VISION
Build the foundation for the next generation of Cardiothoracic Surgeons

MISSION
Educate in a collegial environment

FUTURE MEETINGS

42ND ANNUAL MEETING
June 22–25, 2016
Hilton Waikoloa Village
Waikoloa, Hawaii

43RD ANNUAL MEETING
June 21–24, 2017
Broadmoor
Colorado Springs, Colorado
**41st ANNUAL MEETING**
**June 24–27, 2015**

*(Founded as the Samson Thoracic Surgical Society)*

*These sections available on-site in Whistler, British Columbia, or by logging into the Members Only Area of the WTSA Website at westernthoracic.org/members.*

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OFFICERS AND COUNCIL

President
Michael S. Mulligan
Seattle, Washington

Vice President, & Representative to the Board of Governors, American College of Surgeons
John D. Mitchell
Aurora, Colorado

Immediate Past President
Thomas A. Burdon
Stanford, California

Secretary
Patricia A. Thistlethwaite
La Jolla, California

Treasurer
Joseph C. Cleveland, Jr.
Aurora, Colorado

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Calgary, Alberta

Mark T. Metzdorff (2015)
Elmira, New York

Richard I. Whyte (2017)
Boston, Massachusetts

Councillor/Founder
Arthur N. Thomas
Hillsborough, California

Historian
Marvin Pomerantz
Tucson, Arizona

Editor
Richard D. Weisel
Toronto, Ontario
2015–2016 COMMITTEES

INDUSTRY RELATIONS COMMITTEE

James I. Fann, Chair (2016)
Robbin G. Cohen (2016)
Steven R. DeMeester (2016)
Sean C. Grondin (2016)
John R. Mehall (2016)
Surindra N. Mitruka (2016)
Michael S. Mulligan (2016)

LOCAL ARRANGEMENTS COMMITTEE

Leah M. & Jeffrey Backhus, Co-Chairs
Susan D. Moffatt-Bruce, Samson Fun Run
Joseph C. Cleveland, Jr., Golf Tournament
Richard I. Whyte, Tennis Tournament

MEMBERSHIP COMMITTEE

Sean C. Grondin, Chair (2017)
Anthony D. Caffarelli (2017)
Brian S. Cain (2015)
Michael M. Madani (2017)
Paul H. Schipper (2016)

NOMINATING COMMITTEE

J. Scott Millikan, Chair (2015)
Thomas A. Burdon (2019)
John C. Chen (2018)
Robbin G. Cohen (2016)
Robert C. Robbins (2017)

PROGRAM COMMITTEE

John J. Lamberti, Chair (2015)
Jessica S. Donington (2016)
David M. McMullan (2017)
Susan D. Moffatt-Bruce (2016)
Nahush A. Mokadam (2017)
Daniel L. Serna (2015)
Michael S. Mulligan, Ex-Officio (2015)
Patricia A. Thistlethwaite, Ex-Officio (2015)
Richard D. Weisel, Ex-Officio (2015)
PROGRAM SUBCOMMITTEES

Adult Cardiac
- Craig J. Baker (2015)
- Matthew S. Slater (2015)

Congenital Heart
- Eric J. Devaney (2015)
- Tara B. Karamlou (2015)
- Sunil P. Malhotra (2015)
- Lester C. Permut (2015)

General Thoracic
- Jules Lin (2015)
- Joseph B. Shrager (2015)
- Richard I. Whyte (2015)

REPRESENTATIVES

Representative to the Board of Governors, American College of Surgeons
John D. Mitchell
Aurora, Colorado

Representative to the Advisory Council for Cardiothoracic Surgery, American College of Surgeons
John C. Chen
Honolulu, Hawaii
## SCHEDULE OF EVENTS
### For Registered Professional Attendees

### WEDNESDAY, June 24, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 pm – 6:00 pm</td>
<td>Registration</td>
<td>MacDonald Foyer</td>
</tr>
<tr>
<td>1:00 pm – 6:00 pm</td>
<td>Speaker Ready Room</td>
<td>Tremblant</td>
</tr>
<tr>
<td>7:00 pm – 9:00 pm</td>
<td>New Members/Welcome Reception</td>
<td>Woodlands Terrace</td>
</tr>
</tbody>
</table>

