafting: A Multi-Institutional Assessment of Cost and Outcomes

**Authors:** \*James Mehaffey<sup>1</sup>, \*Robert Hawkins<sup>1</sup>, Eric Charles<sup>1</sup>, \*Alan Speir<sup>2</sup>, Mohammed Quader<sup>3</sup>, \*Gorav Ailawadi<sup>4</sup>, \*Nicholas Teman<sup>1</sup>

**Author Institution(s):** <sup>1</sup>University of Virginia, Charlottesville, VA; <sup>2</sup>INOVA Heart and Vascular Institute, Falls Church, VA; <sup>3</sup>Virginia Commonwealth University, Richmond, VA; <sup>4</sup>University of Virginia Health System, Charlottesville, VA

**Objectives:** Limited multi-institutional data evaluating minimally invasive cardiac surgery (MICS) coronary artery bypass surgery (CABG) outcomes has raised concern for increased resource utilization compared to standard sternotomy. The purpose of this study was to assess short-term outcomes and resource utilization with MICS CABG in a propensity matched regional cohort.

**Methods:** Isolated CABG patients (2012-2019) were extracted from a regional Society of Thoracic Surgeons database. Patients were stratified by MICS CABG versus conventional sternotomy, propensity score matched 1:2 to balance baseline differences, and compared by univariate analyses.

**Results:** Of 26,255 isolated coronary artery bypass graft patients, 139 MICS CABG and 278 sternotomy patients were well balanced after matching. There was no difference in the operative mortality rate (0.7% MICS CABG versus 2.2% sternotomy,  $p=0.383$ ) or major morbidity (7.2% MICS CABG versus 7.9% sternotomy,  $p=0.795$ ). However, MICS CABG patients received fewer blood products (12.2 vs 22.2%,  $p=0.013$ ) as well they had shorter intensive care unit (30 vs 45 hours,  $p=0.049$ ) and hospital length of stays (6 vs 7 days,  $p=0.005$ ). Finally, median hospital cost was significantly lower in the MICS CABG group (\$27,906 vs \$35,011  $p<0.0001$ ) compared to conventional sternotomy.

**Conclusions:** Conventional sternotomy and MICS CABG approaches are associated with similar perioperative outcomes despite higher transfusion rates with sternotomy. Resource utilization including length of stay and hospital cost was lower with MICS CABG in this regional cohort.

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**Notes:**

# ADULT CARDIAC SURGERY POSTERS

## AC-P3. Safety of Non-Vitamin K Anticoagulants Versus Warfarin Following Cardiac Surgery Via Sternotomy

**Authors:** Winborne Hamlin<sup>1</sup>, Alayna Garcia<sup>1</sup>, Bonnie Punske<sup>1</sup>, Vincent VanBuren<sup>2</sup>, Faraz Kerendi<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Cardiothoracic & Vascular Surgeons, PA, Austin, TX;

<sup>2</sup>Texas A&M College of Medicine, Bryan, TX

**Objectives:** Warfarin has been the standard treatment for long-term anticoagulation for decades. More recently, non-vitamin K oral anticoagulants (NOACs) have emerged as an alternative to warfarin in several patient populations. However, the safety of NOACs immediately following cardiac surgery via sternotomy is largely unknown. We sought to compare the safety of NOACs as compared to warfarin when initiated early after sternotomy.

**Methods:** 313 patients were retrospectively reviewed who received oral anticoagulation (107 warfarin, 206 NOAC) within 3 weeks of sternotomy. Charts were reviewed for adverse bleeding events within 3 months of the operation. Events were classified by a blinded physician as major (associated with any of the following: death, involvement of a critical anatomic site (intracranial, spinal, pericardial, articular, retroperitoneal, or intramuscular), fall in hemoglobin concentration >2 g/dL, transfusion of packed red blood cells, or permanent disability) or minor (bleeding that required medical care but did not meet criteria for major). Quantitative and categorical variables were compared with t-tests and chi-squared tests, respectively. The power for detecting a medium effect size for contingency tables (Cohen's  $w=0.3$ ) was 0.99.

**Results:** Demographic and procedural data were statistically comparable between groups, and there was an equal distribution in reason for anticoagulation among groups (Table 1). In the warfarin group, the average INR was 2.0. No difference in the number of overall bleeding events was detected (9.43% warfarin vs. 7.25% NOAC,  $p=0.0554$ ). There was also no difference in severity of bleeding events – major bleeding (7.55 % warfarin vs. 5.80 % NOAC,  $p=1$ ) and minor bleeding (1.89% warfarin vs. 1.45% NOAC,  $p=1$ ). Major bleeding events were also similar when the NOAC group was separated based on the specific drug used (4.40% rivaroxaban vs. 6.0% apixaban vs. 7.55% warfarin,  $p=0.39$ ).

**Conclusions:** The use of NOACs in the immediate postoperative period appears to be safe with no added risk of bleeding when compared to warfarin. There was a non-significant trend toward reduced bleeding events in the NOAC group. A larger sample size and a randomized comparison are needed to determine if this trend is clinically significant.

	Warfarin	NOACs	P-value
Age	72.7	72.0	0.94
Gender: Male	73.6%	71.0%	0.63
Last Creatinine Level	1.2	1.2	0.59
Anticoagulant Medication within 8 hours	25.5%	25.6%	0.98
Full Sternotomy	99.1%	96.6%	0.20
Coronary Artery Bypass	65.1%	68.6%	0.53
Valve Surgery	58.5%	59.4%	0.87
Other Cardiac Procedure	50.0%	50.2%	0.61
Atrial Fibrillation Procedure	33.0%	38.6%	0.33
Aortic Procedure	10.4%	11.6%	0.75
Mechanical Valve	0.0%	0.0%	1.00
Aortic Valve Replacement	32.1%	28.5%	0.44
Mitral Valve Repair/Replacement	30.1%	32.8%	1
Tricuspid Valve Repair/Replacement	6.6%	3.4%	0.28
Intra-aortic Balloon Pump	14.2%	10.1%	0.29
Left Atrial Appendage Procedure	45.3%	45.4%	0.12

Notes:

# ADULT CARDIAC SURGERY POSTERS

## AC-P4. Contemporary Trends and Midterm Outcomes in Mitral Valve Repair for Degenerative Mitral Valve Disease: Ring vs. Band

**Authors:** Patrick Chan, Laura Seese, Arman Kilic, Christopher Sciortino, Ibrahim Sultan, Thomas Gleason, \*Danny Chu

**Author Institution(s):** *University of Pittsburgh Medical Center, Pittsburgh, PA*

**Objectives:** To evaluate the contemporary trends and midterm outcomes of mitral valve (MV) repair for degenerative MV disease with bands versus complete rings in a multi-site healthcare organization.

**Methods:** From January 2011 to December 2017, 1,462 patients presented at major healthcare organization for MV repair. Of these patients, 919 patients had MV repair for degenerative mitral disease. A complete ring was implanted in 534 patients and band was implanted in 385 patients. Data collected include patient demographics, pre-operative characteristics, operative management, and post-operative morbidity and mortality.

**Results:** Patients who had a MV ring repair were significantly older ( $68.0 \pm 11.3$  vs  $64.5 \pm 12.1$  years,  $p < 0.01$ ) with more preoperative comorbidities such as diabetes (28.3% vs. 20.8%,  $p < 0.01$ ), hypertension (78.7% vs. 71.2%,  $p < 0.01$ ) and chronic lung disease (24.3% vs. 16.4%,  $p < 0.01$ ) compared to patients who had MV band repair. Left ventricular ejection fraction was significantly higher in patients who had a band implanted compared to ring ( $53.4 \pm 12.5$  vs.  $49.9 \pm 13.3$ ,  $p < 0.01$ ). Patients with previous heart failure symptoms were more likely to have a complete ring implanted (48.9% vs. 41.3%,  $p = 0.03$ ). 30-day, 1- and 5-year mortality was significantly higher in patients who had ring vs. band implantation (20.0% vs 12.5%,  $p < 0.003$ ). However, at 5-years, multivariate analysis showed that implanting a band vs. ring was not a significant independent predictor of operative mortality, 5-year mortality or hospital readmission. Age, creatinine, chronic lung disease, peripheral vascular disease were significant predictors of 5-year mortality. Both ring and band implantation cohorts had similar freedom from  $\geq 2+$  mitral regurgitation (MR) (7.9% vs. 9.6%,  $p = 0.6$ ) with a mean follow up of  $1.3 \pm 0.5$  and  $1.2 \pm 1.1$  years respectively.

**Conclusions:** Mitral valve complete rings were implanted into patients who had more co-morbidities and had higher Society of Thoracic Surgeons Predicted Risk of Mortality scores. Despite having significantly higher mortality at 30 days, our analysis showed that the implantation of a ring vs. band was not a significant independent predictor of operative mortality, 5-year mortality and hospital readmission. Furthermore, both rings and bands had similar freedom from  $\geq 2+$  MR (Figure 1).



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**Notes:**

# ADULT CARDIAC SURGERY POSTERS

## AC-P5. Treatment Effect of Concomitant Tricuspid Valve Operation for Tricuspid Valve Regurgitation at the Time of Pericardiectomy for Constrictive Pericarditis

**Authors:** Rolando Calderon-Rojas, Kevin Greason, Katherine King, Sushil Luis, Jae Oh, \*John Stulak, Richard Daly, \*Joseph Dearani, \*Hartzell Schaff

**Author Institution(s):** Mayo Clinic, Rochester, MN

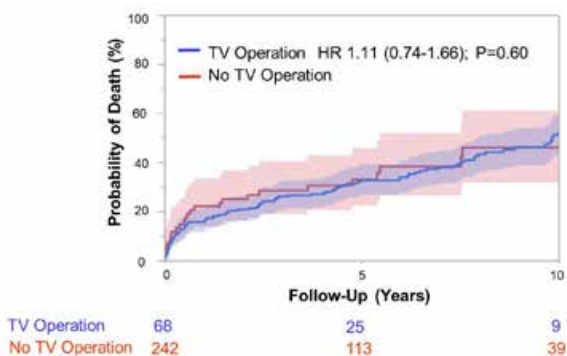
**Objectives:** Determine the outcome effect of concomitant tricuspid valve operation for regurgitation during pericardiectomy for constrictive pericarditis.

**Methods:** We conducted a cohort study of 310 patients with mild or worse tricuspid valve regurgitation who underwent pericardiectomy for constrictive pericarditis from 2000 to 2016. Patients were divided into two treatment groups: tricuspid valve operation (intervention group, n=68) and no tricuspid operation (control group, n=242). Survival analysis, proportional odds models, and landmark analysis were carried out to estimate the treatment effects of tricuspid valve operation.

**Results:** Tricuspid valve regurgitation was graded mild in 203 (65%) patients, moderate in 69 (22%), and severe in 38 (12%). Tricuspid valve operation included repair in 54 patients (17%) and replacement in 14 (5%). Mechanical circulatory support was used more commonly in the intervention group (15% versus 5%;  $p=0.009$ ), but stroke (3% versus 2%;  $p=0.210$ ) and mortality (9% versus 6%;  $p=0.422$ ) rates were similar. Tricuspid valve intervention resulted in a reduced risk for long-term mortality (hazard ratio 0.68; 95% CI 0.38-1.21;  $p=0.192$ ), less than moderate tricuspid valve regurgitation at follow-up (odds ratio versus moderate or severe: 0.093; 95% CI 0.04-0.19), and less than moderate right ventricular enlargement at follow-up (odds ratio versus moderate or severe 0.67; 95% CI 0.35-1.24). Remnant severe right ventricular dysfunction resulted in increased risk of mortality (hazard ratio versus none/trivial: 4.87; 95% CI 1.10-21.65;  $p=0.037$ ).

**Conclusions:** Concomitant tricuspid valve operation for regurgitation can be done without increased operative mortality during pericardiectomy for constrictive pericarditis. Operation appears protective against long-term mortality, residual tricuspid regurgitation, and right ventricular enlargement.

Variable	Univariate analysis (n = 310)		Multivariable analysis (n = 293)	
	Hazard ratio (95% Confidence interval)	p value	Hazard ratio (95% Confidence interval)	p value
Age (years)	1.02 (1.00-1.04)	0.002	1.01 (0.99-1.02)	0.496
Female sex	0.85 (0.59-1.22)	0.381	1.35 (0.87-2.09)	0.186
Diabetes	1.93 (1.34-2.76)	<0.001	2.11 (1.42-3.15)	<0.001
Severe chronic lung disease	1.99 (1.25-3.16)	0.004	2.18 (1.32-3.59)	0.002
Previous pacemaker	1.29 (0.87-1.91)	0.197	1.32 (0.85-2.06)	0.220
Atrial fibrillation	1.40 (1.01-1.95)	0.044	1.28 (0.87-1.87)	0.205
Coronary artery disease	2.53 (1.80-3.55)	<0.001	2.69 (1.75-4.13)	<0.001
Right ventricular enlargement, moderate/severe	1.58 (0.97-2.58)	0.066	1.14 (0.56-2.34)	0.712
Right ventricular dysfunction, moderate/severe	1.87 (1.15-3.03)	0.011	2.18 (1.12-4.21)	0.021
Tricuspid valve regurgitation, moderate/severe	1.33 (0.95-1.86)	0.094	1.22 (0.79-1.90)	0.367
Tricuspid valve operation	1.11 (0.74-1.67)	0.604	0.68 (0.38-1.21)	0.192
Radical pericardectomy	0.99 (0.69-1.41)	0.962	1.12 (0.76-1.66)	0.562
Cardiopulmonary bypass	1.52 (1.01-2.31)	0.047	1.58 (0.98-2.55)	0.060



Notes:

# ADULT CARDIAC SURGERY POSTERS

## AC-P6. Tricuspid Annuloplasty With Edge-to-Edge Repair is Effective for Severe Tricuspid Regurgitation

**Authors:** Matthew Byler<sup>1</sup>, Jared Beller<sup>1</sup>, William Chancellor<sup>1</sup>, \*Robert Hawkins<sup>1</sup>, \*James Mehaffey<sup>1</sup>, \*Nicholas Teman<sup>1</sup>, \*Irving Kron<sup>1</sup>, \*Leora Yarbboro<sup>1</sup>, \*Gorav Ailawadi<sup>2</sup>

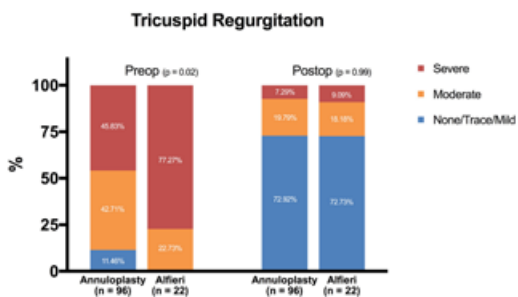
**Author Institution(s):** <sup>1</sup>University of Virginia, Charlottesville, VA; <sup>2</sup>University of Virginia Health System, Charlottesville, VA

**Objectives:** Edge-to-edge tricuspid leaflet repair has been used as an adjunct to annuloplasty for severe tricuspid regurgitation (TR). However, no studies have compared outcomes between annuloplasty with edge-to-edge repair versus annuloplasty alone. The purpose of this study was to compare surgical and echocardiographic outcomes in the short and intermediate term between these two approaches.

**Methods:** All patients who underwent tricuspid valve repair (2014-18) in an institutional Society of Thoracic Surgeons (STS) database were stratified between annuloplasty alone (annuloplasty group) or annuloplasty with concomitant edge-to-edge repair (Alfieri group). Preoperative and follow-up echocardiograms were evaluated to determine the severity of TR and the improvement after repair. Risk-adjustment was performed using 1:1 propensity score matching to assess the effects of the tricuspid repair on mortality and major morbidity.

**Results:** A total of 119 patients underwent tricuspid valve repair including 22 patients (18.5%) in the Alfieri group. There were no significant differences in demographics or comorbidities between groups, however, patients in the Alfieri group had significantly worse baseline TR (Severe TR: 77% vs. 46%,  $p=0.02$ ). The median annuloplasty ring size was 30mm ( $p > 0.05$ ) for both groups, while the median echocardiographic follow-up was 67.5 days [12 – 360]. Despite worse TR at baseline in the Alfieri group, post-operative freedom from moderate/severe TR was surprisingly similar between the two groups at follow up (Figure). After propensity score matching, major morbidity (46.7% vs. 40.0%,  $p = 0.713$ ) was equal between groups with no operative mortalities in either group. Importantly, there was no occurrence of tricuspid stenosis following edge-to-edge repair.

**Conclusions:** Edge-to-edge tricuspid repair with annuloplasty demonstrated excellent improvement in TR and operative outcomes despite significantly worse baseline regurgitation. Tricuspid stenosis did not occur in follow-up. This data suggests that concomitant edge-to-edge repair is a safe and effective repair method when annuloplasty alone does not achieve an acceptable TR reduction.



Notes:

# ADULT CARDIAC SURGERY POSTERS

## AC-P7. Partial Aortic Root Remodeling for Root Reconstruction in Patients With Acute Type A Dissection

**Authors:** Xin Chen<sup>2</sup>, Huang Fuhua<sup>1</sup>, \*Michael Carmichael<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Nanjing First Hospital Heart and Vascular Institute, Nanjing, China; <sup>2</sup>Nanjing First Hospital, Jiangsu, China

**Objectives:** Preservation of the native aortic valve is a goal of aortic dissection treatment. We report our experience with partial aortic root remodeling for aortic valve reconstruction in patients with acute type A dissection, which involves the non-coronary and/or the right coronary sinus, with just one trimmed Dacron graft.

**Methods:** Between October 2004 and March 2019, we performed partial aortic root remodeling in 367 patients, who underwent emergency surgical intervention. The dissected sinuses were excised leaving a 3-5 mm rim of the aortic wall from the attached aortic valve cusps. A short piece (4-5 cm) of collagen coated woven polyester vascular prosthesis was trimmed with one or two "tongues" to reconstruct the noncoronary sinus and/ or the right coronary sinus, but without using separated patches. Additional procedures included ascending aorta replacement in 3, ascending and hemi-arch replacement in 70 patients, and total arch replacement plus stent-elephant trunk (Sun's Procedure) in 294 patients. The mean follow-up time was 37.2±14.5 months.

**Results:** Surgical mortality was 8.7% (32/367) 5 (1.5%) patients underwent re-operation of the aortic valve and 6 (1.8%) patients died during follow-up. At the end of follow-up, trivial or no aortic regurgitation was found in 303 (93.5%) patients, but mild aortic regurgitation was found in 19(5.9%) patients.

**Conclusions:** Our data suggest that the early and mid-term results of partial aortic root remodeling were favorable, and it restored valve durability and function. Thus, the use of technique for root reconstruction in patients with acute type A dissection should be strongly considered.

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**Notes:**

# CONGENITAL POSTERS

## CONG-P1. Surgical Time of Day Does Not Negatively Impact Patient Outcomes and Hospital Resource Utilization for Congenital Heart Surgery

**Authors:** Ariela Zenilman<sup>1</sup>, David Blitzer<sup>2</sup>, Emile Bacha<sup>3</sup>, David Kalfa<sup>4</sup>, \*Paul Chai<sup>5</sup>, \*Damien LaPar<sup>4</sup>, Brett Anderson<sup>2</sup>

**Author Institution(s):** <sup>1</sup>Columbia Medical Center, New York, NY; <sup>2</sup>Columbia University Medical Center, New York, NY; <sup>3</sup>Columbia University College of Physicians and Surgeons, Weill Cornell College of Medicine, New York, NY; <sup>4</sup>Columbia University College of Physicians and Surgeons, New York, NY; <sup>5</sup>Morgan Stanley Children's Hospital of New York/ Columbia University Medical Center, Ridgewood, NJ

**Objectives:** Studies in adult cardiothoracic surgery suggest that surgery start times may affect patient outcomes and hospital resources. Whether the environment surrounding pediatric cardiac surgery mitigates this impact has not been evaluated. This study evaluates the relationship between start times, outcomes, resource utilization, and costs in pediatric cardiac surgery.

**Methods:** A total of 377 children (age<20) undergoing congenital heart operations (atrioventricular septal defect repair, ventricular septal defect closure, tetralogy of Fallot repair, Glenn, or Fontan) were evaluated over a 4-year period. Impact of timing of operation was evaluated by the relationship between incision time and outcomes as both a continuous and categorical variable (late incision after 3PM). Univariable and hierarchical multivariable analyses were utilized to estimate risk-adjusted associations between incision time and primary outcomes (patient morbidity, mortality, duration of intubation, resource utilization and costs).

**Results:** Mean age was 2.7+/-6.7years, and weight was 11.4+/-13.3kg. Repair of VSD (25%) and TOF (23%) were the most common performed. Late incision after 3PM occurred in 11% of cases, resulting in their average ICU arrival time of 7PM. The incidence of composite major morbidity and/or mortality was 6.5% (n=25); operative mortality was 1.3% (n=5). Median hospital length of stay was 6 [4-9] days. Patients accrued median hospital costs of \$46,085 [\$37,501-\$60,023]. After risk adjustment, surgical incision time was not significantly associated with morbidity or mortality (P=0.46), duration of intubation (P=0.51), ICU LOS (P=0.49), or total costs (P=0.89). Importantly, late incision time did not affect median time to extubation (17.4hrs [12, 20] vs. 19hrs [4,28], P=0.26) or ICU LOS (3days [2-4] vs. 3days [2-5], P=0.64).

**Conclusions:** Time of day for elective congenital cardiac operations is not associated with adverse patient outcomes or increased costs and resource utilization. These data provide important benchmarks for future analyses to determine optimal timing of complex neonatal repairs and to improve patient and family satisfaction.