### THURSDAY, June 25, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00 am</td>
<td>Samson Fun Run</td>
<td>Start at Hotel Entrance</td>
</tr>
<tr>
<td>7:00 am – 12:30 pm</td>
<td>Registration</td>
<td>MacDonald Foyer</td>
</tr>
<tr>
<td>7:00 am – 12:30 pm</td>
<td>Speaker Ready Room</td>
<td>Tremblant</td>
</tr>
<tr>
<td>7:00 am – 12:00 pm</td>
<td>Exhibits</td>
<td>MacDonald C-F</td>
</tr>
<tr>
<td>7:00 am – 8:00 am</td>
<td>Breakfast</td>
<td>MacDonald C-F</td>
</tr>
<tr>
<td>8:00 am – 9:00 am</td>
<td>Scientific Session I</td>
<td>MacDonald A-B</td>
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<tr>
<td>9:00 am – 9:10 am</td>
<td>New Member &amp; Samson Prize Finalist Introductions</td>
<td>MacDonald A-B</td>
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<tr>
<td>9:10 am – 9:55 am</td>
<td>Presidential Address</td>
<td>MacDonald A-B</td>
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<tr>
<td>9:55 am – 10:20 am</td>
<td>Coffee Break: Visit Exhibits &amp; Posters</td>
<td>MacDonald C-F</td>
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<tr>
<td>10:20 am – 11:40 am</td>
<td>Scientific Session II</td>
<td>MacDonald A-B</td>
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<tr>
<td>11:40 am – 12:25 pm</td>
<td>Controversies Debate</td>
<td>MacDonald A-B</td>
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<tr>
<td>1:30 pm</td>
<td>ATV Wilderness Adventure*</td>
<td>Depart from Hotel Entrance</td>
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<tr>
<td>1:30 pm</td>
<td>Ziptrek Bear Tour*</td>
<td>Depart from Hotel Entrance</td>
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<tr>
<td>6:00 pm – 10:00 pm</td>
<td>Mountain Sports Street Party Theme Dinner</td>
<td>Portobello Alley</td>
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*Separate Subscription Required*
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</table>
| 6:00 am – 12:00 pm | Registration  
MacDonald Foyer                                  |
| 6:00 am – 12:00 pm | Speaker Ready Room  
Tremblant                                             |
| 6:30 am – 7:50 am | Simultaneous Breakfast Sessions*  
I) Lung Cancer Screening in the Post-Approval Era*  
Empress B  
II) Prosthetic Valve Selection in the Era of Transcatheter Valves*  
Empress C |
| 7:00 am – 12:00 pm | Exhibits  
MacDonald C-F                                      |
| 7:00 am – 8:00 am | Breakfast  
MacDonald C-F                                     |
| 8:00 am – 8:50 am | Postgraduate Course  
MacDonald A-B                                    |
| 8:50 am – 10:30 am | Scientific Session III  
MacDonald A-B                                 |
| 10:30 am – 11:00 am | Coffee Break: Visit Exhibits & Posters  
MacDonald C-F                                |
| 11:00 am – 12:00 pm | Scientific Session IV  
MacDonald A-B                               |
| 1:20 pm          | Golf Tournament*  
Golf Club                                               |
| 2:00 pm          | Tennis Tournament*  
Tennis Club                                             |
|                 | Free Evening                                              |