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**Notes:**

# CONGENITAL POSTERS

## CONG-P2. Postoperative Surveillance and Clearance Following Surgical Repair of Anomalous Aortic Origin of Coronary Arteries

**Authors:** K. Barry Deatrick<sup>1</sup>, Sagar Amin<sup>2</sup>, Jean Jeudy<sup>3</sup>, Gregory Bittle<sup>1</sup>, David Morales<sup>1</sup>, \*Sunjay Kaushal<sup>4</sup>

**Author Institution(s):** <sup>1</sup>University of Maryland, College Park, MD; <sup>2</sup>Emory University, Atlanta, GA; <sup>3</sup>University of Maryland School of Medicine, Baltimore, MD; <sup>4</sup>University of Maryland Medical Center, Baltimore, MD

**Objectives:** Anomalous aortic origin of a coronary artery (AAOCA) is a rare but potentially lethal condition and a leading cause of sudden cardiac death in young patients. In spite of surgical correction, there is still little consensus on how to clear patients for return to strenuous activity. We have employed a protocol of CTA and perfusion scan at 3 months before returning to strenuous activity, with close clinical supervision. We also sought to assess the safety and efficacy of this protocol and to review anatomic factors predisposing to complications of AAOCA.

**Methods:** All patients undergoing surgical treatment for anomalous aortic origin of a coronary artery between 2011 and 2016 were identified. Patients were analyzed for presentation, anatomy, operative treatment and postoperative course. Electrocardiogram gated computed tomography analysis was performed, assessing for angle, intramural length, intramural area, and the diameter of the post-intramural segment. Postoperatively, all patients underwent repeat CTA and myocardial perfusion scan, assessing reversible ischemia at 3 months before returning to strenuous activity.

**Results:** 24 patients underwent a surgical repair of an anomalous coronary segment, with a median age of 16 years. (12-81 years). 22 underwent unroofing of the intramural segment, and 2 underwent coronary bypass. 4 underwent concomitant surgical procedures including bypass and valve replacement. There were no operative or late mortalities. 18 (75%) of patients had an anomalous right coronary artery originating from the left sinus of Valsalva, and 6 patients (25%) had a left coronary artery originating from the left sinus. Patients presenting with symptoms (arrest, arrhythmia or chest pain) had a similar intramural length to those with atypical symptoms ( $9.1 \pm 4.2$  mm vs  $8.1 \pm 2.5$  mm,  $P=NS$ ). There was no significant difference in the angle of origin of the intramural segment between groups, ( $27.1 \pm 8.9$  degrees vs.  $24.8 \pm 10.3$  degrees,  $P=NS$ ). CTA at 3 months before returning to strenuous activity demonstrated no residual intramural segments. 18 (75%) patients have undergone postoperative myocardial perfusion scan, and 17 of these (94%) had no evidence of reversible ischemia. No patients have had residual symptoms or evidence of ischemia, and have been cleared to resume strenuous activity without adverse events.

**Conclusions:** Unroofing of the intramural segment of the anomalous artery is safe and effective. Not all patients presenting with malignant arrhythmia had anomalous left coronaries, suggesting a potential danger to observation for patients with anomalous right coronaries. No patients have had recurrent symptoms, and all have safely returned to activities following our postoperative protocol. Further studies are justified to identify patients at risk for malignant arrhythmia and in need of further surveillance.

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**Notes:**

# CONGENITAL POSTERS

## CONG-P3. Outcomes of Aorto-Left Ventricular Tunnel Repair for Neonates and Children

**Authors:** Ariela Zenilman<sup>1</sup>, David Blitzer<sup>2</sup>, Emile Bacha<sup>3</sup>, \*Paul Chai<sup>4</sup>, David Kalfa<sup>5</sup>, \*Damien LaPar<sup>5</sup>

**Author Institution(s):** <sup>1</sup>Columbia Medical Center, New York, NY; <sup>2</sup>Columbia University Medical Center, New York, NY; <sup>3</sup>Columbia University College of Physicians and Surgeons, Weill Cornell College of Medicine, New York, NY; <sup>4</sup>Morgan Stanley Children's Hospital of New York/ Columbia University Medical Center, Ridgewood, NJ; <sup>5</sup>Columbia University College of Physicians and Surgeons, New York, NY

**Objectives:** Aorto-left ventricular tunnel (ALVT) is a rare and challenging congenital condition that can present with a wide range of clinical urgency, severity, and progression to heart failure. As a result, current evidence to guide optimal management and highlight long term results is lacking. The purpose of this investigation was to evaluate a single institutional experience with this rare defect to highlight approaches to surgical repair and analyze outcomes following aorto-left ventricular tunnel repair among neonates and children.

**Methods:** A total of 5 patients with a confirmed diagnosis of ALVT were evaluated at a single institution over a three-year study period (2015-2019). Surgical repair included both primary and patch repair techniques. Patient characteristics, anatomic features, operative outcomes, hospital resource utilization and long-term follow-up were evaluated by univariate analyses.

**Results:** Median age at operation was 1.5 years [range: 1day-19 years], including 3 males and 2 females. Median preoperative weight was 8.5 kg [3-60 kg]. Median follow-up (100%) was 133 days [22- 295days]. Indications for surgery were progression of heart failure symptoms in 2 patients, neonatal hemodynamic instability on the first day of life in 2 patients necessitating emergent operative repair, and an elective repair. Operative repairs included a patch repair in 4 patients and primary closure alone in 1 (Table 1). There were no operative mortalities, median ICU and hospital lengths of stay were 11 days [5-24 days] and 15 days [6-25days]. Importantly, at follow-up, one patient underwent reoperation (25%) for right ventricular outflow tract obstruction with patch revision, while the one patient repaired primarily had a moderately sized residual tunnel on follow-up echocardiography but remains asymptomatic (Table 2). All patients (100%) had preserved aortic valve and biventricular function.

**Conclusions:** Surgical repair of ALVT can be performed safely in neonates and children with acceptable hospital resource utilization and preserved aortic valve and ventricular function. A patch repair technique from the left ventricular aspect appears to provide the most durable result compared to primary repair alone. A well-coordinated, multidisciplinary approach to antenatal care.

**Table 1:** Operative characteristics

Patient	Tunnel Location	Ventricular Closure	Aortic Closure	Reintervention
1	Between R & L SoV	Patch	Replacement with graft	No
2	L SoV	Primary	Primary	No
3	R SoV	Primary	Patch	Reoperation for increasing residual tunnel in setting of suture dehiscence
4	STJ	Primary	Patch	No
5	STJ	Patch	Patch	No

*SoV: Sinus of Valsalva, STJ: Sinotubular junction*

**Table 2:** Follow up information

Patient	Duration of Follow-up (days)	ICU LOS (days)	Hospital LOS (days)	AVLT Tunnel Status at Follow-up
1	160	5	10	No residual tunnel
2	133	6	6	Residual tunnel with moderate jet (both sites)
3	295	11	15	Small residual defect at patch (aortic) side
4	133	24	25	No residual tunnel
5	22	22	23	Thrombosed residual tunnel, no residual flow

**Notes:**

# CONGENITAL POSTERS

## CONG-P4. An Operation to Repair Distant Anomalous Pulmonary Venous Drainage Using an In-Situ Pericardial Roll

**Authors:** Hani Najm<sup>1</sup>, Tara Karamlou<sup>1</sup>, Munir Ahmad<sup>2</sup>, David Majdalany<sup>1</sup>, \*Robert Stewart<sup>1</sup>, Saad Hasan<sup>1</sup>, Gosta Pettersson<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Cleveland Clinic, Cleveland, OH; <sup>2</sup>Cleveland Clinic Foundation, Cleveland, OH

**Objectives:** Repair of anomalous pulmonary venous return when the veins are remote from the left atrium is challenging, and may eventuate in a higher prevalence of pulmonary vein stenosis, superior vena cava stenosis, or intracardiac baffle obstruction. We describe our experience in 5 patients with a novel technique, utilizing an in-situ pericardial roll repair of anomalous pulmonary venous return that reduces these complications.

**Methods:** Five patients underwent in-situ pericardial roll repair of anomalous pulmonary venous return between 2018-2019. Median age was 34 years (range 0.25 -65), and all patients were male. Predominant presenting symptom among the four adults was dyspnea on exertion, whereas the one infant had evidence of congestive heart failure. Evaluation included both echocardiography coupled with either computed tomography or magnetic resonance imaging (Figure 1A and B). Three patients had partial anomalous venous drainage of the right upper and middle veins into superior vena cava high above the right pulmonary artery with no atrial septal defect; one had scimitar syndrome with situs solitus and dextrocardia, and the infant had heterotaxy with unbalanced atrioventricular canal and mixed obstructed total anomalous pulmonary venous return (TAPVR). In all cases, the anomalous pulmonary veins drained into the respective cava far from the left atrium, not ideal for traditional repair techniques. In-situ pericardial roll and natural reflections of the pericardium were used to direct the anomalous venous return to the left atrium (Figure 2A -C). All patients had concomitant complex procedures, including repair of sinus of Valsalva aneurysm, tricuspid valve repair, bi-atrial maze, pulmonary artery banding, common atrioventricular valve repair, repair of residual VSD and repair of iatrogenic aortic valve perforation.

**Results:** There was no mortality. Median hospital stay was 8 (range 4-60) days. Median follow-up time is 5.2 (8-1) months. The infant with single ventricle, heterotaxy, and mixed TAPVR required percutaneous dilatation and stenting of left atrial anastomosis, but is doing well awaiting bidirectional Glenn. At last follow-up, imaging showed widely patent pulmonary veins to the left atrium (Figure 2D). Adult patients are asymptomatic with excellent functional status (NYHA Class 1).

**Conclusions:** In-situ autologous pericardial roll is a useful new surgical technique that removes the need for mobilization of distant anomalous pulmonary veins with direct anastomosis or complex intracardiac baffles. It is suitable for multiple varied anatomic configurations, and can be used in infants and adults.



Figure 1A: Partial anomalous right upper and middle pulmonary veins (APV's) draining to superior vena cava, above level of right pulmonary artery



Figure 1B: Frontal reconstruction showing partial anomalous Right veins draining above level of right pulmonary artery

## Operative Sequence: Scimitar



A: Pericardial roll harvest and Pulmonary vein anastomosis



B: Pericardial roll creation and anatomic lie



C: Completed pericardial baffle



D: Post-repair CT showing widely patent pericardial roll



Notes:

# CONGENITAL POSTERS

## CONG-P5. Transdiaphragmatic Tunneled Broviac Catheters: Cost-Effective Perioperative Central Venous Access

**Authors:** Muhammad Owais Abdul Ghani<sup>1</sup>, Muhammad Aanish Raees<sup>1</sup>, Alan Tang<sup>1</sup>, Dhivyaa Anandan<sup>2</sup>, \*Bret Mettler<sup>1</sup>, \*Karla Christian<sup>1</sup>, Chevis Shannon<sup>1</sup>, \*David Bichell<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Vanderbilt University Medical Center, Nashville, TN; <sup>2</sup>Vanderbilt University, Nashville, TN

**Objectives:** Infants undergoing congenital heart surgery require central-venous-lines(CVL) for the management of fluid balance, administration of medicines and hemodynamic monitoring. Central venous access can be achieved by various combinations of transthoracic-lines(TTL), percutaneous-indwelling-central-catheters(PICC) and tunneled-broviac-catheters(TBC). TTLs are removed by protocol prior to CICU discharge (risk of bleeding), at which time PICCs are commonly placed for continued access. Transdiaphragmatic TBCs (low risk of bleeding) placed at the time of sternotomy, remain in place until hospital discharge. TBCs may reduce cost, complications, and radiation exposure associated alternative CVLs. We characterized actual cost profiles associated with strategies that do versus do not include TBCs.

**Methods:** Our Institution's Congenital Heart Surgery Database was queried from January 2014-December 2016, to identify all patients under 1 year of age undergoing congenital heart surgery. Two hundred twenty patients were included all of whom had various combinations of CVLs placed intraoperatively or during their hospital course.

Cost data was acquired from our in house EPSi database in partnership with the office of finance. Our cohort was divided into 2 groups, TBC and non-TBC. We calculated the total cost associated with each groups' CVLs and used the Mann-Whitney U test to analyze the results due to unequal distribution of the data.

**Results:** Eighty-three (37.7%) of the 220 patients had TBCs and 137 (62.3%) did not. The TBC group had 4 PICC insertions and 6 associated radiological interventions, with a mean total line related cost (TLRC) of \$210 (SD 333.37). The non-TBC group had 90 PICCs and 203 radiological interventions, with a mean TLRC of \$871.56 (SD 744.46). The cost differences were significant with p-value<0.029. Cost difference between the two groups was attributed to fewer PICCs and radiological imaging required by the TBC group.

**Conclusions:** Our descriptive study infers that the use of tunneled broviac catheters incur lower costs than the standard combination of TTLs and PICCs. Although our sample size was small, the data suggests that the cost effectiveness was due to decreased number of PICCs inserted and associated radiological interventions required.



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Mean & SD of the following:	TBC (n=83)	non-TBC (n=137)	p-value*
Total Line Related Costs*	210.98 ± 333.37	871.56 ± 744.46	<0.029
Total PICC Costs*	60.02 ± 331.45	839.50 ± 744.47	<0.000
Total Radiology Costs*	4.27 ± 23.55	79.42 ± 97.58	<0.000

\* Total Line Related Cost = Cost<sub>lineal</sub> + Cost<sub>rl</sub> + Total Cost<sub>ncc</sub>

† Total Cost<sub>ncc</sub> = Cost<sub>ncc</sub> \* no. of PICC lines + Total Radiology Cost

‡ Total Radiology Cost = Cost<sub>cxr</sub> \* no. of CXR + Cost<sub>axr</sub> \* no. of AXR + Cost<sub>fluorcopy</sub>

\* Mann-Whitney U test

**Notes:**

# CONGENITAL POSTERS

## CONG-P6. Lead Replacement in Adults With D-Transposition of the Great Arteries Treated With Mustard Procedure: A Single Center Experience

**Authors:** \*Brian Kilmartin, Beth Brickner, James Daniels, Richard Wu, \*Michael Jessen, \*Lynn Huffman, Michael Luna

**Author Institution(s):** *University of Texas Southwestern Medical Center, Dallas, TX*

**Objectives:** To describe techniques and outcomes of transvenous laser-assisted lead extraction with and without stenting of the baffle in adult patients with prior Mustard corrections of D-transposition of the great arteries (D-TGA). Adult patients with D-TGA have a frequent need of cardiac implantable electronic devices (CIED) and patients with prior Mustard operations are at risk for baffle stenosis. When pacemaker or ICD leads fail, the condition of the baffle needs to be considered and managed with the lead intervention.

**Methods:** All patients who underwent pacemaker lead extraction and replacement from Jan 2012 to March 2019 and who also had a history of Mustard correction of D-TGA were included in a retrospective database. Patients requiring only generator replacement were excluded. Patient clinical data and outcomes were recorded by chart review.

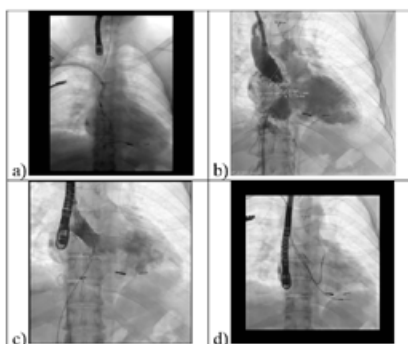
**Results:** Between 2012-2019, 8 patients, 6 males, median age 40 years (range 29-48), were included. All devices at time of surgery were pacemakers. Procedural indications were: lead failure in 4; baffle stenosis with functioning leads in 1; and both lead complications and baffle stenosis in 3. A total of 11 leads were replaced (all extracted with laser assistance). 3 of 8 baffles were stented or ballooned after lead removal, with new leads (pacemaker or ICD) placed within the stent. 7 of 8 patients had stenosed or occluded central veins at presentation. One tip of a lead that had been implanted 269 months prior was retained in the myocardium. One patient sustained an innominate vein dissection treated with a balloon-expandable stent. Median postop LOS was 2 days (1-3). At median follow-up of 35.5 months, one patient progressed to severe heart failure and was transplanted. No additional baffle or lead interventions have been required.

**Conclusions:** CIED lead replacement with or without baffle stenting may be needed decades after Mustard procedure. Concomitant stenosis or occlusion of central veins is common. These procedures are safe and effective and can be done without compromising future lead or baffle interventions.

Age/Sex	Indication	Stent Procedure	Age at time of Mustard Procedure (months)	Months since lead implanted
48M	Upgrade to ICD		24	256
40F	Baffle occlusion	Baffle stented	6	59, 240
40F	Upgrade to ICD	Angioplasty of prior baffle stent	9	97
29M	Upgrade to ICD		1	146
42M	Upgrade Pacemaker	Baffle stented	12	49,269
36M	Lead Recall		12	72
37M	Lead Failure		4	210,210
42M	Lead Failure		1	108

## Patient Data

42 year old Male with Pacemaker Lead Failure and Baffle Stenosis



- (a) Laser-assisted extraction of old pacemaker leads  
 (b) angiogram of baffle stenosis (c) baffle stent placed (d) new leads implanted

Notes:

# THORACIC POSTERS

## GT-P1. Esophageal Gastrointestinal Stromal Tumors: Does Extent of Surgical Resection Affect Outcomes?

**Authors:** \*Katy Marino, Emily Bond, \*Mickey Ising, Jaimin Trivedi, Victor van Berkel, Matthew Fox

**Author Institution(s):** *University of Louisville, Louisville, KY*

**Objectives:** Esophageal gastrointestinal stromal tumors are uncommon esophageal malignancies, and represent less than one percent of all gastrointestinal stromal tumors. Esophagectomy has been the standard practice for resectable tumors, however, outcomes of enucleation are less understood.

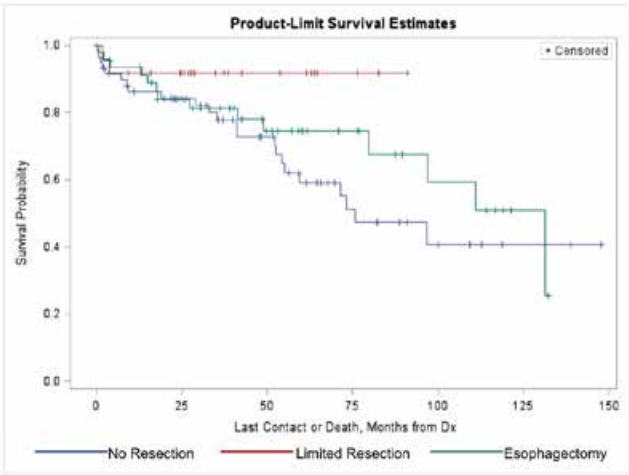
**Methods:** We queried the National Cancer Database for all patients from 2004-2015 with gastrointestinal stromal tumors of the esophagus. Patients who have metastatic disease, were treated with radiation, or received pre-operative systemic therapy were excluded. Kaplan-Meier analysis was used to examine survival.

**Results:** We identified 152 patients who met criteria for inclusion with esophageal gastrointestinal stromal tumors. Their mean age was  $64.4 \pm 13.0$  and 54.6% were male. Fifty-three patients underwent esophagectomy, thirty-one underwent local resection (Table 1). Sixty-eight patients did not undergo any surgical therapy. One-hundred-thirty patients had available survival data. In the limited resection group, 30 and 90-day mortality was 0% (n= 0) and 2.1% (n=1), respectively. In the esophagectomy group, 30 and 90-day mortality was 4% (n=1) and 7% (n=3), respectively. Kaplan-Meier analysis failed to demonstrate a difference in survival between patients undergoing limited resection versus esophagectomy (Figure 1). There was an observed difference in survival between patients undergoing any resection versus no resection, however, this did not reach statistical significance.

**Conclusions:** In patients with esophageal gastrointestinal stromal tumors, no difference in survival exists after enucleation or esophagectomy. Limitations of the study include small number of patients and lack of local recurrence data.

Table 1: Patient Characteristics

Variable	No Resection n = 68	Limited resection n= 31	Esophagectomy n= 53	p
Male sex	36 (53%)	19 (61%)	28 (53%)	0.7
Age (years)	68.8 ± 11.7	58.4 ± 13.3	62.2 ± 12.7	0.0002
Caucasian Race	50 (74%)	27 (87%)	39 (74%)	0.2
Academic/ Comprehensive	33 (49%)	15 (54%)	32 (65%)	0.8
Privately Insured	20 (29%)	17 (55%)	19 (36%)	0.05
Charlson comorbidity score >0	12 (18%)	8 (26%)	26 (30%)	0.4
Tumor size (mm)	80 (32-100)	40 (IQR 23-58)	60 (IQR 45-94)	0.004
Readmission within 30 days	N/A	3 (10%)	7 (13%)	0.6
Hospital Stay (days)	N/A	2 (IQR 1-5)	14 (IQR 8-20)	<0.001
Time to surgery (days)	N/A	14 (IQR 0-41)	18.5 (IQR 0-65)	0.2
Post-operative Systemic Therapy	N/A	11 (35%)	19 (35%)	0.9
30-day mortality	N/A	0 (0%)	1 (2.1%)	0.3
90-day mortality	N/A	1 (4%)	3 (7%)	0.3



Notes:

# THORACIC POSTERS

## GT-P2. Pre-Emptive Pain Management Program Leads to Reduction of Opioid Prescriptions and Complications After Elective Pulmonary Resection

**Authors:** Haydee del Calvo, Duc Nguyen, \*Leonora Meisenbach, Ray Chihara, \*Edward Chan, Edward Graviss, \*Min Kim

**Author Institution(s):** *Houston Methodist Hospital, Houston, TX*

**Objectives:** Enhanced Recovery After Surgery (ERAS) protocols have shown to decrease complications after surgery, however, ERAS programs have not decreased the prevalence of opioid prescriptions after surgery. We developed and implemented a pre-emptive pain management program where providers agreed to have non-opioid pain medication as a standard pain management strategy at discharge with patient education about the pre-emptive pain management program.

**Methods:** At our institution, we performed a retrospective case control study of prospectively collected Society of Thoracic Surgeon data on patients who underwent elective pulmonary resection surgery. We compared the outcomes between patients who were managed with and without a pre-emptive pain management program.

**Results:** Among 463 patients, 132 patients were in the pre-emptive pain management group while 331 patients were in the control group. There were significantly fewer complications (16% vs 35%,  $p<0.001$ ), shorter average hospital length of stay (2 vs 3 days,  $p<0.001$ ), fewer opioid prescriptions at discharge (17% vs 83%,  $p<0.001$ ) and a lower 30-day readmission rate (2% vs 9%,  $p=0.01$ ) in the pre-emptive pain management group compared to controls. Multivariate logistic regression analyses showed that the pre-emptive pain management program (OR 0.06; 95% CI 0.03, 0.11,  $p<0.001$ ) and robotic surgery (OR 0.51; 95% CI 0.3, 0.81,  $p<0.01$ ) were associated with smaller odds of discharge to home with opioid prescriptions. In addition, multivariate logistic regression analysis showed that the pre-emptive pain management program (OR 0.53; 95% CI 0.28, 0.99,  $p=0.046$ ) and robotic surgery (OR 0.45; 95% CI 0.26, 0.77,  $p=0.004$ ) were associated with less post-operative complications.

**Conclusions:** The pre-emptive pain management program led to a decrease in opioid prescriptions and complications after elective pulmonary resections. Successful implementation of this program can lead to significant decreases in the amount of prescription opioids in the community.

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**Notes:**

# THORACIC POSTERS

## GT-P3. Induction Bleomycin for Primary Mediastinal Nonseminomatous Germ Cell Tumors Does Not Increase Major Perioperative Morbidity or Mortality in Patients Undergoing Surgery for Residual Disease

**Authors:** Raul Caso, Gregory Jones, Darren Feldman, Samuel Funt, Sujata Patil, George Bosl, Deaglan McHugh, Dean Bajorin, Manjit Bains, \*David Jones

**Author Institution(s):** Memorial Sloan Kettering Cancer Center, New York, NY

**Objectives:** We sought to determine whether induction bleomycin affects operative and pulmonary complications in patients (pts) with primary mediastinal nonseminomatous germ cell tumors (PMNSGCT) undergoing resection of residual disease.

**Methods:** We performed a retrospective chart review of PMNSGCT pts who underwent thoracic resection following induction chemotherapy at our institution from 1980 to 2018 and had complete follow-up data. We compared overall and pulmonary perioperative morbidity and mortality for pts treated with bleomycin-containing vs. non-bleomycin containing regimens.

**Results:** 101 pts (66 bleomycin vs. 35 no bleomycin) met inclusion criteria (median age 28 years, range 16-65) with no differences in preoperative tumor size ( $P=0.51$ ) or preoperative DLCO ( $P=0.68$ ) between bleomycin and non-bleomycin groups. There were also no differences in intraoperative fluids ( $P=0.92$ ), blood loss ( $P=0.83$ ), transfusions ( $P=0.09$ ), operative time ( $P=0.49$ ), concomitant lung resections ( $P=0.33$ ) or extent of lung resections ( $P=0.53$ ). All pts with prior bleomycin exposure were managed intraoperatively with a low  $FiO_2$  ( $\sim 0.30$ ). Median hospital stay was 7 days for both groups ( $P=0.43$ ). There were no perioperative deaths. The bleomycin group had a non-significant trend toward more 30-day complications (30.3% vs. 17.1%,  $P=0.15$ ) due to more minor (16.7% vs. 0%,  $P<0.01$ ) but not major (13.6% vs. 17.1%,  $P=0.64$ ) events. Bleomycin use was not associated with increased 30-day pulmonary complications nor 90-day mortality (**Table**).

**Conclusions:** Induction bleomycin does not result in increased perioperative major morbidity or death in pts with PMNSGCT undergoing multidisciplinary management and post-chemotherapy resection of residual disease.



**Table 1. Operative and Pulmonary Morbidity**

Variable	Bleomycin N (%)	No Bleomycin N (%)	P value
No. of patients	66	35	
30-day Clavien-Dindo complications	20 (30.3)	6 (17.1)	0.150
Minor (Grade ≤2)	11 (16.7)	0	0.007
Major (Grade >2)	9 (13.6)	6 (17.1)	0.637
All pulmonary complications	6 (9.1)	2 (5.7)	0.431
Major pulmonary complications	3 (4.5)	2 (5.7)	0.569
Reintubation/intubation >48 hrs	1 (1.5)*	2 (5.7)**	0.275
Pneumonia/ARDS and reintubation	2 (3.0)	0	0.425
90-day mortality	1 (1.5)	0	0.660

\*1 pt remained intubated after intraoperative repair of IVC

\*\*2 pts reintubated

**Notes:**

# THORACIC POSTERS

## GT-P4. Type 2 Diabetes Is Associated With Failure of Non-Operative Treatment for Sternoclavicular Joint Infection

**Authors:** Shriya Reddy<sup>1</sup>, Jack Mizelle<sup>1</sup>, Helene Sterbling<sup>2</sup>, \*Virginia Little<sup>1</sup>, Kei Suzuki<sup>3</sup>

**Author Institution(s):** <sup>1</sup>Boston University School of Medicine, Boston, MA; <sup>2</sup>INOVA Heart and Vascular Institute, Falls Church, VA; <sup>3</sup>Boston Medical Center, Boston, MA

**Objectives:** A standardized treatment algorithm for sternoclavicular joint infection (SCJi) management is lacking in the literature. While intravenous drug use (IVDU) has been implicated as a major comorbidity, its association with outcome of non-operative management has not been studied. As a high-burden safety net hospital with prevalent IVDU patients, we hypothesized non-operative management of IVDU patients would be more likely to fail than in non-IVDU patients, and sought to identify risk factors predicting failure for the overall cohort of patients.

**Methods:** We retrospectively reviewed charts of patients diagnosed with SCJi between January 2001 and December 2017. Study cohort consisted of those with completed follow-up. Non-operative management included image-guided drainage and/or prolonged antibiotics, while operative management included SCJ resection or open drainage in addition to antibiotics. Demographic and clinical risk factors were collected. A chi-squared analysis was performed to determine any association between these variables and management planning, as well as relation to outcome of non-operative treatment. Treatment failure was defined as lack of resolution after antibiotic completion, including recurrence, functional impairment, or necessitating subsequent operative intervention.

**Results:** Study cohort consisted of 35 patients with diagnosis of SCJi and completed follow-up, with median age of 51 years. IVDU was prevalent, seen in 45.6% (16/35). Operative management was the initial treatment for 25.7% (9/35) and was associated with presenting sign of abscess ( $p=0.03$ ). No other signs/symptoms, comorbidities, and demographic variables were associated with type of initial treatment. Non-operative management was the initial approach for the remaining 74.3% (26/35). Among these patients, SCJi resolved in 73.1% (19/26). IVDU consisted 50.0% (13/26), but had no association with outcome of non-operative management ( $p=0.50$ , **Table 1**). Neither age ( $p=0.56$ ) nor gender ( $p=0.36$ ) was associated with outcome of non-operative treatment. Type 2 diabetes was seen in 23.1% (6/26) and was significantly associated with outcome of non-operative management. Those with type 2 diabetes composed only 15.8% (3/19) of patients experiencing success with non-operative management, compared to 42.9% (3/7) experiencing failure ( $p=0.03$ , **Table 1**).

**Conclusions:** This study constitutes the largest SCJi series with IVDU population. We found no association between IVDU status and either initial treatment pattern or outcome of non-operative management. Type 2 diabetes was associated with failure of non-operative management, identifying a potential factor to be considered in deciding management of SCJi patients.

Table 1.

Variable or Factor	Success Rate (n=19)	Failure Rate (n=7)	p value
Demographic Variable			
Age (Median=51)			
<51	36.8% (7/19)	42.9% (3/7)	0.56
>/=51	63.2% (12/19)	57.1% (4/7)	
Gender			
Male	73.7% (14/19)	57.1% (4/7)	0.36
Female	26.3% (5/19)	42.9% (3/7)	
Clinical Risk Factor			
IVDU	52.6% (10/19)	42.9% (3/7)	0.50
non-IVDU	47.4% (9/19)	57.1% (4/7)	
DM2	15.8% (3/19)	42.9% (3/7)	0.03
No DM2	84.2% (16/19)	57.1% (4/7)	
Indwelling Catheter	26.3% (5/19)	28.6% (2/7)	0.64
No Indwelling Catheter	73.7 % (14/19)	71.4% (5/7)	
Renal Failure	21.1% (4/19)	28.6% (2/7)	0.53
No Renal Failure	78.9 % (15/19)	71.4% (5/7)	

Notes:

# THORACIC POSTERS

## GT-P5. Performance of the Surgical Risk Preoperative Assessment System (SURPAS) in Pulmonary Resection: An External Validation Study

**Authors:** Shi Yan<sup>1</sup>, Meier Hsu<sup>1</sup>, Kay See Tan<sup>1</sup>, Katherine Gray<sup>2</sup>, \*Daniela Molena<sup>1</sup>, \*Matthew Bott<sup>1</sup>, Prasad Adusumilli<sup>1</sup>, Manjit Bains<sup>1</sup>, Robert Downey<sup>1</sup>, James Huang<sup>1</sup>, Bernard Park<sup>1</sup>, Gaetano Rocco<sup>1</sup>, Valerie Rusch<sup>1</sup>, Smita Sihag<sup>1</sup>, \*David Jones<sup>1</sup>, \*James Isbell<sup>1</sup>

**Author Institution(s):** <sup>1</sup>Memorial Sloan Kettering Cancer Center, New York, NY; <sup>2</sup>New York Presbyterian, New York, NY

**Objectives:** Accurate preoperative risk assessment is necessary for informed decision-making for patients and surgeons. Several preoperative risk calculators are available, but few have been examined in the general thoracic surgical patient population. The Surgical Risk Preoperative Assessment System (SURPAS) is a risk assessment tool applicable to a wide spectrum of surgical procedures developed to predict the risk of common adverse postoperative outcomes using a parsimonious set of preoperative input variables. In this external validation study, we sought to determine the performance of SURPAS in predicting postoperative complications in patients undergoing pulmonary resection.

**Methods:** Between January 2016 and December 2017, a total of 1723 patients underwent eligible pulmonary resections at our center. Using data from our institution's prospectively maintained thoracic surgery database, we calculated the predicted risks of 12 categories of postoperative complications using the latest version of the SURPAS prediction models. Discrimination and calibration between SURPAS-predicted and observed outcomes were assessed by calculating the C-indices and plotting calibration curves for each outcome.

**Results:** The discrimination ability of SURPAS was moderate across all outcomes with C-indices between 0.64 and 0.79 (Table). Calibration curves (not shown) indicated excellent calibration for all outcomes except for infectious and cardiac complications, discharge to a location other than home, and mortality; all of which were overestimated by the SURPAS models.

**Conclusions:** Overall, SURPAS accurately predicts outcomes for pulmonary resections in this large, single-center validation study. However, discretion should be applied when using the tool to assess risk for postoperative infectious and cardiac complications, discharge to a location other than home, and mortality. Although the parsimonious nature of SURPAS is one of its strengths, its performance might be improved by including additional factors known to influence outcomes following pulmonary resection such as gender and smoking status.

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**Observed and predicted probabilities of each outcome**

<b>Outcome</b>	<b>Observed %</b>	<b>Predicted<sup>†</sup> % (SD)</b>	<b>C-Index (95% CI)</b>
Mortality	0.5	1.6 (1.3)	0.762 (0.607-0.916)
Any Morbidity	9.4	12.5 (5.0)	0.743 (0.703-0.784)
Pulmonary	3.0	5.8 (3.0)	0.740 (0.668-0.812)
Infection	1.1	3.2 (0.6)	0.640 (0.525-0.756)
UTI	0.9	1.3 (0.4)	0.678 (0.547-0.810)
VTE	0.6	1.2 (2.4)	0.788 (0.635-0.941)
Cardiac	0.3	1.1 (0.6)	0.783 (0.604-0.963)
Transfusion	4.3	4.8 (2.9)	0.752 (0.696-0.809)
Renal	1.2	0.8 (0.4)	0.654 (0.544-0.765)
Neurologic	0	0.35 (0.17)	NA*
Unplanned Readmission	5.1	5.4 (1.3)	0.656 (0.596-0.717)
Discharge not home	0.9	6.7 (4.0)	0.682 (0.570-0.795)

<sup>†</sup> Mean of predicted probabilities across all patients, \* Too few events to generate reliable values

**Notes:**

# THORACIC POSTERS

## GT-P6. Development and Validation of a Postoperative Urinary Retention Prediction Model for General Thoracic Surgical Patients

**Authors:** Ammar Asban, Rongbing Xie, Luqin Deng, \*Rajat Kumar, \*James Kirklin, James Donahue, \*Benjamin Wei

**Author Institution(s):** *University of Alabama at Birmingham, Birmingham, AL*

**Objectives:** Urinary retention remains a frequent post-operative complication associated with patient discomfort and delayed discharge following general thoracic surgery. We aimed to develop and prospectively validate a predictive model of postoperative urinary retention in general thoracic surgical patients.

**Methods:** We retrospectively developed a predictive model using patient data from the Society of Thoracic Surgeons General Thoracic Surgery Database at our institution. Inclusion criteria were adult patients who underwent an STS major surgical procedure. Exclusion criteria were patients undergoing outpatient surgery, ICU patients, preoperative or intraoperative use of foley catheter, and preoperative dialysis. Multivariable logistic regression models identified risk factors associated with urinary retention, and a prognostic nomogram was developed for assisting medical decision-making. We then prospectively validated the predictive model in a cohort of general thoracic surgical patients using receiver operating characteristic (ROC) analysis.

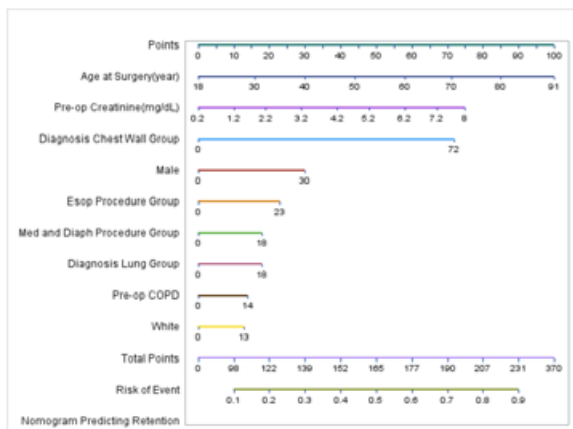
**Results:** The predictive model was developed with data from 1484 patients undergoing general thoracic surgery from August 2013 to March 2017; among them, 284 (19%) patients experienced urinary retention within 24 hours of the operation. Operations included anatomic lung resection (32%), wedge resection (28%), decortication (12%), and others (28%). Mean age was 59 years, 51% were male, and 82% were white. Risk factors for postoperative urinary retention included older age, male sex, white race, higher preoperative creatinine, COPD, primary diagnosis, and primary procedure (Table). A proposed nomogram for estimating the risk of having postoperative urinary retention is shown (Figure). The prospective validation cohort included 646 patients from April 2017 to November 2018, and 65 (10%) of them had urinary retention. We compared the ROC curves of the development and validation models, and both models had great discrimination for urinary retention with similar C statistics (0.74 vs. 0.71,  $p > 0.05$ ).

**Conclusions:** Postoperative urinary retention occurs in nearly 20% of patients who undergo major general thoracic surgery without a urinary catheter in place at the end of their operation. Using a validated predictive model for postoperative urinary retention may help with targeting certain patients with prophylactic measures to prevent this complication.

**Table. Multivariable logistic regression model predicting post-op 24-hr urinary retention in patients who underwent general thoracic procedures, n=2130, 2013-2018**

Variable	Odds Ratio (95% CI)	P-value
Age (per 10-yr increase)	1.58 (1.40, 1.79)	<.0001
Male	2.73 (2.03, 3.66)	<.0001
White Race	1.55 (1.02, 2.34)	0.04
Creatinine (per 1.0 mg/dL increase)	1.38 (1.05, 1.81)	0.02
COPD	1.60 (1.19, 2.17)	<0.01
Diagnosis: Lung	1.84 (1.19, 2.85)	0.01
Diagnosis: Chest Wall	11.09 (4.42, 27.82)	<.0001
Procedure: Mediastinum/Neck and Diaphragm	1.85 (1.06, 3.22)	0.03
Procedure: Esophageal	2.15 (1.05, 4.40)	0.04

**Figure. Nomogram for predicting the probability of having post-op 24-hr urinary retention in patients who underwent general thoracic procedures, n=2130, 2013-2018**



\*Esop- Esophageal

\*Med and Diaph-Mediastinum/Neck and Diaphragm

Example: The total points of a 60-year-old white male patient, with a creatinine of 2.0 mg/dL and COPD undergoing lobectomy equals 145 (55+13+30+15+14+18), with a predicted probability of retention between 0.3 to 0.4.

Notes:

# THORACIC POSTERS

## GT-P7. Surgical Management of Non-Small Cell Lung Cancer in the Fissure: Less Is More?

**Authors:** Shane Smith<sup>1</sup>, Adam Bograd<sup>2</sup>, Gal Levy<sup>2</sup>, Shu Ching Chang<sup>3</sup>, Alexander Farivar<sup>2</sup>, Ralph Aye<sup>2</sup>, Brian Louie<sup>2</sup>, Eric Vallieres<sup>2</sup>

**Author Institution(s):** <sup>1</sup>Swedish Medical Center, Seattle, WA; <sup>2</sup>Swedish Cancer Institute, Seattle, WA; <sup>3</sup>Providence St. Joseph Health, Portland, OR

**Objectives:** The surgical management of non-small cell lung cancers that extend and invade across the fissure into an adjacent lobe remains an area of uncertainty. Traditionally, a maximal resection with a bilobectomy on the right or pneumonectomy on the left is offered. Parenchymal-sparing combinations are possible but with no long term survival or recurrence data available. We sought to examine the influence of resection extent on overall survival, recurrence patterns, and cumulative incidence of recurrence in the treatment of tumors that cross the fissure.

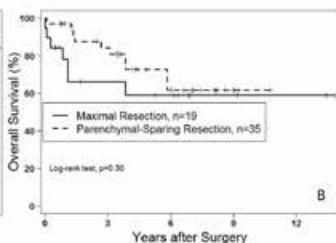
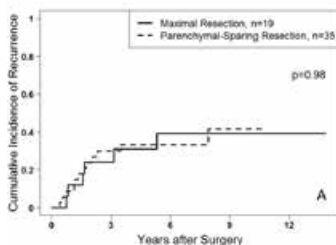
**Methods:** All preoperative computed tomography and operative reports of resections greater than a lobectomy from 2006-2018 at our institution were identified and reviewed. Patients were grouped into "maximal resection" (MR): bilobectomy or pneumonectomy, or "parenchymal sparing resection" (PSR): lobectomy with en bloc segment or non-anatomical wedge. All patients were staged by AJCC 8th Edition. Disease recurrence was defined as local at the surgical margin, regional at the mediastinum, hilum, and supraclavicular fossa, and beyond was considered systemic. Overall survival was calculated using Kaplan-Meier method. Cumulative incidence of recurrence (CIR) was calculated using competing risk analysis and compared across groups using Grey's test.

**Results:** There were 54 patients identified undergoing MR=19 and PSR=35. MR consisted of all right-sided bilobectomies. Patients in the PSR group were older, had shorter length of stay, and more adenocarcinoma (Table 1). The median (Q1, Q3) follow-up times were 1.67 (0.75, 6.58) years for MR and 4.17 (2.58, 6.79) for PSR. The 30-day mortality was 0%. Major morbidity was higher in MR group compared to the PSR group (15.8% vs 0%). There was no statistically significant difference in recurrences but regional and distant recurrences were most frequent ( $p = 0.82$ ). PSR was not associated with an increased CIR compared to MR ( $p = 0.98$ ; Figure 1A). Similarly, post-resection estimated overall survival at 1-, 3-, 5- and 7- years between the two cohorts was not significantly different ( $p = 0.30$ ; Figure 1B). Long-term estimated overall survival at 7 years was excellent in both cohorts, reaching 59% and 62% after MR and PSR, respectively.

**Conclusions:** When technically possible, a lobectomy with *en bloc* anatomical segment or wedge is a feasible option for the resection of tumors invading the fissure with lower morbidity compared to maximal resection. PSR does not appear to compromise oncologic outcomes of either overall survival or cumulative incidence of recurrence, compared to MR.



	Maximal Resection, n=19 (35.2%)	Parenchymal-Sparing Resection, n=35 (64.8%)	p-value
Median Age years(Q1, Q3)	60.0 (55.5, 66.5)	68.0 (63.0, 72.0)	0.01
Sex n(%)			0.78
F	8 (42.1)	17 (48.6)	
M	11 (57.9)	18 (51.4)	
Median Length of Stay days(Q1, Q3)	7.0 (5.0, 10.0)	5.0 (4.0, 9.0)	0.05
Morbidity at 30 days n(%)	3 (15.8)	0 (0)	0.04
Median Tumor Greatest Diameter cm(Q1, Q3)	5.0 (4.2, 7.0)	4.0 (2.7, 5.7)	0.10
Pathologic Stage n(%)			0.23
I	5 (26.3)	17 (48.6)	
II	10 (52.6)	11 (31.4)	
III	4 (21.1)	7 (20)	
Histology n(%)			0.02
Adenocarcinoma	9 (47.4)	26 (74.3)	
NSCLC	2 (10.5)	0 (0)	
Squamous Cell	8 (42.1)	9 (25.7)	
Recurrence n(%)			0.82
None	12 (63.2)	24 (68.6)	
Local	1 (5.3)	3 (8.6)	
Regional	4 (21.1)	4 (11.4)	
Systemic	2 (10.5)	4 (11.4)	
Estimated overall survival % (95% CI)			0.30
1 year	78 (61, 100)	97 (92, 100)	
3 years	66 (47, 93)	84 (72, 98)	
5 years	59 (39, 88)	73 (58, 91)	
7 years	59 (39, 88)	62 (45, 85)	
Median Follow up years(Q1,Q3)	1.67 (0.75, 6.58)	4.17 (2.58, 6.79)	0.29



Notes:

# THORACIC POSTERS

## GT-P8. Short and Long-Term Results of Surgical Resection of Primary Pulmonary Pleomorphic Carcinoma

**Authors:** Domenico Galetta, Lorenzo Spaggiari

**Author Institution(s):** *European Institute of Oncology, Milan, Italy*

**Objectives:** Pulmonary pleomorphic carcinoma is a rare neoplasm and factors affecting survival after pulmonary resection, as well as its clinical and pathologic characteristics, are still unknown. For a better understanding we reviewed our large experience with these patients.