*Separate Subscription Required
### SATURDAY, June 27, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>6:00 am – 12:00 pm</td>
<td>Registration</td>
<td>MacDonal Foyer</td>
</tr>
<tr>
<td>6:00 am – 11:30 am</td>
<td>Speaker Ready Room</td>
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<tr>
<td>6:30 am – 10:30 am</td>
<td>Exhibits</td>
<td>MacDonal C-F</td>
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<tr>
<td>6:30 am – 7:30 am</td>
<td>Breakfast</td>
<td>MacDonal C-F</td>
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<tr>
<td>7:00 am – 8:15 am</td>
<td>Concurrent Forums</td>
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<tr>
<td></td>
<td>A) Adult Cardiac</td>
<td>MacDonald A-B</td>
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<td></td>
<td>B) General Thoracic</td>
<td>Empress B</td>
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<tr>
<td></td>
<td>C) Congenital Heart Disease</td>
<td>Empress C</td>
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<tr>
<td>8:30 am – 9:50 am</td>
<td>Scientific Session V</td>
<td>MacDonald A-B</td>
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<tr>
<td>9:50 am – 10:10 am</td>
<td>Coffee Break: Visit Exhibits &amp; Posters</td>
<td>MacDonal C-F</td>
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<tr>
<td>10:10 am – 11:10 am</td>
<td>Scientific Session VI</td>
<td>MacDonal A-B</td>
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<tr>
<td>11:10 am – 12:00 pm</td>
<td>C. Walton Lillehei Point/Counterpoint Session</td>
<td>MacDonal A-B</td>
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<tr>
<td>12:00 pm – 12:30 pm</td>
<td>Annual Business Meeting <em>(Members Only)</em></td>
<td>MacDonal A-B</td>
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<td>12:30 pm – 2:00 pm</td>
<td>Family Luncheon</td>
<td>Woodlands Terrace</td>
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<tr>
<td>7:00 pm – 11:00 pm</td>
<td>President’s Reception &amp; Banquet <em>(Black Tie Preferred)</em></td>
<td>MacDonal A-C</td>
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### DRESS CODE

Except for the President’s Reception and Banquet, the dress code for the Annual Meeting is Resort Casual; jacket and ties are not required. The President’s Reception and Banquet is black tie preferred, with dark suits acceptable.
ACCREDITATION

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American Association for Thoracic Surgery (AATS) and the Western Thoracic Surgical Association (WTSA). The American Association for Thoracic Surgery is accredited by the ACCME to provide continuing medical education for physicians.

The American Association for Thoracic Surgery designates this live activity for a maximum of 12.75 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

CME MISSION STATEMENT

Purpose
The Western Thoracic Surgical Association (WTSA) is committed to improving patient care and enhanced patient quality of life through the provision of state-of-the-art continuing medical education (CME) to its members and non-member attendees at its sole CME activity, its annual meeting. The overarching goal of the WTSA CME program is to provide a high quality CME activity (its annual meeting) that will address the professional practice gap of its physician and allied health learners by facilitating change in participants’ competence and performance.

Content Areas
The content areas of the WTSA's CME program annual meeting include but, are not limited to, acquired heart disease, thoracic oncologic issues, congenital heart disease, general thoracic disorders, pulmonary disorders, and adult cardiac disease. The scope of activities involves the body of knowledge and skills generally recognized and accepted by the profession and the specialty as within the basic medical/surgical sciences, surgical specialties, the discipline of clinical medicine, and providing healthcare to the public.

Target Audience
In the context of WTSA's role as a regional surgical membership association, the target audiences of the WTSA's CME program are its current members, as well as a potential member base including physicians and other healthcare professionals involved in the diagnosis and treatment of cardiothoracic disease. These include, among others, general thoracic surgeons, cardiothoracic surgeons, interventional radiologists, cardiologists, and cardiothoracic anesthesiologists, as well as allied healthcare professionals who may benefit from team learning activities. The WTSA reaches throughout the western United States and the western provinces of Canada in its attempt to make the most current information available to as wide a medical/physician/surgical audience as possible.
Types of Activities Provided
Through its sole CME activity, the annual meeting, the WTSA provides topic based abstract sessions, a postgraduate course, a controversies in cardiothoracic surgery panel discussion, and a point/counterpoint debate session all of which foster audience participation through a designated question and answer period subsequent to the presentation. In addition, highly specialized techniques, protocols, and findings are offered in each of the three subspecialties of adult cardiac surgery, general thoracic surgery, and congenital heart disease through individual breakfast sessions, moderated poster sessions, and/or concurrent brief communications symposia offered during the course of the annual meeting.

Expected Results
The success of the CME mission is measured by the extent to which participants in the WTSA annual meeting have gained an enhanced understanding of the latest techniques and current research specifically related to adult cardiac surgery, general thoracic surgery, and congenital heart disease, and have incorporated these lessons learned into their practice environment. Furthermore, through these changes and individual practice environments, it is expected that positive changes in physician/surgeons competence and performance in limited instances will be accomplished. The overarching expected result of the WTSA's CME mission is improved patient care and enhanced patient quality of life through advanced medical education of the association’s membership and active participants in its CME program, the annual meeting.