**Methods:** Records of patients with diagnosis of pulmonary pleomorphic carcinoma operated on between January 1999 and December 2018 were retrospectively analyzed from a prospective database; survival was calculated by using Kaplan-Meier method.

**Results:** There were 156 patients (124 men and 32 women) with a median age of 66 years (range, 39 to 85). 122 patients (78.2%) were smokers. Median tumor size was 4.9 cm (range, 1.1 to 23 cm). Initial histological diagnosis was NSCLC in 98 cases, adenocarcinoma in 28, pleomorphic tumor in 18, and no diagnosis in 12. 86 patients (55.1%) received a platinum based induction chemotherapy. Surgery included lobectomy in 101 patients (64.7%), pneumonectomy in 34 (21.8%), wedge resection in 13 (8.3%), and segmentectomy in 8 (5.2%). Four patients (2.6%) had an incomplete resection. Postoperative staging included 49 stage I (31.4%), 57 stage II (36.5%), and 50 stage III (32.1%). 74 patients (47.4%) received adjuvant treatment. Five-year overall survival and disease-free survival were 36.6% and 35.7%, respectively (median, 34 and 21 months, respectively). Recurrences occurred in 88 patients (56.4%) most of them at distant sites (56/88 [63.6%]). Factors associated with increased survival included no smoke habit ( $p=.02$ ), no induction therapy ( $p=.004$ ), right side disease ( $p=.01$ ); pathological stage I ( $p=.001$ ), no metastatic lymph nodes ( $p=.001$ ), and adjuvant treatment ( $p=.003$ ). At multivariate analysis, pNO, pstage I, and adjuvant treatment were independent prognostic factors ( $p=.002$ , 95%CI: 1.54-6.43;  $p=.003$ , 95%CI: 1.23-7.32,  $p=.001$ , 95%CI: 1.26-4.72, respectively).

**Conclusions:** Pulmonary pleomorphic carcinomas are aggressive tumors usually presented as a large lesion in males. Preoperative diagnosis remains difficult. Prognosis is poor, and distant recurrence rate is high. Long-term survival can be achieved in early stage disease and by an appropriate adjuvant therapy.

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**Notes:**

# PATIENT SAFETY POSTERS

## PS-P1. Digital Solution for Follow-Up in Congenital Cardiac Surgery

**Authors:** Meena Nathan, Jacqueline O'Brien, Nitin Gujral, Vincent Chiang, Pedro del Nido

**Author Institution(s):** Boston Children's Hospital, Boston, MA

**Objectives:** In this era of public scrutiny, there is an ongoing need for innovative methods for short and long term follow-up for patients. As part of a quality initiative, we developed an automated postoperative follow-up system for patients following discharge after congenital cardiac surgery at Boston Children's Hospital. Our goal was to achieve as complete as possible follow-up at 30 days and 1 year post discharge from congenital cardiac surgery in a center that has a wide referral base not only across the United States and but also internationally.

**Methods:** Discharge Communication, DisCo, is a web based system, compatible with mobile devices/ tablets/personal computers, developed at Boston Children's Hospital. Based on parent/patient preference, an automated HIPPA compliant text and/or email with a link to a 1 page health-status survey is sent at thirty days and one year in English and Spanish following discharge after congenital cardiac surgery. The response is automatically stored in a firewall protected database and uploaded to the patient's medical record after review. Patient/parent or primary care provider/ cardiologist are contacted if there was no response after 2 attempts. Descriptive statistics are used to describe findings.

**Results:** There were a total of 2119 thirty day and 1153 one year surveys sent between 10/11/2016 to 12/31/2018. The 30 day surveys had a 63% (1329) response to the survey link, with in an additional 31% (654) completion by a call to the parent/patient or caregivers. Only 6% (136) could not be contacted. The one year survey, had a 76% (569) response to survey link, with an additional 16% (182) completion by a call to the parent/patient or caregivers. However, 35% (402) could not be reached, although there is an ongoing effort to contact them. The distribution of responses and details of health status responses is provided in the figure and table. Not all parents/patients responded to all questions. The adults had a better response rate to the link with 190/245 (78%) for the 30 day follow-up and 66/96 (69%) for the one year follow-up.

**Conclusions:** DisCo provides a successful web based health status assessment tool following congenital cardiac surgery. Any patient/parent reported clinical concerns initiates additional contact for further management. Thus DisCo helps identify patients who need additional closer follow-up. Future plans include use of DisCo for longitudinal follow-up of high-risk patients.

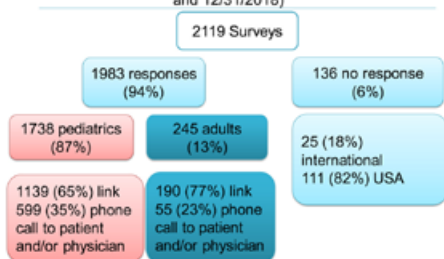
Table: 30 day DisCo responses from 1983 completed surveys

	Response numbers	Proportion
<b>Health Status at 30 days</b>		
Recovering	307	15.5%
Back to baseline	287	14.5%
Better	1171	59%
Other	99	5%
Unfilled	129	6%
<b>Physician Visit</b>		
Yes	1923	97%
No	55	2.5%
Unfilled	16	0.5%
<b>Type of Physician Visit</b>		
Cardiologist and PCP	1046	53%
Cardiologist	697	35%
PCP	98	5%
Unfilled	153	7%
<b>Hospital Readmission</b>		
Yes	382	19%
No	1493	75%
Unfilled	118	6%
<b>Any additional information</b>		
Yes	313	16%
No	1580	79%
Unfilled	100	5%

DisCo: discharge communication; PCP: primary care physician

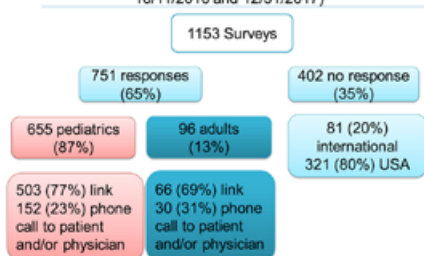
## CV Surgery DisCo Response

30 day follow up (consecutive discharges between 10/11/2016 and 12/31/2018)



## CV Surgery DisCo Response

One Year Follow Up (consecutive discharges between 10/11/2016 and 12/31/2017)



## SIMULATION & TEAM-BASED LEARNING POSTERS

### STBL-P1. Multi-Modal Assessment of Cardiopulmonary Bypass Skills in a High-Fidelity Simulation Environment

**Authors:** Joshua Hermesen<sup>1</sup>, Hossein Mohammadipanah<sup>2</sup>, Kenneth Perrone<sup>2</sup>, Su Yang<sup>2</sup>, Anna Witt<sup>2</sup>, Carla Pugh<sup>2</sup>

**Author Institution(s):** <sup>1</sup>University of Wisconsin, Madison, WI; <sup>2</sup>Stanford University, Stanford, CA

**Objectives:** Assessing operating room competence for cardiac surgical trainees is challenging given real-world variables of time, patient safety, public reporting of outcomes, and variation in trainee skill and pace of skill acquisition.

A high fidelity simulator, utilizing a perfused porcine heart, actual instrumentation, cannulae, and tubing has been shown to be a useful training adjunct but trainee and expert performance with this simulator have not been compared. We hypothesized that assessment of cognitive and technical skills within a high fidelity simulated environment could discern expert from novice performance.

**Methods:** Three fellows (PGY 6-8) and 3 attending surgeons each performed three aortic cannulations and decannulations. The third repetition included venous cannulation, commencement of cardiopulmonary bypass (CPB) and cardioplegia catheter and crossclamp placement to arrest the heart (XC, Image 1B). First assistant and scrub personnel were constant. Performance across 20 cognitive and 21 technical domains were assessed in real time via specific checklists scored by a single attending surgeon not participating in the study (experimental setup, Image 1A). Cognitive and technical scores for each task (cannulation [checklist; image 2], CPB, XC) and overall were compared. Surgeon and assistant motion metrics and path length were assessed by electromagnetic motion sensors worn under sterile gloves.

**Results:** Cognitive scores were significantly different between experts and trainees for aortic cannulation ( $8.1 \pm 1.5$  vs  $6.1 \pm 1.8$ ,  $p=0.02$ ) and CPB ( $3.7 \pm 0.6$  vs  $1.0 \pm 1.0$ ,  $p=0.02$ ) but not XC ( $5.7 \pm 1.5$  vs  $3.7 \pm 2.5$ ,  $p=0.3$ ).

Overall analysis (combining all 3 tasks) showed a significant difference in cognitive ( $6.7 \pm 2.3$  vs  $4.6 \pm 2.7$ ,  $p=0.03$ ) but not technical ( $6.2 \pm 2.5$  vs  $5.8 \pm 2.2$ ,  $p=0.7$ ) scores favoring the experts. Experts did construct purse-string sutures more quickly ( $63 \pm 14$  seconds vs  $81 \pm 30$  seconds,  $p=0.03$ ), and arrest the heart more efficiently (path length  $64.9 \pm 26.4$  m vs  $133.4 \pm 29.2$  m,  $p=0.04$ ).

Assistant total path length was similar while working with experts and trainees. However, the assistant moved simultaneously a lesser percentage of time while helping experts vs trainees ( $4.9 \pm 2\%$  vs  $10.1 \pm 5.4\%$ ,  $p=0.02$ ), possibly suggesting receipt of more specific instruction.

**Conclusions:** Multi-modal assessment (cognitive, technical, motion) of basic cardiac surgical tasks (ie: cannulation sequence) within a high fidelity simulation environment can discriminate between experts and trainees in some specific cognitive and technical domains. This type of construct may allow for developing 'competence thresholds' which could have implications for training and certification paradigms.

## Aortic Cannulation

- |  |                                    |   |
|--|------------------------------------|---|
| 1. Checks BP and ensures appropriate range (cognitive)                           |                                    |   |
| a. Appropriate range is < 110 systolic   | Y                                  | N |
| 2. Heparinizes patient (cognitive)   | Y                                  | N |
| a. Perfusionist to ask dose to give  |                                    |   |
| b. Acceptable dose range is 300-450 units/kg                                     | Y                                  | N |
| 3. Pursestring sutures placed (technical, assessed by motion and time)           |                                    |   |
| a. Need to reset needle manually   | Y                                  | N |
| b. # of times needle reset manually  | _____                              |   |
| c. Any bleeding from full thickness bite?  | Y                                  | N |
| d. Pursestring 1 execution time  | _____                              |   |
| e. Pursestring 2 execution time  | _____                              |   |
| 4. AV Loop divided (cognitive, can be done at any point before cannula inserted) |                                    |   |
| a. Done with appropriate communication with perfusionist                         | Y                                  | N |
| b. Done without appropriate communication with perfusionist                      | Y                                  | N |
| c. Done only after cannula inserted  | Y                                  | N |
|  | } (a = 1 point, b or c = 0 points) |   |
| 5. Cannula Placement and Deairing (technical, graded in real time)               |                                    |   |
| a. >1 attempt to cannulate   | Y                                  | N |
| b. Blood spray outside of immediate field  | Y                                  | N |
| c. Leakage around the cannula  | Y                                  | N |
| d. >1 attempt to complete deairing   | Y                                  | N |
| 6. Cannula Secured (technical, graded in real time)                              | Y                                  | N |
| a. Good arc/angle of cannula tip   | Y                                  | N |
| b. Silk suture broken while tying?   | Y                                  | N |
| 7. Cannula tested (cognitive)  |                                    |   |
| a. Check requested   | Y                                  | N |
| b. Closure of verbal loop after testing  | Y                                  | N |
| 8. Cannulation execution time  |                                    |   |
| a. Time from aortic incision to cannula testing                                  | _____                              |   |
| 9. Cannula Removal   |                                    |   |
| a. Appropriate BP ensured?   | Y                                  | N |
| b. Clear coordination with assistant?  | Y                                  | N |
| c. Blood spray outside immediate field?  | Y                                  | N |
| d. Suture broken while tying?  | Y                                  | N |

Cognitive Score = \_\_\_\_ of 10 (red Y's equal 1 point)

Technical Score = \_\_\_\_ of 9 (black N's equal 1 point)

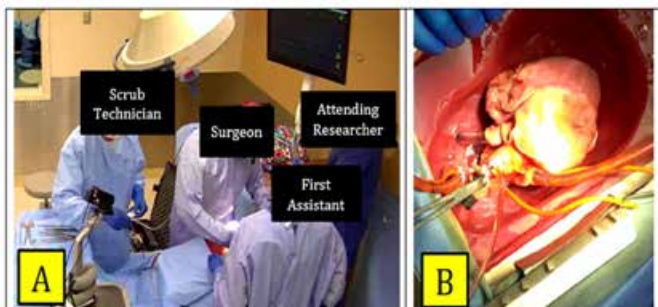


Image 1: (A) View of Simulation OR during data collection, (B) Overhead view during simulation showing aortic, venous and cardioplegia cannulas and crossclamp applied.

## Notes:

## SURGICAL EDUCATION POSTERS

### SE-P1. Cardiothoracic Surgery Interest in Surgical Residency Applicants

**Authors:** \*Robert Dabal, Evan Garner, Zachary Burns, John Porterfield, David Mauchley, \*David Cleveland, Zviadi Aburjania, Luz Padilla

**Author Institution(s):** *University of Alabama at Birmingham, Birmingham, AL*

**Objectives:** While the demand for cardiothoracic (CT) surgeons is projected to rise over the next decade, changes in the paradigms for residency training have shifted dramatically over the last ten years. After an initial increase in positions and applicants, the number of integrated cardiothoracic training positions has plateaued. Additionally, the overall number of traditional training programs has declined, raising concerns about a possible future shortage of CT surgeons. The current study was designed to understand which factors may influence medical students to pursue a career in CT surgery.

**Methods:** After Association of American Medical Colleges (AAMC) and Institutional Review Board (IRB) approval, a programmatic list of 1,100 email addresses from surgery residency applicants was obtained for the 2019 application cycle. A survey was sent using Qualtrics that would record anonymous responses of baseline characteristics, surgical competitiveness, and CT surgery interest. Descriptive analysis of the data was performed.

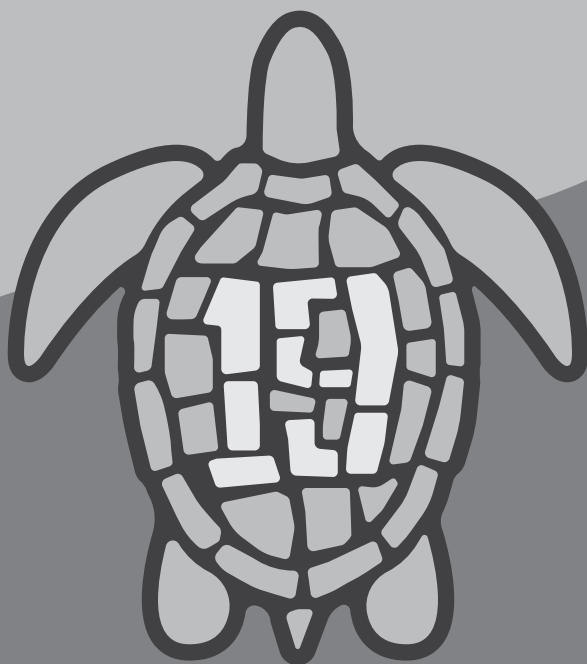
**Results:** One hundred and sixty nine of the applicants responded. Approximately 60% were male (101/169), white (109/169), and reported an anticipated total medical school debt of over \$150,000 (94/169); while 26% (44/169) reported they would have no debt at graduation. Only 53.9% (89/169) of applicants reported having a formal CT surgery rotation during medical school. 22% (37/169) of applicants expressed a definite interest in pursuing a career in CT surgery while almost 39% (66/169) had little to no interest. Of those candidates interested in CT surgery, past mentorship from a CT surgeon was the single most important factor impacting their interest. Students not interested in CT surgery expressed a lack of exposure and mentorship in the field as common issues. Additionally, 44% (51/116) of candidates who applied solely for traditional general surgery positions cited a lack of exposure to CT surgery in medical school as the primary reason for not considering integrated CT training.

**Conclusions:** Evolving strategies in CT surgical training combined with increasing demand for CT surgeons necessitate a better understanding of how medical students make the decision to pursue CT training. In order to increase the number of CT surgery applicants, efforts should be aimed at increasing exposure of medical students to cardiothoracic surgery rotations and, providing more opportunities for mentorship by CT surgery faculty.



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**Notes:**



# PAST MEETINGS AND AWARDS

# PAST MEETINGS

1954—Hollywood Beach, FL..  
 1955—White Sulphur Springs, WV  
 1956—Miami Beach, FL  
 1957—New Orleans, LA  
 1958—Miami Beach, FL  
 1959—Edgewater Park, MS  
 1960—Nassau Bahamas, B.W.I.  
 1961—Memphis, TN  
 1962—Ocho Rios, Jamaica  
 1963—San Antonio, TX  
 1964—Atlanta, GA  
 1965—Freeport, Grand Bahama  
 1966—Asheville, NC  
 1967—Dallas, TX  
 1968—San Juan, Puerto Rico  
 1969—Washington, DC  
 1970—Bermuda  
 1971—Tampa, FL  
 1972—Port of Spain Trinidad and Tobago  
 1973—Louisville, KY  
 1974—Williamsburg, VA  
 1975—New Orleans, LA  
 1976—Acapulco, Mexico  
 1977—Marco Island, FL  
 1978—Marco Island, FL  
 1979—San Antonio, TX  
 1980—White Sulphur Springs, WV  
 1981—Palm Beach, FL  
 1982—Hilton Head Island, SC  
 1983—Marco Island, FL  
 1984—Hilton Head, SC  
 1985—Boca Raton, FL  
 1986—White Sulphur Springs, WV  
 1987—Boca Raton, FL  
 1988—Marco Island, FL  
 1989—Scottsdale, AZ  
 1990—Dorado, Puerto Rico  
 1991—Orlando, FL  
 1992—Wesley Chapel, FL  
 1993—Panama City Beach, FL  
 1994—Marco Island, FL  
 1995—San Antonio, TX  
 1996—Cancun, Mexico  
 1997—Naples, FL  
 1998—Orlando, FL  
 1999—San Juan, PR  
 2000—Marco Island, FL  
 2001—San Antonio, TX  
 2002—Miami, FL  
 2003—Bonita Springs, FL  
 2004—Cancun, Mexico  
 2005—Orlando, FL  
 2006—Tucson, AZ  
 2007—Bonita Springs, FL  
 2008—Austin, TX  
 2009—Marco Island, FL  
 2010—Orlando, FL  
 2011—San Antonio, TX  
 2012—Naples, FL  
 2013—Scottsdale, AZ  
 2014—Tucson, AZ  
 2015—Orlando, FL  
 2016—Naples, FL  
 2017—San Antonio, TX  
 2018—Amelia Island, FL

## PRESIDENT

James D. Murphy\*  
 Paul W. Sanger\*  
 Donald L. Paulson\*  
 Duane Carr\*  
 John S. Harter\*  
 Edward F. Parker\*  
 Edgar W. Davis\*  
 DeWitt C. Daughtry\*  
 James E. Dailey\*  
 Lewis H. Boshier\*  
 Robert G. Ellison\*  
 Francis H. Cole\*  
 Will C. Sealy\*  
 Edward R. Munnell\*  
 Milton V. Davis\*  
 Osler A. Abbott\*  
 Watts R. Webb  
 Hawley H. Seiler\*  
 A. Robert Cordell\*  
 James W. Pate  
 Bertram A. Glass\*..  
 Frederick H. Taylor\*  
 James W. Brooks\*  
 Joseph W. Peabody, Jr.\*  
 Robert Carr\*  
 Harold C. Urschel Jr\*  
 W. Glenn Young Jr\*  
 Dennis Rosenberg\*  
 J. Kent Trinkle\*  
 Francis Robicsek  
 Charles R. Hatcher, Jr  
 George C. Kaiser  
 Richard B. McElvein  
 J. Alex Haller, Jr\*  
 O. Brewster Harrington\*  
 Richard E. Clark\*  
 Harvey W. Bender, Jr  
 Robert M. Sade  
 William A. Cook\*  
 Gordon F. Murray\*  
 Ronald C. Elkins  
 Frederick L. Grover  
 William C. Alford  
 Kit. V. Arom\*  
 Hendrick B. Barner  
 William A. Baumgartner  
 Donald C. Watson  
 William F. Sasser  
 Constantine Mavroudis  
 Joseph I. Miller, Jr  
 D. Glenn Pennington  
 Irving L. Kron  
 Ross Ungerleider  
 Carolyn E. Reed\*  
 John W. Hammon  
 Michael J. Mack  
 Keith S. Naunheim  
 Joseph S. Coselli  
 Walter H. Merrill  
 Robert J. Cerfolio  
 Richard L. Prager  
 John H. Calhoon  
 Andrea J. Carpenter  
 David R. Jones  
 Kevin D. Accola

## SECRETARY

Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 Hawley H. Seiler\*  
 James W. Brooks\*  
 James W. Brooks\*  
 James W. Brooks\*  
 James W. Brooks\*  
 J. Kent Trinkle\*  
 J. Kent Trinkle\*  
 J. Kent Trinkle\*  
 Richard B. McElvein  
 Richard B. McElvein  
 Richard B. McElvein  
 Richard B. McElvein  
 Harvey W. Bender, Jr.  
 Harvey W. Bender, Jr.  
 Harvey W. Bender, Jr.  
 Gordon F. Murray\*  
 Gordon F. Murray\*  
 Gordon F. Murray\*  
 Hendrick B. Barner\*  
 Hendrick B. Barner\*  
 Hendrick B. Barner\*  
 D. Glenn Pennington  
 D. Glenn Pennington  
 D. Glenn Pennington  
 \*D. Glenn Pennington  
 Carolyn E. Reed\*  
 Carolyn E. Reed\*  
 Carolyn E. Reed\*  
 Carolyn E. Reed\*  
 John H. Calhoon  
 John H. Calhoon  
 John H. Calhoon  
 John H. Calhoon  
 Robert J. Cerfolio  
 Robert J. Cerfolio  
 Robert J. Cerfolio  
 Robert J. Cerfolio  
 David R. Jones  
 David R. Jones  
 David R. Jones  
 David R. Jones  
 Daniel L. Miller  
 Daniel L. Miller  
 Daniel L. Miller

\* Deceased

# AWARDS

## CLIFFORD VAN METER PRESIDENT'S AWARD

Formerly known as the President's Award, the Clifford Van Meter President's Award was established in 2008 to recognize the best scientific paper delivered at the STSA Annual Meeting. In 2013, this Award was augmented to specifically recognize the best adult cardiac surgery paper delivered at the Annual Meeting. The award is given on the basis of originality, content, and presentation. Previous award recipients have uniformly displayed excellence in all areas. The selected author receives a certificate identifying the award and a suitable monetary reward. The recipient is chosen by the President with assistance from the Council.