OBJECTIVE
The Annual Meeting of the Western Thoracic Surgical Association is designed to provide two-and-a-half days of comprehensive educational experience for WTSA members and guest physicians in the field of thoracic and cardiovascular surgery. It is the Association’s intent to bring together the leading surgeon scientists in these specialties to freely and openly discuss their latest clinical and research efforts.

The program begins with a half-day scientific plenary session of original papers and the Presidential Address by Michael S. Mulligan, and concludes with a Controversies Debate that asks Should Patient and Physician Values/Expectations Be Consonant?

The Friday scientific program features: simultaneous breakfast sessions on both thoracic and adult cardiac topics; plenary sessions of original papers; and a Postgraduate Course, sponsored by an educational grant from the White Memorial Medical Center and Foundation Lyman A. Brewer, III, Fund and a donation from Thomas J. Fogarty.
The Saturday scientific program begins with concurrent moderated forums of shorter-form oral presentations addressing a far ranging field of topics in each of the three subspecialties. The plenary science continues with: additional original papers; and the highly successful C. Walton Lillehei Point/Counter-Point Session, with this year’s debate asking Is the Proliferation of Portable ECMO Devices Beneficial to Society?

At the conclusion of the Annual Meeting, participants should have an enhanced understanding of the latest techniques and current research specifically related to the fields of adult cardiac, general thoracic, and congenital heart disease clinical surgery, experimental surgery and related sciences, surgical education, and the socioeconomic aspects of surgical care. Through the open discussion periods for each of the six plenary Scientific Sessions, the Controversies Debate, the Point/Counterpoint Session, the Breakfast Sessions, the Postgraduate Course, and the Concurrent Forums on Adult Cardiac, General Thoracic and Congenital Heart Disease, participants will have the opportunity to hear the pros and cons of each paper and/or debate presented to gain an overall perspective of their current practices and utilize results presented to select appropriate surgical procedures and interventions for their own patients and integrate state-of-the-art knowledge into their current practice and/or research.

LEARNING OBJECTIVES

At the conclusion of this activity, participants will be able to:

• Discuss current investigations and novel approaches in the management of adult cardiac, general thoracic and congenital heart disease patients suffering from an array of surgical conditions relating to the heart, lungs, organs of the thorax, and other airway/circulation diseases;

• Discuss current basic science investigations relating to advances in the treatment and management of cardiothoracic and/or congenital heart disease patients and conditions;

• Discuss current investigative studies in clinical outcomes for patients with surgical cardiothoracic and/or congenital heart disease disorders or pathologies.
DISCLOSURE STATEMENT

It is the policy of the American Association for Thoracic Surgery (AATS) that any individual who is in a position to control or influence the content of an educational activity to disclose all relevant financial relationships or affiliations. All identified conflicts of interest must be resolved and the educational content thoroughly vetted by the AATS for fair balance, scientific objectivity, and appropriateness of patient care recommendations. In addition, faculty members are asked to disclose when any discussion of unapproved use of pharmaceutical or medical device occurs.

For further information on the Accreditation Council for Continuing Medical Education (ACCME) Standards of Commercial Support, please visit www.accme.org.
GENERAL INFORMATION

REGISTRATION
The Registration Desk will be open in the MacDonald Foyer during the following hours:

- Wednesday, June 24 1:00 pm – 6:00 pm
- Thursday, June 25 7:00 am – 12:30 pm
- Friday, June 26 6:00 am – 12:00 pm
- Saturday, June 27 6:00 am – 12:00 pm

SPEAKER READY ROOM
The Speaker Ready Room will be located in Tremblant. Presenting authors are requested to turn in their PowerPoint slides to the technician in the Speaker Ready Room at least 30 minutes prior to the opening of the session at which they are to present (presentation slides can be turned in as early as Wednesday, June 24th). All presentations must be submitted in PowerPoint format only.