1964—Bertram A. Glass	New Orleans, Louisiana
1965—Harold C. Urschel, Jr.*	Dallas, Texas
1966—Thomas J. Yeh	Savannah, Georgia
1967—Yale H. Zimberg	Richmond, Virginia
1968—J. Alex Haller, Jr.*	Baltimore, Maryland
1969—William H. Sewell*	Sayre, Pennsylvania
1970—George R. Daicoff	St. Petersburg, Florida
1971—Charles E. Eastridge	Memphis, Tennessee
1972—J. Kent Trinkle*	San Antonio, Texas
1973—Donald L. Bricker	Lubbock, Texas
1974—Harvey W. Bender, Jr.	Nashville, Tennessee
1975—Charles E. Martin	Nashville, Tennessee
1976—Gordon F. Murray*	Chapel Hill, North Carolina
1977—Denis H. Tyras*	St. Louis, Missouri
1978—Joseph I. Miller, Jr.	Atlanta, Georgia
1979—M. Wayne Flye	Galveston, Texas
1980—Francis Robicsek	Charlotte, North Carolina
1981—Ellis L. Jones	Atlanta, Georgia
1982—William G. Malette	Omaha, Nebraska
1983—Robert H. Breyer	Springfield, Massachusetts
1984—Blair A. Keagy	Chapel Hill, North Carolina
1985—John W. Hammon, Jr.	Nashville, Tennessee
1986—William H. Frist	Nashville, Tennessee
1987—Jean-Nicolas Vauthey..	New Orleans, Louisiana
1988—Robert A. Gustafson	Morgantown, West Virginia
1989—Harvey I. Pass	Bethesda, Maryland
1990—Vincent L. Gott	Baltimore, Maryland
1991—Ross M. Ungerleider	Durham, North Carolina
1992—William H. Frist	Nashville Tennessee
1993—Kirk R. Kanter	Atlanta, Georgia
1994—Thomas L. Spray	St. Louis, Missouri
1995—Constantine Mavroudis	Chicago, Illinois
1996—David A. Fullerton	Denver, Colorado
1997—Christopher J. Knott-Craig	Oklahoma City, Oklahoma
1998—James L. Zellner	Charleston, South Carolina
1999—Thomas D'Amico	Durham, North Carolina
2000—Joseph C. Cleveland, Jr.	Denver, Colorado
2001—Neal D. Kon	Winston-Salem, South Carolina
2002—Joseph S. Coselli	Houston, Texas
2003—Robert J. Cerfolio	Birmingham, Alabama
2004—Malcolm DeCamp	Boston, Massachusetts
2005—Seenu V. Reddy	San Antonio, Texas
2006—Andrew W. ElBardissi	Rochester, Minnesota
2007—John Stulak	Rochester, Minnesota
2008—G. Chad Hughes	Durham, North Carolina
2009—Scott H. Johnson	Lansing, Michigan
2010—Kenneth A. Kesler	Indianapolis, Indiana
2011—Robert Stewart	Cleveland, Ohio
2012—Haritha Reddy	Ann Arbor, Michigan
2013—Bartosz Rylski	Freiburg, Germany
2014—Stephano Mastrobuoni	Brussels, Belgium
2015—Anthony L. Estrera	Houston, Texas
2016—A. Michael Borkon/Kaitlyn Carl	Kansas City, Missouri
2017—Anita Nguyen	Rochester, Minnesota
2018—Melissa Levack	Nashville, Tennessee

\* Deceased

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## CAROLYN REED PRESIDENT'S AWARD

The Carolyn Reed President's Award was established in 2013 to recognize the best general thoracic surgery scientific paper delivered at the STSA Annual Meeting. Named in memory of STSA Past President, Carolyn E. Reed, MD, (STSA President, 2006-07), this award will be given on the basis of originality, content, and presentation. The selected author receives a certificate identifying the award and a suitable monetary reward. The recipient is chosen by the President with assistance from the Council.

2013—R. Douglas Adams  
2014—Pamela Samson  
2015—Jonathan Spicer  
2016—Juliana Stone  
2017—Linda W. Martin  
2018—Tamar Nobel

Merrillville, Indiana  
Webster Groves, Missouri  
Montreal, Quebec  
Boston, Massachusetts  
Charlottesville, Virginia  
New York, New York

## GEORGE R. DAICOFF PRESIDENT'S AWARD

The George R. Daicoff President's Award was established in 2013 to recognize the best congenital heart surgery scientific paper delivered at the STSA Annual Meeting. Named for longtime active member, George R. Daicoff, MD, this award will be given on the basis of originality, content, and presentation. The selected author receives a certificate identifying the award and a suitable monetary reward. The recipient is chosen by the President with assistance from the Council.

2013—Vincent K.H. Tam  
2014—Jennifer Solms Nelson  
2015—James D. St. Louis  
2016—William Patrick  
2017—Minoo N. Kavarana  
2018—Jeffrey Jacobs

Fort Worth, Texas  
Chapel Hill, North Carolina  
Wayzata, Minnesota  
Menlo Park, California  
Charleston, South Carolina  
Saint Petersburg, Florida

## TIKI AWARD

The quality of slides can greatly enhance or detract from a scientific presentation. In order to emphasize the importance of well-planned and prepared slides, the Southern Thoracic Surgical Association has created the Tiki Award.

This award is given to the person who presents a slide at the annual meeting which is judged by a committee appointed by the President to be the most memorable and noteworthy. This slide can be selected because it is unintelligible, confusing, cluttered, irrelevant, or conversely because it is superbly clear, concise, colorful, pertinent, and/or utilizes state of the art graphics.

1964—Watts R. Webb  
1965—J. Alex Haller, Jr.\*  
1966—Richard M. Peters  
1967—Myron W. Wheat  
1968—Carl H. Almond  
1969—Francis Robicsek  
1970—William A. Neely  
1971—Paul C. Adkins  
1972—Panagiotis Symbas  
1973—James L. Alexander  
1974—Lloyd H. Hudson  
1975—Richard E. Clark\*  
1976—William S. Lyons  
1977—Maruf A. Razzuk  
1978—Harold C. Urschel, Jr.\*  
1979—Maruf A. Razzuk  
1980—Francis Robicsek

New Orleans, Louisiana  
Baltimore, Maryland  
San Diego, California  
St. Petersburg, Florida  
Columbia, South Carolina  
Charlotte, North Carolina  
Jackson, Mississippi  
Washington, DC  
Atlanta, Georgia  
Savannah, Georgia  
Flint, Michigan  
St. Louis, Missouri  
Alexandria, Virginia  
Dallas, Texas  
Dallas, Texas  
Dallas, Texas  
Charlotte, North Carolina

# AWARDS

1981—Robert Sade  
 1982—Kit V. Arom\*  
 1983—Herbert E. Warden\*  
 1984—Noel L. Mills  
 1985—George C. Kaiser  
 1986—J. G. Selle  
 1987—Steven Gundry  
 1988—Harvey I. Pass  
 1989—Duke E. Cameron  
 1990—Richard E. Clark\*  
 1991—William H. Coltharp  
 1992—Joseph S. Coselli  
 1993—Benson R. Wilcox\*  
 1994—P. Michael McFadden  
 1995—Carolyn E. Reed\*  
 1996—John L. Ochsner\*  
 1997—Clifford H. Van Meter, Jr.\*  
 1998—John D. Oswalt  
 1999—W. Randolph Chitwood  
 2000—Ross M. Ungerleider  
 2001—Neal D. Kon  
 2002—W. Steves Ring  
 2003—Betsey Urschel  
 2004—John Puskas  
 2005—Meredith Scott  
 2006—Constantine Mavroudis  
 2007—Robert J. Cerfolio  
 2008—Curt Tribble  
 2009—Jeffrey P. Jacobs  
 2010—Peter K. Smith  
 2011—John H. Calhoun  
 2012—Vinay Badhwar  
 2013—Lorraine Cerfolio  
 2014—Kristine J. Guleserian  
 2015—Daniel L. Miller  
 2016—Thoralf M. Sundt  
 2017—Joseph A. Dearani  
 2018—William A. Baumgartner

\* Deceased

Charleston, South Carolina  
 Minneapolis, Minnesota  
 Morgantown, West Virginia  
 New Orleans, Louisiana  
 St. Louis, Missouri  
 Charlotte, North Carolina  
 Baltimore, Maryland  
 Bethesda, Maryland  
 Baltimore, Maryland  
 Pittsburgh, Pennsylvania  
 Nashville, Tennessee  
 Houston, Texas  
 Chapel Hill, North Carolina  
 New Orleans, Louisiana  
 Charleston, South Carolina  
 New Orleans, Louisiana  
 New Orleans, Louisiana  
 Austin, Texas  
 Greenville, North Carolina  
 Portland, Oregon  
 Winston-Salem, South Carolina  
 Dallas, Texas  
 Dallas, Texas  
 Atlanta, Georgia  
 Shell, Wyoming  
 Chicago, Illinois  
 Birmingham, Alabama  
 Gainesville, Florida  
 St. Petersburg, Florida  
 Durham, North Carolina  
 San Antonio, Texas  
 Pittsburgh, Pennsylvania  
 Birmingham, Alabama  
 Dallas, Texas  
 Marietta, Georgia  
 Boston, Massachusetts  
 Rochester, Minnesota  
 Baltimore, Maryland

## OSLER ABBOTT AWARD

The Osler Abbott Award was first given in 1960 and has been awarded annually to that member of the Association who excels in the art of discussionmanship. It was named for Osler Abbott, MD of Atlanta, Georgia, who, in 1950, somehow managed to discuss 26 papers, no mean feat since only 25 were presented and one was his own!

In the early years, sheer volume of discussion was sufficient to earn at least an honorable mention, but volume alone never won the award. More important were factors such as pomposity, arrogance, irrelevancy, and the use of outdated slides which had been shown on two or more occasions. In recent years, the tactics have ranged from extreme subtlety to blatant exhibitionism and from apparent indifference to obvious covetousness.

To place this traditional award on a somewhat higher plane of competition, the Council, in its wisdom, decided to base the decision on Oslerian principles, and selection would come from evaluation of the more memorable of discussions during the scientific sessions.

Thus, the reincarnated purposes of the Osler Abbott Award of the Southern Thoracic Surgical Association are:

1. To focus on the importance of open, frank, and candid discussion in the spirit and substance of the Southern Thoracic Surgical Association and, in this way, to encourage more objective and active participation by all members attending the Annual Meeting.
2. To stimulate a healthy give-and-take among the members and, thereby, enhance the camaraderie and esprit-de-corps which have traditionally characterized the Southern Thoracic Surgical Association.

1960—Joseph W. Peabody Jr.*	Washington, DC
1961—Milton V. Davis	Dallas, Texas
1962—E. Converse Peirce, II	New York, New York
1963—Lewis H. Bosher Jr.	Richmond, Virginia
1964—Sam E. Stephenson Jr.	Jacksonville, Florida
1965—Bertram A. Glass*	New Orleans, Louisiana
1966—Robert E. Carr	Fort Worth, Texas
1967—Osler A. Abbott*	Atlanta, Georgia
1968—Watts R. Webb	New Orleans, Louisiana
1969—William A. Cook*	Andover, Massachusetts
1970—Edward F. Parker*	Charleston, South Carolina
1971—Minas Joannides Jr.	St. Petersburg, Florida
1972—J. Alex Haller Jr.*	Baltimore, Maryland
1973—Harold C. Urschel Jr*	Dallas, Texas
1974—Bertram A. Glass*	New Orleans, Louisiana
1975—Gilbert S. Campbell	Little Rock, Arkansas
1976—James W. Brooks*	Richmond, Virginia
1977—J. Kent Trinkle*	San Antonio, Texas
1978—Raymond C. Read*	Little Rock, Arkansas
1979—Richard E. Clark*	St. Louis, Missouri
1980—Joseph Peabody Jr*	Washington, DC
1981—Robert M. Sade*	Charleston, South Carolina
1982—James S. Donahoo	Philadelphia, Pennsylvania
1983—Francis Robicsek	Charlotte, North Carolina
1984—Milton V. Davis	Kaufman, Texas
1985—George C. Kaiser	St. Louis, Missouri
1986—Milton V. Davis	Kaufman, Texas
1987—J. Alex Haller Jr.*	Baltimore, Maryland
1988—Ronald C. Elkins	Oklahoma City, Oklahoma
1989—Bradley M. Rodgers	Charlottesville, Virginia
1990—Harvey W. Bender Jr.	Nashville, Tennessee
1991—Kamal A. Mansour*	Atlanta, Georgia
1992—Arthur E. Baue*	St. Louis, Missouri
1993—Kit V. Arom*	Minneapolis, Minnesota
1994—Frederick L. Grover	Denver, Colorado
1995—Constantine Mavroudis	Chicago, Illinois
1996—George Daicoff	St. Petersburg, Florida
1997—Ross M. Ungerleider	Durham, North Carolina
1998—Lynn Harrison	New Orleans, Louisiana
1999—William A. Baumgartner	Baltimore, Maryland
2000—Robert J. Cerfolio	Birmingham, Alabama
2001—Carolyn E. Reed*	Charleston, South Carolina
2002—John H. Calhoon	San Antonio, Texas
2003—Constantine Mavroudis	Chicago, Illinois
2004—Keith S. Naunheim	St. Louis, Missouri
2005—Irving L. Kron	Charlottesville, Virginia
2006—Thoralf M. Sundt	Rochester, Minnesota
2007—W. Steves Ring	Dallas, Texas
2008—John W. Hammon	Winston-Salem, North Carolina
2009—Kevin D. Accola	Orlando, Florida
2010—Vinod Thourani	Atlanta, Georgia
2011—Jeffrey P. Jacobs	Saint Petersburg, Florida

# AWARDS

2012—Duke E. Cameron  
 2013—Daniel L. Miller  
 2014—Stephen C. Yang  
 2015—Joseph A. Dearani  
 2016—Douglas J. Mathisen  
 2017—Daniela Molena  
 2018—David R. Jones

\* Deceased

Baltimore, Maryland  
 Marietta, Georgia  
 Baltimore, Maryland  
 Rochester, Minnesota  
 Boston, Massachusetts  
 New York, New York  
 New York, New York

## KENT TRINKLE EDUCATION LECTURESHIP

The Kent Trinkle Educational Lectureship is dedicated to J. Kent Trinkle, (STSA President, 1981-82) for his contributions to cardiothoracic surgery and STSA. Each year, in honor of Dr. Trinkle's remarkable dedication to student education, an STSA member is selected to present on his/her training program. Presenters are selected by the STSA President.

1993—Benson R. Wilcox\*  
 1994—George C. Kaiser  
 1995—J. Kent Trinkle\*  
 1996—Irving L. Kron  
 1997—William A. Baumgartner  
 1998—Donald C. Watson, Jr.  
 1999—Fred A. Crawford, Jr.  
 2000—Robert A. Guyton  
 2001—Joel D. Cooper  
 2002—W. Steves Ring  
 2003—Walter G. Wolfe  
 2004—Joseph Coselli  
 2005—Neal Kon  
 2006—Joe B. Putnam, Jr  
 2007—Walter H. Merrill  
 2008—Curt Tribble  
 2009—Irving L. Kron  
 2010—Michael R. Mill  
 2011—John H. Calhoon  
 2012—Bartley P. Griffith  
 2013—Michael Argenziano  
 2014—Mark S. Slaughter  
 2015—John S. Ikonomidis  
 2016—William A. Baumgartner  
 2017—Marc R. Moon  
 2018—William A. Baumgartner  
     John H. Calhoon  
     John A. Kern

Chapel Hill, North Carolina  
 St. Louis, Missouri  
 San Antonio, Texas  
 Charlottesville, Virginia  
 Baltimore, Maryland  
 Memphis, Tennessee  
 Charleston, South Carolina  
 Atlanta, Georgia  
 St. Louis, Missouri  
 Dallas, Texas  
 Durham, North Carolina  
 Houston, Texas  
 Winston-Salem, North Carolina  
 Nashville, Tennessee  
 Cincinnati, Ohio  
 Gainesville, Florida  
 Charlottesville, Virginia  
 Chapel Hill, North Carolina  
 San Antonio, Texas  
 Baltimore, Maryland  
 New York, New York  
 Louisville, Kentucky  
 Charleston, South Carolina  
 Baltimore, Maryland  
 St. Louis, Missouri  
 Baltimore, Maryland  
 San Antonio, Texas  
 Charlottesville, Virginia

## HAROLD URSCHER HISTORY LECTURESHIP

The Harold Urscher History Lectureship is dedicated to long-time STSA member and contributor, Harold C. Urscher, Jr., MD, (STSA Historian, 2001-12). This lectureship was established in memory of Dr. Urscher in 2013. The lecturer will be selected annually by the Program Committee as the abstract author who submitted the most exemplary history abstract.

2013—Joseph S. Coselli  
 2014—Daniel L. Miller  
 2015—Erle H. Austin  
 2016—Robert M. Sade  
 2017—Stephen C. Yang  
 2018—Pouya Hemmati

Houston, Texas  
 Marietta, Georgia  
 Louisville, Kentucky  
 Charleston, South Carolina  
 Baltimore, Maryland  
 Rochester, Minnesota



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## HAWLEY H. SEILER RESIDENTS COMPETITION AWARD

The Hawley H. Seiler Residents Competition Award is presented for an outstanding paper by a cardiothoracic or general surgery resident. It is bestowed upon the resident excelling in the following categories regarding their abstract submission: quality of abstract as well as manuscript and oral presentation. The award is named after STSA Past President and founding member, Hawley H. Seiler.

Dr. Seiler's many contributions to STSA included serving as Secretary for 15 years and presenting on numerous topics at Annual Meetings.

1997—Elaine E. Tseng	Baltimore, Maryland
1998—Stephen Langley	Durham, North Carolina
1999—Aron Goldberg	Charleston, South Carolina
2000—Cullen D. Morris	Atlanta, Georgia
2001—Sitaram M. Emani	Durham, North Carolina
2002—Thomas H. Maxey	Charlottesville, Virginia
2003—Brian T. Bethea	Baltimore, Maryland
2004—Tara Karamlou	Portland, Oregon
2005—Edward John Hickey	London, England
2006—Thomas K. Varghese	Seattle, Washington
2007—Tara Karamlou	Portland, Oregon
2008—David T. Cooke	Sacramento, California
2009—Jeremiah Geoff Allen	Baltimore, Maryland
2010—Castigliano M. Bhamidipati	Charlottesville, Virginia
2011—Sameh Said	Rochester, Minnesota
2012—Timothy George	Baltimore, Maryland
2013—Rachel L. Medbery	Atlanta, Georgia
2014—Damian J. LaPar	Charlottesville, Virginia
2015—Emily A. Downs	Charlottesville, Virginia
2016—J. Trent Magruder	Baltimore, Maryland
2017—Joshua M. Rosenblum	Atlanta, Georgia
2018—Tessa Watt	Ann Arbor, Michigan

## MAVROUDIS-URSCHEL AWARD

The Mavroudis-Urschel Award was established in 2006 to recognize and honor an STSA member who has not only made important contributions to the STSA scientific program, but who has also uniquely personified the social spirit, camaraderie, and fun for which STSA is famous. The award is named for STSA Past Presidents Constantine Mavroudis and Harold Urschel, who both contributed significantly not only to the scientific value of the STSA Annual Meeting but also, and just as importantly, to the organization's high spirits (and high-jinx).

There is more to an organization than its bylaws, and there is more to its Annual Meeting than the slides and presentations. To many, STSA meetings are as much about social interactions as they are about new research findings in cardiothoracic surgery. Meeting highlights also happen at social events, such as the president's mixer, receptions, sports events, and during the exhibit hall breaks. The Award goes to a member who has enhanced both aspects of the organization, scientific and social, and done so with a distinctive, even flamboyant, personal style—in the manner of its namesakes.

The Mavroudis-Urschel Award is made at the discretion of the President with input and recommendation from the double-secret Tiki and Osler-Abbot committee chairs. When given, the award is announced at the annual dinner/dance.

2007—Kit V. Arom*	Bangkok, Thailand
2009—John H. Calhoon	San Antonio, Texas
2010—Keith S. Naunheim	St. Louis, Missouri
2011—Francis Robicsek	Charlotte, North Carolina
2012—Harold C. Urschel, Jr*	Dallas, Texas

# AWARDS

2013—Kevin D. Accola  
 2014—Andrea J. Carpenter  
 2015—Kamal A. Mansour\*  
 2016—Shanda Blackmon  
 2017—Stephen C. Yang  
 2018—Daniel Miller

Orlando, Florida  
 San Antonio, Texas  
 Atlanta, Georgia  
 Rochester, Minnesota  
 Baltimore, Maryland  
 Marietta, Georgia

\*Deceased

## STSA INSPIRATION AWARD

The STSA Inspiration Award was established in 2007 to recognize the important contribution of mentorship to the specialty and the organization, and to encourage upcoming generations of CT surgeons by helping to cultivate mentors worthy of emulation.

The future of cardiothoracic surgery is in the hands and hearts of its medical students and residents. Inspiring a resident or medical student to become a CT surgeon—to become a great CT surgeon—is among the most far-reaching and important contributions one can make to the specialty and ultimately to the Southern Thoracic Surgical Association.

The residency program directors and faculty at teaching programs affiliated with the STSA are developing and inspiring future cardiothoracic surgeons every day—teaching them to become leaders in their future institutions, practices, and communities. And mentorship is not limited to program directors and faculty. Surgeons in private practice hire young graduates and become influential mentors providing career guidance and support often for years to come.

To acknowledge the crucial importance of mentorship in developing CT surgeons and to recognize and positively reinforce STSA members who have excelled in their mentorship roles, STSA established its Inspiration Award in 2007. The Inspiration Award is given to the STSA member who has demonstrated exceptional efforts in motivating, inspiring, and cultivating the clinical and research talents of medical students, residents and/or early career CT surgeons.

Nominations must be submitted in writing by September 1 to the sitting STSA President to be considered for possible presentation at the subsequent STSA Annual Meeting. Recommendation letters should outline the specific merits of the nominee and his or her positive influences for the 'mentee(s)'. Recipient must be a member of STSA in good standing. The award is given at the discretion of the President in consultation with the Council.

2007—Robert J. Cerfolio  
 Hooshang Bolooki  
 2009—Irving L. Kron  
 2010—Kamal A. Mansour\*  
 Francis Robicsek  
 2012—Harvey W. Bender, Jr  
 Frederick L. Grover  
 Ara A. Vaporciyan  
 2013—James Robert Headrick  
 2014—Curtis G. Tribble  
 2015—L. Henry Edmunds  
 2016—Clinton E. Baisden  
 2017—Jennifer S. Lawton  
 Richard Lee

Birmingham, Alabama  
 Miami, Florida  
 Charlottesville, Virginia  
 Atlanta, Georgia  
 Charlotte, North Carolina  
 Nashville, Tennessee  
 Aurora, Colorado  
 Houston, Texas  
 Chattanooga, Tennessee  
 Charlottesville, Virginia  
 Bryn Mawr, Pennsylvania  
 San Antonio, Texas  
 Baltimore, Maryland  
 St. Louis, Missouri  
 Southport, NC  
 Durham, NC

2018—Gordon Murray\**(Awarded posthumously)*  
 Walter Wolfe

\*Deceased

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## JAMES W. BROOKS MEDICAL STUDENT SCHOLARSHIP

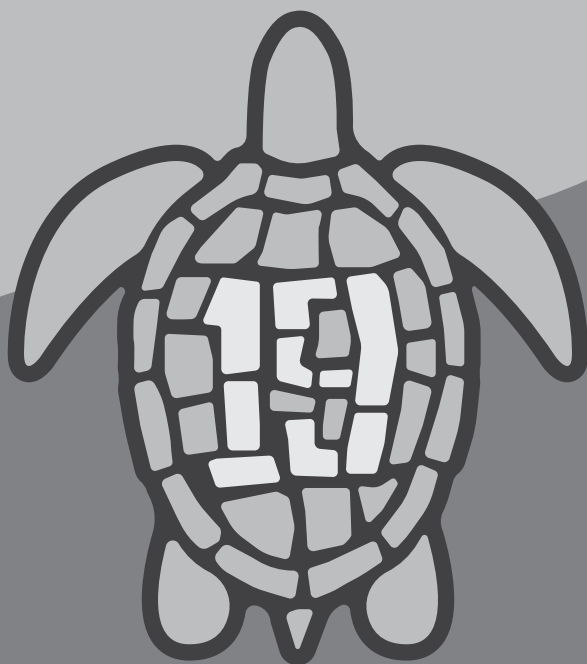
The STSA James W. Brooks Medical Student Scholarship was established in 2010 to pay tribute to Dr. Jim Brooks, past president of STSA and a great mentor to countless residents and students. The Brooks Scholarship seeks to identify 2nd, 3rd, and 4th year medical students in the STSA region who are interested in cardiothoracic surgery. The recipient(s), selected annually by a committee of STSA leaders, receives funding to attend the STSA Annual Meeting and the unique opportunity to benefit from the guidance of STSA members, thus extending Dr. Brooks' legacy as a great mentor. It has become increasingly important to begin mentoring future CT surgeons at the medical student level. In establishing the Brooks Scholarship and providing first-rate mentorship, STSA hopes to annually inspire promising medical students to become great CT surgeons, thus making a far-reaching and important contribution to the future of the specialty and ultimately to the STSA.

2010—Elizabeth A. Spradlin	Richmond, Virginia
2011—Carlo Bartoli	Louisville, Kentucky
2012—Vernissia Tam	Baltimore, Maryland
2013—Sahar Saddoughi	Charleston, South Carolina
2014—Mickey Ising	Louisville, Kentucky
Xiaoying Lou	Chicago, Illinois
2015—Bogdan Kindzelski	Potomac, MD
Graham Ungerleider	Winston-Salem, North Carolina
2016—Caitlin Brown	Portland, Oregon
Andrew Percy	Richmond, Virginia
2017—Trevor Davis	Nevada, Iowa
John Kelly	Atlanta, Georgia
Raymond Strobel	Ann Arbor, Michigan
2018—Walker Blanding	Charleston, South Carolina
William Frankel	Houston, Texas
Shawn Shah	Charlottesville, Virginia
2019—Nicholas Goel	Philadelphia, Pennsylvania
Samantha Halpern	Durham, North Carolina
Selena Li	Boston, Massachusetts
Phillip Mackie	Gainesville, Florida

## STSA JAMES W. BROOKS RESIDENT SCHOLARSHIP

The STSA James W. Brooks Resident Scholarship was established in 2014 and seeks to identify a general surgery resident who is committed to CT surgery. The recipient(s), selected annually by a committee of STSA leaders, receives funding to attend the STSA Annual Meeting and the unique opportunity to benefit from the guidance of STSA members, thus extending Dr. Brooks' legacy as a great mentor.

2014—Zachary Kon	Baltimore, MD
2015—Erin Schumer	Louisville, Kentucky
Mansi Shah	Chapel Hill, North Carolina
2016—Sameer Hirji	Alston, Massachusetts
David Ranney	Durham, North Carolina
2017—Charles Fraser	Baltimore, Maryland
2018—Alex Kossar	New York, New York
2019—Eric Etchill	Baltimore, Maryland
Corbin Frye	St. Louis, Missouri
Gregory Leya	Boston, Massachusetts
Rodrigo Zea Vera	Houston, Texas



# EXHIBITORS

# EXHIBIT HOURS AND FLOOR PLAN

## Exhibitors\*

\*Confirmed as of October 14, 2019

## Exhibit Hours

### THURSDAY, NOVEMBER 7

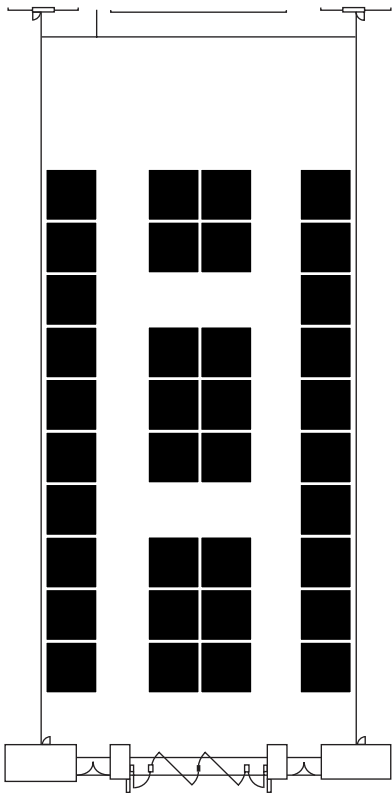
Exhibits Open 10:00 am – 12:00 pm  
1:30 pm – 3:30 pm

### FRIDAY, NOVEMBER 8

Exhibits Open 7:45 am – 12:00 pm  
12:45 pm – 3:30 pm

The exhibit hall will be closed during the lunch hour. On Thursday, the exhibit hall will close from 12:00 – 1:30 pm and on Friday, from 12:00 – 12:45 pm. Exhibit hours will resume after lunch each day.

- Exhibit Hall is located in the Calusa Ballroom 7
- All coffee breaks scheduled during show hours are in the exhibit area
- Complimentary coffee and pastries will be served



# EXHIBITORS

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## ABBOTT

Marietta, GA 30062

**BOOTH: 212**

## ATRICURE, INC.

Mason, OH 45040

**BOOTH: 206**

AtriCure provides innovative technologies for the treatment of Afib and related conditions. Physicians around the globe use AtriCure technologies for the treatment of Afib and reduction of Afib related complications.

## AURIS HEALTH

Redwood City, CA 94065

**BOOTH: 209**

With the Monarch™ Platform, Auris™ helps physicians diagnose small peripheral nodules by leveraging the precision of a robotically controlled bronchoscope.

## BIOMERIEUX

Durham, NC 27704

**BOOTH: 211**

A world leader in diagnostics for more than 50 years, bioMérieux provides diagnostic solutions which help clinicians and laboratories stay ahead of the challenges associated with sepsis diagnosis, AKI, antibiotic stewardship, and laboratory efficiency.

## BIOSTABLE SCIENCE & ENGINEERING

Austin, TX 78754

**BOOTH: 111**

BioStable Science & Engineering is a cardiovascular device company focused on developing and commercializing proprietary valve repair technologies that provide an alternative to valve replacement for patients with aortic valve disease. The company's HAART Aortic Repair Technologies are designed to simplify and standardize aortic valve repair, enabling surgeons to offer the recognized clinical benefits of valve repair to patients undergoing surgical correction of aortic insufficiency or aortic root aneurysm.

## CRYOLIFE

Kennesaw, GA 30101

**BOOTH: 110**

Headquartered in suburban Atlanta, Georgia, CryoLife is a leader in the manufacturing, processing, and distribution of medical devices and implantable tissues used in cardiac and vascular surgical procedures focused on aortic repair. CryoLife markets and sells products in more than 90 countries worldwide. For additional information about CryoLife, visit our website, [www.cryolife.com](http://www.cryolife.com).

## CSL BEHRING

King of Prussia, PA 19406

**BOOTH: 115**

CSL Behring is a global biotherapeutics leader driven by our promise to save lives. We meet patients' needs using the latest technologies to develop and deliver innovative biotherapies that are used to treat serious and rare conditions such as coagulation disorders, primary immune deficiencies, hereditary angioedema and inherited respiratory disease.

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**EDWARDS LIFESCIENCES**

Irvine, CA 92614

**BOOTH: 203**

Edwards Lifesciences, based in Irvine, Calif., is the global leader in patient-focused medical innovations for structural heart disease. For more information, visit [www.Edwards.com](http://www.Edwards.com) or @EdwardsLifesci.

**ESSENTIAL PHARMACEUTICALS**

Durham, NC 27703

**BOOTH: 120****FEHLING SURGICAL**

Kennesaw, GA 30152

**BOOTH: 116**

FEHLING SURGICAL INSTRUMENTS is the leader in fine crafted surgical instrumentation that has focused on Cardiothoracic surgery for over 30 years.

**GETINGE**

Wayne, NJ 07470

**BOOTH: 113**

Getinge is a leading global provider of innovative solutions for operating rooms, intensive-care units, hospital wards, sterilization departments and for life science companies and institutions. Based on first-hand experience and close partnerships, Getinge offers innovative healthcare solutions that improve every-day life for people, today and tomorrow.

**INTUITIVE**

Sunnyvale, CA 94086

**BOOTH: 112**

At Intuitive®, innovating for minimally invasive care is the passion that drives us. Our robotic-assisted da Vinci® Surgical System helps empower doctors and hospitals to make surgery less invasive than an open approach.

**JACE MEDICAL**

Warsaw, IN 46580

**BOOTH: 202**

JACE Medical is the leader in speed and efficiency with rigid sternal closure. The Low Profile system offers the broadest portfolio, thinnest plates, and new-to-the-world instrumentation. Please view short video clips at [www.jacemed.com](http://www.jacemed.com).

**KARL STORZ ENDOSCOPY-AMERICA INC.**

El Segundo, CA 90245

**BOOTH: 204**

KARL STORZ delivers enterprise-wide, scalable solutions for surgical endoscopic video imaging, instrumentation, and operating room integration with best in-class service. We offer a wide array of products to support cardiac and thoracic surgery.

**KLS-MARTIN**

Jacksonville, FL 32245

**BOOTH: 214**

KLS Martin is a company dedicated to producing innovative medical devices for craniomaxillofacial surgery including surgical instruments, distraction osteogenesis devices, and power systems.

# EXHIBITORS

## LIFENET HEALTH

**BOOTH: 108**

Virginia Beach, VA 23453

LifeNet Health is a leader in global regenerative medicine. It provides organ, tissue and cell-based solutions for clinicians and researchers. Saving Lives, Restoring Health, Giving Hope. Learn more at [lifenethealth.org](http://lifenethealth.org).

## LSI SOLUTIONS

**BOOTH: 103**

Victor, NY 14564

LSI SOLUTIONS® is a medical device company dedicated to advancing minimally invasive therapeutics through research, development, and manufacturing of minimally invasive surgical instruments. Our mission is to lead the world in medical production innovation.

## MED ALLIANCE SOLUTIONS

**BOOTH: 218**

Sycamore, IL 60178

MED Alliance Solutions empowers your approach to cardio-thoracic surgery. We offer innovative, high-quality and cost-effective cardio-thoracic medical devices on a national basis.

## MEDIKNOX

**BOOTH: 119**

Las Vegas, NV 89102

Mediknox works with the most advanced medical devices, and simplify professional medical technology for home use. This Technology is clinically proven and FDA cleared medical devices, and currently carried, used and sold by medical professionals, including those within this field.

## MEDTRONIC

**BOOTH: 104-106**

Minneapolis, MN 55432

We are driven by the possibilities of what medical technology can do to improve lives around the world. Join us in our commitment to take healthcare Further, Together. [www.medtronic.com](http://www.medtronic.com).

## ONCOCYTE

**BOOTH: 220**

Alameda, CA 94501

OncoCyte is a molecular diagnostic company providing actionable answers to critical decision points across the lung cancer continuum. Our first commercial assay is a treatment stratification test that identifies Stage I-IIA NSCLC patients who may benefit from adjuvant chemotherapy and is extensively published in Lancet, JAMA, JTO and CLC. Medicare Coverage (proposed).

## PACIRA BIOSCIENCES

**BOOTH: 213**

Parsippany, NJ 07054

Pacira BioSciences, Inc. is a leading provider of non-opioid pain management and regenerative health solutions dedicated to advancing and improving outcomes for health care practitioners and their patients. To learn more about Pacira, including the corporate mission to reduce overreliance on opioids, visit [www.pacira.com](http://www.pacira.com).



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**PARAGONIX**

Braintree, MA 02184

**BOOTH: 210**

Paragonix Technologies markets organ transportation devices that safeguard organs during the journey between donor and recipient patients. Clinically proven, medically trusted cold preservation techniques in a novel suspension system provide unprecedented physical and thermal protection. Paragonix SherpaPak™ CTS is the only commercially available FDA cleared and CE marked transport device for heart transportation.

**SCANLAN INTERNATIONAL, INC.**

St. Paul, MN 55107

**BOOTH: 102**

"The highest quality surgical instruments have been designed and manufactured by the Scanlan Family since 1921" — Tim Scanlan You deserve the best. Experience the Scanlan difference at exhibit #102.

**TERUMO**

Ann Arbor, MI 48103

**BOOTH: 105**

At Terumo Cardiovascular Group, we develop, manufacture, and distribute medical devices for cardiac and vascular surgery with an emphasis on cardiopulmonary bypass, intra-operative monitoring and vascular grafting.

**TRANSONIC SYSTEMS, INC.**

Ithaca, NY 14850

**BOOTH: 121**

Transonic, the pioneer in CABG flow assessment, offers state-of-the-art technology for on-the-spot quantitative confirmation of bypass flow to guarantee early graft patency.

**VERAN MEDICAL**

St. Louis, MO 63114

**BOOTH: 205**

Veran's SPiN Thoracic Navigation System enables intraoperative, percutaneous localization of lung nodules to assist in the minimally-invasive access, identification, and resection in high-risk lung cancer patients.

**WEXLER SURGICAL**

Houston, TX 77035

**BOOTH: 107**

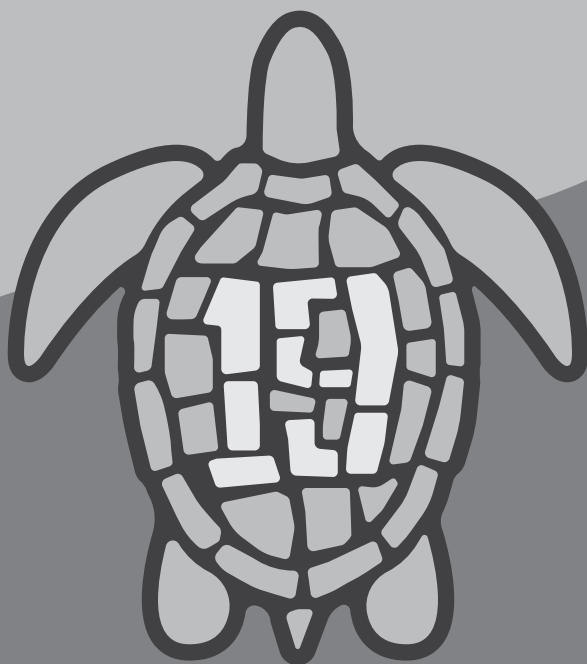
Wexler Surgical designs and manufactures a variety of titanium and stainless steel specialty surgical instruments and products for Cardiac, Vascular, Thoracic, and Micro Surgery. Come see our VATS/MICS instruments and ask about our Optimus Series. Visit us online at [www.wexlersurgical.com](http://www.wexlersurgical.com) for more information about our products and services.

**ZIMMER BIOMET**

Jacksonville, FL 32218

**BOOTH: 207**

Founded in 1927 and headquartered in Warsaw, Indiana, Zimmer Biomet is a global leader in musculoskeletal healthcare. With operations in more than 25 countries around the world, we design, manufacture and market orthopaedic reconstructive products; sports medicine, biologics, extremities and trauma products; spine, bone healing, craniomaxillofacial and thoracic products; dental implants; and related surgical products.



# NECROLOGY REPORT

# NECROLOGY REPORT

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**Robert T. Angel, MD**

*Waco, TX*

**Hendrick "Rick" Barner, MD**

*St. Louis, MO*

**Alfonso Chiscano, MD**

*San Antonio, TX*

**William A. Cook, MD**

*North Andover, MA*

**Hugo L. Deaton, MD**

*Hickory, NC*

**David S. Hubbell, MD**

*Saint Petersburg, FL*

**Loyde H. Hudson, MD**

*Fayetteville, AR*

**Allen S. Hudspeth, MD**

*Winston Salem, NC*

**Graydon A. Long, MD**

*Lexington, KY*

**Allen G. Macris, MD**

*Atlanta, GA*

**John L. Ochsner, MD**

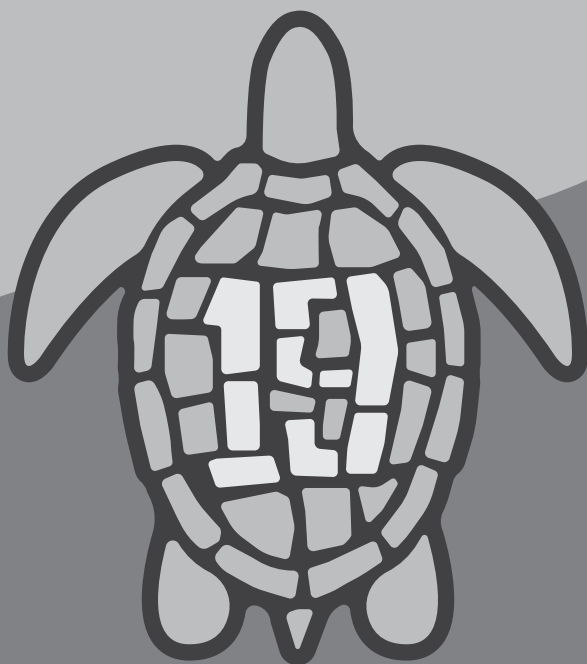
*New Orleans, LA*

**Timothy Takaro, MD**

*Asheville, NC*

**Joseph T. Walls, MD**

*Columbia, MO*



# CONSTITUTION AND BYLAWS

# CONSTITUTION AND BYLAWS

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## SOUTHERN THORACIC SURGICAL ASSOCIATION CONSTITUTION AND BYLAWS

(as amended November 10, 2017)

### CONSTITUTION

#### ARTICLE I: NAME

The name of the Corporation shall be the SOUTHERN THORACIC SURGICAL ASSOCIATION, INC. (hereinafter designated as "the Association").

#### ARTICLE II: OBJECTIVES

The Association is a not-for-profit corporation whose principle objectives are to disseminate knowledge and information and to stimulate progress in the field of thoracic and cardiovascular surgery in the designated geographic area. The mission of the organization is to: support southern and southern trained members of the cardiothoracic surgery community and their families in the pursuit of the highest quality patient care, education, scientific achievement, collegiality, and life balance.

The Association will:

1. Disseminate knowledge, encourage research and report at the annual meeting, scientific session and postgraduate course on the advancements within the field of thoracic and cardiovascular surgery.
2. Promote fellowship among thoracic and cardiovascular surgeons throughout the designated geographic area.
3. Assure that the activities of the Association are undertaken without any discrimination with regard to race, color, religious creed, national origin, ancestry, physical handicap, medical condition, marital status or sex.

#### ARTICLE III: OFFICES

The Association shall have and continuously maintain a registered office and a registered agent in the State of Illinois, and may have such other offices in or outside the State of Illinois at the Council's discretion.

#### ARTICLE IV: MEMBERS

**SECTION 1. Membership.** There shall be six (6) categories of members: Active, Senior, Candidate, Pre-Candidate, Associate, and Honorary Member. Members shall be individuals who support the purpose of the Association and who agree to comply with the Association's rules and regulations. Active and Senior members shall be entitled to hold office and shall have voting privileges. Active and Senior Members must be board certified by the American Board of Thoracic Surgery (ABTS) or its foreign equivalent. If an Active Member moves from the designated membership geographical area outlined in SECTION 2, he or she may retain membership as long as all other requirements for membership are satisfied. Members whose practices have been limited because of disability, or who have reached the age of 65 years, may apply for Senior Membership. The Association shall not be required to subscribe to The Annals of Thoracic Surgery for Senior members. Associate Members include support staff for practicing cardiothoracic surgeons including, but not limited to, nurses, nurse practitioners, perfusionists, physician assistants, and research staff. Honorary membership can be bestowed upon a worthy recipient

# CONSTITUTION AND BYLAWS

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upon recommendation of the Council and ratification by a two-thirds majority of the votes at the annual meeting. Honorary Members are broadly defined as physicians who have made significant contributions to the field of cardiothoracic surgery. Nomination for Honorary Membership can be made to the Council in writing for review prior to the spring Council Meeting. Honorary Members are welcomed at all scientific and business meetings of the Association, but have no obligations or responsibilities in the organization. Candidate Members must be matched or enrolled in a thoracic surgery educational program accredited by the Residency Review Committee for Thoracic Surgery under the authority of the Accreditation Council for Graduate Medical Education that is within the STSA region provided for in SECTION 2 to be classified as a Candidate Member. Candidate Members may retain membership up to three years following the completion of their thoracic surgery training. Candidate members who have been certified in thoracic surgery by the ABTS may, upon written request to the Association and with a letter of recommendation from an Active Member of STSA and approval of the Membership Committee and the Council, transition directly, with no initiation fee applied, to Active Membership. If no such official request is forthcoming, Candidate Membership will be terminated and reinstatement will be dependent upon a formal application for Active Membership, with its associated requirements, including initiation fee and approval by the full membership. Pre-Candidate Members may apply for membership by expressing a desire to enter the field of cardiothoracic surgery. Pre-Candidate Members may transfer to Candidate Member status once they have matched or enrolled in a thoracic surgery educational program accredited by the Residency Review Committee for Thoracic Surgery under the authority of the Accreditation Council for Graduate Medical Education that is within the STSA region.

**SECTION 2. Applicants.** An applicant for Active Membership must at the time of acceptance reside, or have previously practiced cardiothoracic surgery for at least one year, or have completed a thoracic or general surgery residency program, or have completed a thoracic or cardiovascular research or clinical fellowship for at least twelve consecutive months in one of the following states or regions: Alabama; Arkansas; Florida; Georgia; Kentucky; Louisiana; Maryland; Mississippi; Missouri; North Carolina; Oklahoma; South Carolina; Tennessee; Texas; Virginia; West Virginia; District of Columbia; the U.S. territories and commonwealths in the Caribbean. An applicant for active membership must be certified by the ABTS. Applicants who meet the practice requirement above but whose training has been in countries other than the United States of America, and who are certified as proficient in thoracic and cardiovascular surgery by appropriate authorities in their home country, may apply. At least seventy-five percent of the practice of the applicant must be devoted to the field of thoracic and cardiovascular surgery, which may include research and peripheral vascular surgery. If an applicant is unsuccessful in obtaining membership in two successive years, an interval of two years must elapse before he/she may reapply. The Membership Committee and the Council may recommend acceptance of foreign training and certification by stating that, in their opinion, it represents equivalent status. The Membership Committee and Council may recommend acceptance of individuals who, despite not meeting membership criteria regarding training, practice or research in the STSA region, have demonstrated significant involvement with the organization through their participation in the annual meeting, contributions to the scientific program, and service to the organization. Applicants so approved by the Membership Committee and the Council may become Active Members upon election by the membership at an annual meeting.

An applicant for Candidate Membership must at the time of acceptance be matched or enrolled in a thoracic surgery educational program accredited by the Residency Review Committee for Thoracic Surgery under the authority of the

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Accreditation Council for Graduate Medical Education in one of the following states or regions: Alabama; Arkansas; Florida; Georgia; Kentucky; Louisiana; Maryland; Mississippi; Missouri; North Carolina; Oklahoma; South Carolina; Tennessee; Texas; Virginia; West Virginia; District of Columbia; the U.S. territories and commonwealths in the Caribbean. Individuals who have completed their education in one of the above programs and are in the process of acquiring certification in thoracic surgery by the ABTS are eligible to apply for Candidate Membership.

An applicant for Associate Membership must at the time of acceptance be working in field of allied health related to the practice of cardiothoracic surgery in one of the following states or regions: Alabama; Arkansas; Florida; Georgia; Kentucky; Louisiana; Maryland; Mississippi; Missouri; North Carolina; Oklahoma; South Carolina; Tennessee; Texas; Virginia; West Virginia; District of Columbia; the U.S. territories and commonwealths in the Caribbean.

An applicant for Pre-Candidate Membership must at the time of acceptance be enrolled in medical school or general surgery residency in one of the following states or regions: Alabama; Arkansas; Florida; Georgia; Kentucky; Louisiana; Maryland; Mississippi; Missouri; North Carolina; Oklahoma; South Carolina; Tennessee; Texas; Virginia; West Virginia; District of Columbia; the U.S. territories and commonwealths in the Caribbean. They must submit a written statement of interest in cardiothoracic surgery.

Active Membership status will not become effective, nor a certificate of membership presented, unless and until such elected applicant registers at one of the next four annual meetings following his/her initial election to membership. Resident and Associate Membership status will not become effective, nor a certificate of membership presented, unless and until such elected applicant registers for and attends an annual meeting following his or her election to membership. Exception for this requirement may be granted by a majority vote of the Council. Failure to comply with this procedure will require reapplication for membership.

**SECTION 3. Applications.** Application forms for Active, Associate, Candidate and Pre-Candidate Membership are available from the Secretary/Treasurer or at [www.stsa.org](http://www.stsa.org) and are forwarded to the Chair of the Membership Committee for verification. Applications will be verified by the Membership Committee in accordance with the policies and procedures established by the Council.

**SECTION 4. Certificates.** The Council shall issue a Certificate of the Association evidencing the member's admission to the Association and indicating membership status. These certificates remain the sole property of the Association and shall be surrendered upon written demand and/or for non-payment of dues.

**SECTION 5. Resignation.** Members may resign from the Association at any time by giving written notice to the Secretary/Treasurer of the Association. Such resignation shall not relieve the member of any obligation for dues, assessments or other charges previously accrued and unpaid. Membership is not transferable or assignable.

**SECTION 6. Termination of Membership.** The Council, by affirmative vote of two-thirds of all Council members present and voting at any duly constituted meeting of the Council, may suspend or expel a member for cause after an appropriate hearing in accordance with policies and procedures established by the Council. The Council, by affirmative vote of a majority of all Council members present and voting at any duly constituted meeting of the Council may terminate the membership of any member who has become ineligible for membership in accordance with the policies and procedures established by the Council.

# CONSTITUTION AND BYLAWS

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**SECTION 7. Application for Reinstatement.** Any former members of the Association may apply for reinstatement through the regular application procedure.

## ARTICLE V: DUES AND ASSESSMENTS

The initiation and annual dues for each category of member of the Association, the time for paying such dues, and other assessments, if any, shall be determined by the Council. Annual dues are not refundable.

## ARTICLE VI: MEETING OF MEMBERS

**SECTION 1. Annual Meeting.** The annual meeting of the members shall be held at a date, time and place determined by the Council and shall be held in conjunction with the scientific session of the Association.

**SECTION 2. Purpose.** The purpose of the annual meeting is to: elect officers and councilors; receive reports from the Association on the activities of the Council; provide members an opportunity to express their opinions on matters affecting the Association; and to dispense with such other business, as necessary. The order of business for a meeting shall be determined in advance by the President and subsequently adopted at a called meeting.

**SECTION 3. Special Meetings.** Special meetings of the membership may be called by the President or the Council. Such special meetings shall be held at a date, time and place as determined by the Council.

**SECTION 4. Notice of Meetings.** Written notice stating the date, time and place of any annual or special meeting shall be delivered no less than seven (7) days, nor more than 30 days, before the date of the meeting to each member entitled to vote at the meeting. In the case of removal of one or more Council members, a merger, consolidation, dissolution or sale of assets, a written notice of no less than twenty (20) days or more than sixty (60) days before the date of the meeting will be given by, or at the direction of, the President, the Secretary, or the Council.

**SECTION 5. Quorum.** The quorum for the transaction of business at a meeting of members or special meeting shall be a majority of the members attending that meeting.

**SECTION 6. Voting.** Each member with voting rights shall be entitled to only one (1) vote. A majority of the votes present at a meeting where a quorum is present shall be necessary for the adoption of any matter voted upon by the members, except where otherwise provided by law, the articles of incorporation of the Association or these bylaws.

**SECTION 7. Informal Action.** Required action may be taken without a meeting if a consent in writing, setting forth the action taken, is signed by not less than the minimum number of members necessary to authorize such action at a meeting, except for dissolution of the Association, which must be voted on at a special meeting of the members entitled to vote.

## ARTICLE VII: OFFICERS AND THE COUNCIL

**SECTION 1. General Powers.** The property, business and affairs of the Association shall be managed by the Council. The Council may adopt such rules and regulations for the conduct of its business as shall be deemed advisable and may, in the execution of the power granted, appoint such agents as necessary.



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In addition, the Council shall act as a Board of Censors for the trial of all alleged offenses against the bylaws. A report by the Chair of the Council shall be made to the members at the annual meeting.

**SECTION 2. Number, Tenure and Qualifications.** The Council shall consist of the Past President, the Chair of the Council (Immediate Past President), the President, the President-Elect, the Vice President, the Secretary/Treasurer, the Director of Continuing Medical Education, the Historian and three Councilors-at-Large. The representative of the Board of Governors of the American College of Surgeons, representative of the Advisory Council for Cardiothoracic Surgery of the American College of Surgeons, the Editor of the Annals of Thoracic Surgery, the Chair of the Program Committee, the Chair of the Membership Committee, the Chair of the Postgraduate Program Committee, and the Chair of the Finance Committee shall attend the Council meetings without vote.

**SECTION 3. Election.** The eligible members will elect the Council. Officers shall be elected annually to serve a one-year term, except the Secretary/Treasurer whose term shall be for four years and the historian whose term shall be for four years and who can be re-elected. The President, Vice President and Secretary/Treasurer are not eligible for re-election. The term of office of councilors-at-large shall be two years. Two Councilors shall be elected one-year and one Councilor the next year to replace the retiring members, unless a vacancy or vacancies has occurred, in which case an additional Councilor(s) shall be appointed by the President to fill the vacant term(s).

**SECTION 4. Resignation.** Any Council member may resign at any time by giving written notice to the President. Such resignation shall take effect when the notice is delivered, unless the notice specifies a future date. Another exception would be, unless otherwise specified therein, the acceptance of such resignation shall not be necessary to make it effective.

**SECTION 5. Annual Meetings.** The annual meeting of the Council shall be held at the time and place designated by the Council in connection with the annual members meeting.

**SECTION 6. Regular Meetings.** The Council may hold regular meetings at such place and at such times as designated by the Council.

**SECTION 7. Special Meetings.** Special meetings of the Council may be held at any place and time on the call of the President or at the request in writing of any three Council members.

**SECTION 8. Notice of Meetings.** Notice of special meetings of the Council shall be delivered by, or at the direction of, the Secretary/Treasurer to each Council member at least seven (7) days before the day on which the meeting is to be held. Notice may be waived in writing by a Council member, either before or after the meeting. Neither the business to be transacted at, nor the purpose of any special meeting of the Council, need be specified in the notice or waiver of notice of such meeting.

**SECTION 9. Quorum.** A majority of the Council members entitled to vote shall constitute a quorum for the transaction of business at any meeting of the Council.

**SECTION 10. Manner of Acting.** The act of a majority of the Council members at a meeting at which a quorum is present shall be the act of the Council, unless the act of a greater number is required by law, the articles of incorporation, or by these bylaws.

# CONSTITUTION AND BYLAWS

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**SECTION 11. Informal Action.** Action may be taken by the Council without a meeting if a consent in writing, setting forth the action so taken, is signed by all the Council members.

**SECTION 12. Participation at Meetings by Conference Telephone.** Members of the Council, or of any committee designated by the Council, may take any action permitted or authorized by these bylaws by means of conference telephone, or similar telecommunications equipment, in which all persons participating in the meeting can communicate with each other. Participation in such a meeting shall constitute presence in person at such meeting.

**SECTION 13. Compensation.** Council members, as such, shall not receive any stated compensation for their services on the Council, but the Council may, by resolution, authorize reimbursement for reasonable expenses incurred in the performance of their duties. The Council will occasionally review the reimbursement policies.

## ARTICLE VIII: OFFICERS AND EXECUTIVE DIRECTOR

**SECTION 1. Officers.** The officers of the Association shall consist of the President, the President-Elect, the Vice President, the Secretary/Treasurer, the Chair (Immediate Past President), the Past President, the Historian, and such other officers and assistant officers as may be elected in accordance with the provisions of this Article. The Council may elect or appoint such other officers as it shall deem necessary. These officers shall have the authority to perform such duties as may be prescribed from time-to-time by the Council.

**SECTION 2. President.** The President shall be the principal elected officer of the Association. The President shall preside at all meetings of the Association. The President shall appoint members to the standing committees and to any other special committee, which may be deemed necessary for the welfare of the association. The President shall perform all other duties appropriate to the conduct of the office. At the conclusion of the annual meeting, the retiring President shall automatically become a Councilor for a two-year term of office in the capacity of Chair the first year and Past President the second year.

**SECTION 3. President-Elect.** The President-Elect shall participate in all the meetings and deliberations of the Council during the year elected and shall accede to the office of President the following year.

**SECTION 4. Vice President.** In the absence of the President, or in the event of his or her inability or refusal to act, the Vice President shall perform the duties of the President. When so acting, the Vice-President shall have all the powers, and be subject to all the restrictions, of the President. The Vice President shall perform such other duties as may be assigned by the President or by the Council.

**SECTION 5. Secretary/Treasurer.** As Secretary he/she shall: keep the minutes of the meetings of the members and of the Council in one or more books provided for that purpose; see that all notices are duly given in accordance with the provisions of these bylaws, or as required by law; be custodian of the Council's records; keep a register of the post office address of each member, which shall be furnished to the Secretary by such member; notify candidates of their election to membership; and in general perform all duties incident to the office of Secretary, and such other duties that may be assigned by the President or by the Council. The administrative duties of the Secretary may be assigned, in whole or in part, to the Executive Director by the Council.

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As Treasurer, he/she shall keep an account of all monies received and expended by the Association and shall make disbursements authorized by the Council. All sums received shall be deposited or invested in such bank, trust company, or other depositories authorized by the Council. The Treasurer shall perform all the duties incident to the office of Treasurer and such other duties as may be assigned by the President or by the Council. The administrative duties of the Treasurer may be assigned, in whole or in part by the Council, to the Executive Director. He/she shall present an annual report to the membership for audit.

**SECTION 6. Secretary/Treasurer-Elect.** The Secretary/Treasurer-Elect shall serve as understudy to the Secretary/Treasurer for a term of one year.

**SECTION 7. Chair.** The immediate Past President shall be the Chair of the Council and perform such duties as occasionally may be designated by the President or by the Council. Upon termination of the term of office as President, the President shall become Immediate Past President for a one-year term.

**SECTION 8. Past President.** The Past President shall serve on the Council and perform such duties as may be designated by the President, Chair of the Council, or by the Council. Upon termination of the term of office as Immediate Past President, the Immediate Past President shall become Previous Past President for a one year term.

**SECTION 9. Director of Continuing Medical Education.** The Director of Continuing Medical Education shall be appointed by the President for a term of four years and shall oversee and coordinate the Program and Postgraduate Programs, and the administration aspects of continuing education, and chair the Continuing Education Committee.

**SECTION 10. Executive Director.** The administrative duties and day-to-day operation of the Association shall be conducted by a salaried staff head or firm employed or appointed by the Council. The Executive Director shall be responsible to the Council. The Executive Director shall have the authority to execute contracts on behalf of the Association and as approved by the Council. The Executive Director may carry out the duties of the Secretary of the Association and may carry out the duties of the Treasurer as directed by the Council. The Executive Director shall employ and may terminate the employment of staff members necessary to carry out the work of the Association and shall perform such other duties as may be specified by the Council.

**SECTION 11. Historian.** The Historian shall record the history of the Association, keep archives of the programs and minutes of the Business and Council meetings, and report the deaths of members at the annual business meeting. In addition, he/she shall perform all other duties appropriate to this office and other duties assigned by the President for Council.

## **ARTICLE IX: COMMITTEES**

The President shall appoint committees as may be necessary for the proper conduct and management of the Association. The standing Committees of the Association shall be:

**SECTION 1. Executive Committee.** The Executive Committee shall consist of the officers of the Association and the Executive Director. The Executive Director shall be ex-officio, a member of the Executive Committee without the right to vote. The Executive Committee may exercise the authority of the Council in the management of the affairs of the Association during the intervals between meetings of the Council, subject at all times to the bylaws of the Association, and the prior resolutions,

# CONSTITUTION AND BYLAWS

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regulations and directives issued, adopted or promulgated by the Council.

A majority of the members of the Executive Committee shall constitute a quorum for the transaction of business. Meetings may be called by the President or by any two Executive Committee members.

**SECTION 2. Program Committee.** The Program Committee shall consist of the President, the Director of Continuing Medical Education, the Secretary/Treasurer, the Council Chair, and additional members appointed to the Program Committee. Appointment to the Program Committee shall be for a period of three years. Appointment(s) to this committee shall be made by the President each year. The senior members of the appointed members shall serve as Co-Chairs. It shall be the duty of the committee to review the abstracts of scientific papers submitted by the members and arrange the program for the annual meeting. Seventy-five percent or more of abstracts presented during the regular scientific program the STSA Annual Meeting should include a member of the association as an author.

**SECTION 3. Postgraduate Program Committee.** The Postgraduate Program Committee shall consist of the Director of Continuing Medical Education and appointed members. Appointments to the Postgraduate Program Committee shall be for a period of three years. Appointments to this committee shall be made by the President each year. The senior members of the appointed members of the committee shall serve as Co-Chairs. It shall be the duty of this committee to arrange a Postgraduate Continuing Medical Education Program to cover broad and varied aspects of thoracic surgery to be presented at the time of the annual meeting.

**SECTION 4. Membership Committee.** This committee shall consist of four members. Appointment to the Membership Committee shall be for a period of four years. One new appointee to this committee shall be made by the President each year. The senior member of the committee shall serve as Chair. This committee shall receive applications for membership in the association and after consideration of the applicants may propose them to the Council for approval and to the membership for election.

**SECTION 5. Continuing Medical Education Committee.** This committee shall consist of the Chair of the Postgraduate Committee, the Chair of the Program Committee, and the Director of Continuing Medical Education who shall serve as Chair. It shall be the duty of this committee to set up the objectives of the next annual meeting with the said objectives being presented for approval by the Council at their interim meeting and forwarded to members prior to the annual meeting.

**SECTION 6. Nominating Committee.** This committee shall consist of the four Immediate Past Presidents with the most senior Past President serving as Chair. This committee shall prepare a slate of nominees for officers and Councilors for the following year. This report is submitted to the organization at its annual meeting. The recommendations of the Nominating Committee are not intended to exclude direct nominations from the floor.

**SECTION 7. Scholarship Committee.** This committee shall consist of five members. Appointment to the Scholarship Committee shall be for a period of four years. One new appointee to this committee shall be made by the President each year. The senior member of the committee shall serve as Chair. This committee shall receive applications for all STSA sponsored scholarship programs and after consideration of the applicants may propose scholarship recipients and finalists to the Council for approval.

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**SECTION 8: Finance Committee.** The Finance Committee shall consist of the President-Elect, President, Secretary/Treasurer, Past-President and three (3) members appointed by the Council. The Chair will be appointed by the Executive Committee and will not be a current member of that committee. Each appointed member shall serve for a three-year term, beginning at the time of appointment; provided that the terms of the members appointed by the Council effective January 2018 shall be staggered in such a manner that the initial term of one-third of the appointed members will end at the conclusion of the 2018 STSA Annual Meeting; that the initial term of one-third of the appointed members will end at the conclusion of the 2019 STSA Annual Meeting; that the initial term of one-third of the appointed members term end at the conclusion of the 2020 STSA Annual Meeting. Each appointed member may serve a maximum of two full three-year terms. The Committee shall be responsible for the financial oversight of the Association ensuring its long term financial viability in accordance with the strategic plan established by the Council.

**SECTION 9: Other Committees.** Other committees may be designated by a resolution adopted by a majority of the Council present at a meeting at which a quorum is present (Ad Hoc Committees may be designated by the President with approval of the Council). Except as otherwise provided in such resolution, members of each committee shall be members of the Association, and the President of the Association shall appoint the members thereof. Any member may be removed by the person or persons authorized to appoint such member whenever in their judgment the best interests of the Association shall be served by such removal.

**SECTION 10. Term of Office.** Each member of a committee shall continue as such until the next annual meeting of the Council or until a successor is appointed, unless the committee is terminated, or the member is removed from the committee, ceases to qualify as a member, or the member resigns from the committee.

**SECTION 11. Vacancies.** Vacancies in the membership of any committee may be filled by appointments made in the same manner as provided in the case of the original appointments.

**SECTION 12. Quorum.** Unless otherwise provided in the resolution of the Council designating a committee, a majority of any committee shall constitute a quorum for committee action. The act of a majority of committee members present and voting at a meeting, at which a quorum is present, shall be the act of the committee.

**SECTION 13. Participation at Meetings by Conference Telephone.** Committee members may participate in and act at any committee meeting through the use of a conference telephone or other communications equipment by means of which all persons participating in the meeting can communicate with each other. If the Chair of a committee so orders, participation in such meetings shall constitute attendance at the meeting.

**SECTION 14. Meetings of Committees.** Subject to action by the Council, each committee by a majority vote of its members shall determine the time and place of meetings and the notice required.

**SECTION 15. Informal Action.** Any action required or taken at a meeting of a committee may be taken without a meeting if a consent in writing, setting forth the action so taken, is signed by all of the committee members.

**SECTION 16. Rules.** Each committee may adopt rules for its own government not inconsistent with these bylaws or with rules adopted by the Council.

# CONSTITUTION AND BYLAWS

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## ARTICLE X: OFFICIAL ORGAN

The Annals of Thoracic Surgery shall be the official publication of the Southern Thoracic Surgical Association. Papers read before the Association shall be forwarded to the Editor of The Annals of Thoracic Surgery for consideration for publication at the time requested by the Program Committee Chair and Editor of The Annals.

## ARTICLE XI: CONTRACTS, CHECKS, DEPOSITS AND FUNDS, BONDING

**SECTION 1. Contracts.** The Council may authorize any officer or officers, agent or agents of the Association, in addition to the officers so authorized by these bylaws, to enter into any contract or execute and deliver any instrument in the name of, and on behalf of, the Association. Such authority may be general or confined to specific instances.

**SECTION 2. Depositories.** All funds of the Association not otherwise employed shall be deposited to the credit of the Association in such banks, trust companies or other depositories as the Council may designate.

**SECTION 3. Checks, Drafts, Notes, Etc.** All checks, drafts or other orders for the payment of money and all notes or other evidences of indebtedness issued in the name of the Association shall be signed by such officer or officers, or agent or agents, of the Association and in such manner as shall be determined by resolution of the Council.

**SECTION 4. Bonding.** The Council shall provide for the bonding of such officers and employees of the Association, as needed.

**SECTION 5. Delivery of Notice.** Any notices required to be delivered pursuant to these bylaws shall be deemed to be delivered when transferred or presented in person or deposited in the United States mail addressed to the person at his/her or its address as it appears on the records of the Association, with sufficient first-class postage prepaid thereon.

**SECTION 6. Investments.** Unless otherwise specified by the terms of a particular gift, bequest or devise, grant or other instrument, the funds of the Association may be invested, in such manner as the Council may deem advantageous, without regard to restrictions applicable to trusts or trust funds.

## ARTICLE XII: BOOKS AND RECORDS

The Association shall keep correct and complete books and records of accounts and shall also keep minutes of the proceedings of its members, Council, and committees having any of the authority of the Council, and shall keep at the registered or principal office a record giving the names and addresses of the members entitled to vote. All books and records of the Association may be inspected by any member, or his or her agent or attorney, for any proper purpose at any reasonable time.

## ARTICLE XIII: FISCAL YEAR

The fiscal year of the Association shall be established by the Council.

## ARTICLE XIV: WAIVER OF NOTICE

Whenever any notice is required to be given under the provisions of the General

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Not For Profit Corporation Act of the State of Illinois or under the provisions of the articles of incorporation or the bylaws of the Association, a waiver in writing signed by the person or persons entitled to such notice, whether before or after the time stated therein, shall be deemed equivalent to the giving of such notice. Attendance at any meeting shall constitute waiver of notice unless the person at the meeting objects to the holding of the meeting because proper notice was not given.

## **ARTICLE XV: INDEMNIFICATION OF DIRECTORS, OFFICERS, EMPLOYEES AND AGENTS; INSURANCE**

**SECTION 1. Right to Indemnification.** Each person who was or is a party or is threatened to be made a party to, or is involved in, any action, suit or proceeding—whether civil, criminal, administrative or investigative—by reason of the fact that he/she, or a person of whom he/she is the legal representative, is or was a director, officer, employee or agent of the Association, or is or was serving at the request of the Association, shall be indemnified and held harmless by the Association to the fullest extent authorized by the laws of Illinois against all costs, charges, expenses, liabilities and losses reasonably incurred or suffered by such person in connection with and such indemnification shall continue to a person who has ceased to be associated with the Association. This includes attorneys' fees, judgments, fines, ERISA excise taxes or penalties and amounts paid, or to be paid, in settlement. The right to indemnification conferred in this Article XV shall be a contract right and shall include the right to be paid by the Association the expenses incurred in defending any such proceeding in advance of its final disposition. For the purpose of determining the reasonableness of indemnifiable expenses, the fees and expenses of separate counsel from counsel for the Association, or other joint defendants being indemnified by the Association, shall not be indemnifiable unless there exists a bonafide conflict of interest.

**SECTION 2. Right of Claimant to Bring Suit.** If a claim under Section 1 of Article XV is not paid in full by the Association within a reasonable amount of time after a written claim has been received by the Association, the claimant may at any time thereafter bring suit against the Association to recover the unpaid amount of the claim and, if successful in whole or in part, the claimant shall also be entitled to be paid the expenses of prosecuting such a claim. It shall be a defense to any action that the claimant has failed to meet a standard of conduct which makes it permissible under Illinois law for the Association to indemnify the claimant for the amount claimed. But the burden of proving such defense shall be on the Association.

**SECTION 3. Non-Exclusive of Rights.** The right to indemnification and the payment of expenses incurred in defending a proceeding in advance of its final disposition conferred in Article XV shall not be exclusive of any other right which any person may have or hereafter acquire under any statute, provision of the articles of incorporation, bylaws, agreement, vote of members or disinterested directors or otherwise.

**SECTION 4. Insurance.** The Association shall maintain insurance to the extent of availability at commercial reasonable rates, at its expense, to protect itself and any director, officer, employee or agent of the Association or another corporation, partnership, joint venture, trust or other enterprise against any expense, liability or loss, whether or not the Association would have the power to indemnify such person against such expense, liability or loss under Illinois law.

**SECTION 5. Expenses as a Witness.** To the extent that any director, officer, employee or agent of the Association is by reason of such position, or a position with another entity at the request of the Association, a witness in any proceeding, he shall be indemnified against all costs and expenses actually and reasonably incurred by him or on his behalf in connection therewith.

# CONSTITUTION AND BYLAWS

**SECTION 6. Notification.** If the Association has paid indemnity or has advanced expenses under this Article XV to a director, officer, employee or agent, the Association shall report the indemnification or advance in writing to the members with or before the notice of the next meeting of the members.

**SECTION 7. Effect of Amendment.** Any amendment, repeal or modification of any provision of this Article XV by the members or the directors of the Association shall not adversely affect any right or protection of a director or officer of the Association existing at the time of such amendment, repeal or modification.

## ARTICLE XVI: DISSOLUTION

Upon the dissolution of the Association, and after payment of all indebtedness of the Association, any remaining funds, investments and other assets of the Association shall be distributed to such organization or organizations which are then qualified as exempt from taxation under Section 501(c) 6 of the Internal Revenue Code of 1986, as amended (or the corresponding provision of any future Internal Revenue Law of the United States). This distribution shall only occur if the purposes and objectives of such organization(s) are similar to the purposes and objectives of the Association, as may be determined by vote of the then voting members of the Association.

## ARTICLE XVII: AMENDMENTS

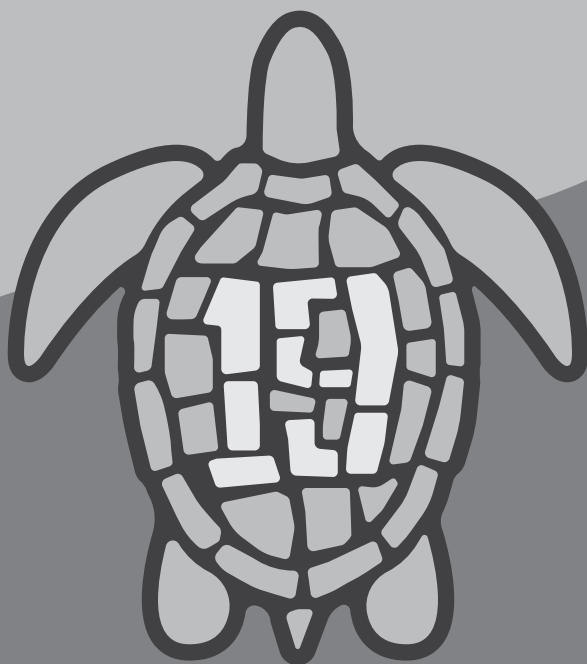
These bylaws may be altered, amended, or repealed at the time of the annual meeting by a two-thirds vote of the membership present, provided that the amendment has been presented to the membership in writing at least 30 days prior to the time of the annual meeting.

## ARTICLE XVIII: PARLIAMENTARY AUTHORITY

The deliberations of the Association, Council, and committees shall be governed by the parliamentary rules and usages contained in the then current edition of "Roberts Rules of Order, Newly Revised", when not in conflict with the bylaws of the Association.







# RELATIONSHIP DISCLOSURE INDEX

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## COMMERCIAL DISCLOSURE STATEMENTS OF PROGRAM PLANNERS

**STSA would like to thank the following STSA leaders for planning the educational content of the STSA 66th Annual Meeting. Unless otherwise noted, these STSA leaders have no relevant commercial relationships to disclose.**

### **Commercial Relationships of STSA 66th Annual Meeting Program Planners**

**J. Jacobs:** Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare; **K. Accola:** Consultant/Advisory Board: Edwards Lifesciences; Speakers Bureau/Honoraria: Edwards Lifesciences; **G. Ailawadi:** Consultant/Advisory Board: Abbott, Edwards Lifesciences, North American Advisory Board, Medtronic; **S. Blackmon:** Consultant/Advisory Board: Olympus; Research Grant: Medtronic, truFreeze; **M. Bott:** Consultant/Advisory Board: AstraZeneca; **D. Jones:** Consultant/Advisory Board: AstraZeneca, Merck; **S. LeMaire:** Consultant/Advisory Board: Acer Therapeutics, Biom'up; Other Research Support: CytoSorbents, Terumo Aortic, W. L. Gore & Associates; **O. Preventza:** Consultant/Advisory Board: Terumo Aortic, W. L. Gore & Associates; **A. Speir:** Consultant/Advisory Board: Atricure, Medtronic; **V. Thourani:** Consultant/Advisory Board: Abbott Vascular, Boston Scientific, Edwards Lifesciences; Research Grant: Abbott Vascular, Boston Scientific, Edwards Lifesciences

**DJeffrey P. Jacobs:** *President, Program Committee, Postgraduate Committee*

**Joseph A. Dearani:** *Program Committee Co-Chair*

**Daniela Molena:** *Program Committee Co-Chair*

**DMatthew J. Bott:** *Postgraduate Committee Co-Chair*

**Ahmet Kilic:** *Program Committee, Postgraduate Committee Co-Chair*

**DKevin D. Accola:** *Program Committee, Postgraduate Committee*

**DGorav Ailawadi:** *Postgraduate Committee*

**Vinay Badhwar:** *Program Committee*

**DShanda H. Blackmon:** *Program Committee*

**Mark I. Block:** *Postgraduate Committee*

**Harold M. Burkhart:** *Program Committee*

**J. Michael DiMaio:** *Program Committee*

**DDavid R. Jones:** *Program Committee*

**Damien J. LaPar:** *Postgraduate Committee*

**Christine L. Lau:** *Program Committee*

**DScott A. LeMaire:** *Program Committee, Postgraduate Committee, CME Committee Director*

**DOurania Preventza:** *Program Committee*

**Todd K. Rosengart:** *Postgraduate Committee*

**DAlan M. Speir:** *Program Committee, Postgraduate Committee*

**James D. St. Louis:** *Program Committee*

**DVinod H. Thourani:** *Program Committee, Postgraduate Committee*

**Stephen C. Yang:** *Program Committee*

## COMMERCIAL DISCLOSURE STATEMENTS OF STSA OFFICERS, COUNCIL AND COMMITTEE MEMBERS

**STSA would like to thank the following leaders for supporting the STSA 66th Annual Meeting as a member of the STSA Council and/or other STSA Committee. Unless otherwise noted, the STSA Officers, Council and Committee Members have no relevant commercial relationships.**

### **Commercial Relationships of STSA Officers, Council and Committee Members**

**J. Jacobs:** Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare; **K. Accola:** Consultant/Advisory Board: Edwards Lifesciences; Speakers Bureau/Honoraria: Edwards Lifesciences; **G. Ailawadi:** Consultant/Advisory Board: Abbott, Edwards Lifesciences, North American Advisory Board, Medtronic; **F. Bakaeen:** Consultant/Advisory Board: JACE Medical; **S. Blackmon:** Consultant/

# RELATIONSHIP DISCLOSURE INDEX

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Advisory Board: Olympus; Research Grant: Medtronic, truFreeze; **M. Bott:** Consultant/Advisory Board: AstraZeneca; **D. Jones:** Consultant/Advisory Board: AstraZeneca, Merck; **M. Kim:** Other: Intuitive Surgical, Medtronic, Veran Medical; **S. LeMaire:** Consultant/Advisory Board: Acer Therapeutics, Biom'up; Other Research Support: CytoSorbents, Terumo Aortic, W. L. Gore & Associates; **O. Preventza:** Consultant/Advisory Board: Terumo Aortic, W. L. Gore & Associates; **A. Speir:** Consultant/Advisory Board: Atricure, Medtronic; **V. Thourani:** Consultant/Advisory Board: Abbott Vascular, Boston Scientific, Edwards Lifesciences; Research Grant: Abbott Vascular, Boston Scientific, Edwards Lifesciences; **J. Zwischenberger:** Consultant/Advisory Board: Cytosorbents, Inc.; Ownership Interest: Avalon; Research Grant: National Institutes of Health

## 2019 STSA Officers and Council

**D**Jeffrey P. Jacobs, President  
**D**Vinod H. Thourani, President-Elect  
**D**Alan M. Speir, Vice President  
**D**Shanda H. Blackmon, Secretary/Treasurer  
**D**Kevin D. Accola, Council Chair  
**D**David R. Jones, Past President  
**D**Faisal G. Bakaeen, Councilor  
**M**elanie A. Edwards, Councilor  
**T**. Brett Reece, Councilor  
**D**Scott A. LeMaire, Continuing Medical Education Director  
**J**ohn W. Hammon, Historian  
**G**. Alexander Patterson, Editor

## 2019 STSA Committee Members

### Program Committee

Joseph A. Dearani (Co-Chair)  
**D**Daniela Molena (Co-Chair)  
**D**Jeffrey P. Jacobs  
**D**Kevin D. Accola  
Vinay Badhwar  
**D**Shanda H. Blackmon  
Harold M. Burkhardt  
J. Michael DiMaio  
**D**David R. Jones  
Christine L. Lau  
**D**Scott A. LeMaire  
**D**Ourania Preventza  
**D**Alan M. Speir  
James D. St. Louis  
**D**Vinod H. Thourani  
Stephen C. Yang

### Membership Committee

Andrew J. Lodge (Chair)  
James J. Gangemi  
W. Brent Keeling  
Hugh M. van Gelder

---

### **Postgraduate Committee**

**D**Matthew J. Bott (Co-Chair)

Ahmet Kilic (Co-Chair)

**D**Kevin D. Accola

**D**Gorav Ailawadi

Mark I. Block

**D**Jeffrey P. Jacobs

Damien LaPar

**D**Scott A. LeMaire

Todd K. Rosengart

**D**Alan M. Speir

**D**Vinod H. Thourani

### **Finance Committee**

Mark S. Slaughter (Chair)

**D**Kevin D. Accola

**D**Shanda H. Blackmon

S. Adil Husain

**D**Jeffrey P. Jacobs

Richard Lee

Thoralf M. Sundt

**D**Vinod H. Thourani

### **Continuing Medical Education Committee**

**D**Scott A. LeMaire (Director)

**D**Matthew J. Bott

Joseph A. Dearani

Ahmet Kilic

Daniela Molena

### **Representative to the Board of Governors of the American College of Surgeons**

**D**Joseph B. Zwischenberger

### **Representative to the Advisory Council for Cardiothoracic Surgery for the American College of Surgeons**

Stephen C. Yang

### **Representative to the STS/ACS Surgical Quality Accreditation for General Thoracic Surgery**

Richard K. Freeman

### **Nominating Committee**

John H. Calhoon (Chair)

**D**Kevin D. Accola

Andrea J. Carpenter

**D**David R. Jones

Scholarship Committee

Jennifer S. Nelson (Chair)

Mara B. Antonoff

Thomas M. Beaver

**D**Min Kim

Anastasios Polimenakos

### ***The Annals of Thoracic Surgery***

G. Alexander Patterson

# RELATIONSHIP DISCLOSURE INDEX

## COMMERCIAL RELATIONSHIPS OF ABSTRACT REVIEWERS

**STSA would like to thank the following leaders for reviewing the abstracts submitted for consideration for presentation at the STSA 66th Annual Meeting. Unless otherwise noted, the abstract reviewers have no relevant commercial relationships.**

**K. Accola:** Consultant/Advisory Board: Edwards Lifesciences; Speakers Bureau/Honoraria: Edwards Lifesciences; **G. Arnaoutakis:** Consultant/Advisory Board: Bolton Medical; **F. Bakaeen:** Consultant/Advisory Board: JACE Medical; **S. Blackmon:** Consultant/Advisory Board: Olympus; Research Grant: Medtronic, truFreeze; **M. Bott:** Consultant/Advisory Board: AstraZeneca; **F.C. Bryan:** Speakers Bureau/Honoraria: Edwards Lifesciences; **E. Chen:** Speakers Bureau/Honoraria: Medtronic; **J. Edgerton:** Speakers Bureau/Honoraria: Atricure; **J. Jacobs:** Consultant/Advisory Board: American Academy of Dermatology, SpecialtyCare; **M. Kim:** Other: Intuitive Surgical, Medtronic, Veran Medical; **S. LeMaire:** Consultant/Advisory Board: Acer Therapeutics, Biom'up; Other Research Support: CytoSorbents, Terumo Aortic, W. L. Gore & Associates; **B. Leshnower:** Speakers Bureau/Honoraria: Medtronic; **H. Merritt:** Consultant/Advisory Board: Atricure; Speakers Bureau/Honoraria: Atricure; **A. Parsons:** Ownership Interest: BeeWell; **O. Preventza:** Consultant/Advisory Board: Terumo Aortic, W. L. Gore & Associates; **V. Thourani:** Consultant/Advisory Board: Abbott Vascular, Boston Scientific, Edwards Lifesciences; Research Grant: Abbott Vascular, Boston Scientific, Edwards Lifesciences; **J. Turek:** Consultant/Advisory Board: BioStable Science and Engineering; **G. Wheatley, III:** Consultant/Advisory Board: Ethicon, Medeon, Medtronic, Terumo Aortic

**D**Kevin D. Accola  
Bahaaldin Alsoufi  
Mara B. Antonoff  
**D**George Arnaoutakis  
Vinay Badhwar  
**D**Faisal G. Bakaeen  
**D**Shanda H. Blackmon  
Mark I. Block  
**D**Matthew J. Bott  
Alejandro Bribriesco  
Paul S. Brown  
**D**F. Curtis Bryan  
Harold M. Burkhardt  
Philip W. Carrott  
**D**Edward P. Chen  
Joel S. Corvera  
Robert J. Dabal  
Mani A. Daneshmand  
Joseph A. Dearani  
Subrato J. Deb  
Ali Dodge-Khatami  
Basil Nasir  
**D**Alden M. Parsons  
Anastasios C. Polimenakos  
**D**Ourania Preventza  
T. Brett Reece  
J. Matthew Reinersman  
Edward B. Savage  
James D. St. Louis

Melanie A. Edwards  
**D**James R. Edgerton  
Richard K. Freeman  
Kristopher M. George  
Ravi K. Ghanta  
D. Tyler Greenfield  
Stephen R. Hazelrigg  
Dawn S. Hui  
Mark D. Iannettoni  
**D**Jeffrey P. Jacobs  
Lauren C. Kane  
W. Brent Keeling  
**D**Min P. Kim  
Russell R. Kraeger  
Christine L. Lau  
**D**Scott A. LeMaire  
**D**Bradley G. Leshnower  
**D**HelenMari L. Merritt  
Joseph I. Miller  
Daniela Molina  
Ezequiel J. Molina  
Randy M. Stevens  
James R. Stewart  
Thoralf M. Sundt  
**D**Vinod H. Thourani  
**D**Joseph W. Turek  
Hugh van Gelder  
**D**Grayson H. Wheatley, III  
Stephen C. Yang

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## COMMERCIAL RELATIONSHIPS OF STSA STAFF

**Unless otherwise noted, staff members have no relevant commercial relationships.**

**Beth Winer:** *Executive Director*

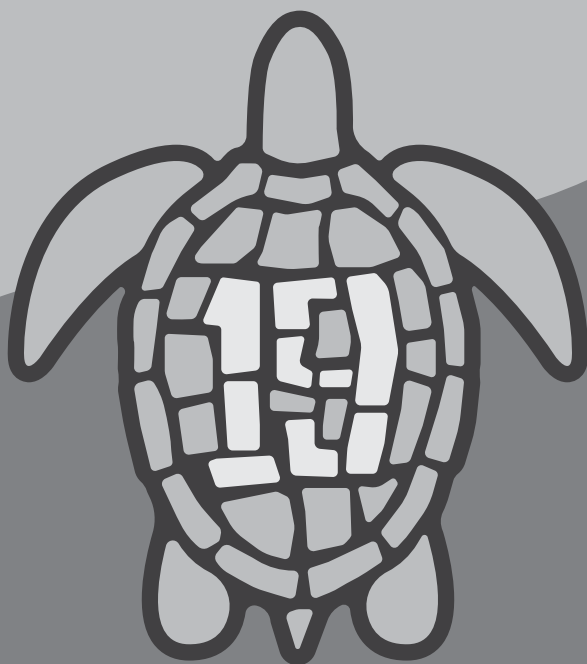
**Laura Medek:** *Affiliate Manager*

**Rachel Pebworth:** *Affiliate Manager*

**Maricruz Carreno:** *Affiliate Organizations Coordinator*

**Sarah O'Brien:** *Senior Manager, Meetings & Conventions*

**Megan Reichstein:** *Exhibit Manager*



# PROGRAM PARTICIPANTS



# PROGRAM PARTICIPANTS

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# TERMINATE AF CLINICAL TRIAL **NOW ENROLLING IN THE U.S.**



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