EXHIBITS
Commercial Exhibits are located in MacDonald C-F and open during the following hours:

- Thursday, June 25 7:00 am – 12:00 pm
- Friday, June 26 7:00 am – 12:00 pm
- Saturday, June 27 6:30 am – 10:30 am

Breakfast is available for all registered physicians in the Exhibit Hall during the following hours:

- Thursday, June 25 7:00 am – 8:00 am
- Friday, June 26 7:00 am – 8:00 am
- Saturday, June 27 6:30 am – 7:30 am

Coffee and other beverages will be available during scheduled breaks.
BADGE IDENTIFICATION

Member and Spouse
Guest Physician and Spouse
Allied Personnel
Exhibitor

Cream
Blue
Green
Orange

INCLUDED IN THE REGISTRATION FEE

Included in the registration fee are the New Members / Welcome Reception on Wednesday evening, the Thursday morning Samson Fun Run, the Mountain Sports Street Party Theme Dinner on Thursday evening, the Saturday Family Luncheon, the President’s Reception and Banquet on Saturday evening, and daily breakfasts (served in the Exhibit Hall for registered professional attendees and in the Hospitality Suite for registered spouses, registered guests, and registered children). Supervised Kids & Teens Receptions, for ages 4–18, will provide dynamic, entertaining, and safe programs during Wednesday’s New Members/Welcome Reception and Saturday’s President’s Banquet. Please remember that individual tickets for events are not offered; full registration is required.

For descriptions of the events included with your registration fee, as well as of the separate-subscription Thursday optional tours/activities and Friday golf and tennis tournaments, please consult the Social Program. In that brochure you will also find information on child care services.
ACKNOWLEDGMENTS
The Western Thoracic Surgical Association wishes to thank the following companies and organizations for their educational and marketing support of the 41st Annual Meeting:

EDUCATIONAL GRANTS (Confirmed through May 28, 2015)

Medtronic, Inc., for their support as a Silver Level Sponsor
St. Jude Medical for their support of the Lillehei Point/Counterpoint
White Memorial Medical Center and Foundation, Lyman A. Brewer, III Fund for their support of the Postgraduate Course
Medtronic, Inc., for their support of the Donald B. Doty Education Award

EXHIBIT SUPPORT (Confirmed through May 28, 2015)

Admedus
AtriCure, Inc.
Bard Davol
Baxter Healthcare
Biomet Microfixation
Cormatrix Cardiovascular, Inc.
CryoLife, Inc.
Edwards Lifesciences
Gore & Associates
HeartWare, Inc
KLS Martin, LP
LifeNet Health
LSI Solutions
MAQUET Medical Systems, USA
Medtronic, Inc.
On-X Life Technologies, Inc.
rEVO Biologics
RTI Surgical
Scanlan International, Inc.
Sorin Group
Spiration, Inc.
St. Jude Medical, Inc.
Terumo Cardiovascular Group
Thoracic Surgery Foundation for Research & Education
Thoratec Corporation
Veran Medical Technologies, Inc.
Vitalcor, Inc.
Wexler Surgical
GUIDELINES FOR SPEAKERS AND DISCUSSANTS

The Program Committee has determined that no slides are to be included in either the invited discussion or spontaneous discussion.

1. Scientific Session speakers will be allowed ten minutes for their presentations, and primary discussants will be allowed two minutes. Concurrent Forum speakers will be allowed five minutes for their presentations.

2. Speakers are requested to present their PowerPoint Presentations in the Speaker Ready Room located in Tremblant, at least 30 minutes prior to the opening of the session at which they are to present (presentation slides can be turned in as early as Wednesday, June 24th). All presentations must be submitted in PowerPoint format only. Speakers with a disclosure will be asked to state the nature of their disclosure prior to the presentation. No personal laptops will be allowed at the podium.

3. In publication, it is customary to group discussions together on a series of papers. Transcription of the discussions will be forwarded to discussants for review and correction. Any delay in the return of corrected discussions means that publication of all papers on the subject will be held up. Such a delay is manifestly unfair to those who are conscientious in the prompt submission of their remarks. Unreasonable delay will preclude publication.
## PROGRAM OUTLINE

### WEDNESDAY, JUNE 24, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 pm – 6:00 pm</td>
<td><strong>REGISTRATION</strong>, MacDonald Foyer</td>
<td></td>
</tr>
<tr>
<td>1:00 pm – 6:00 pm</td>
<td><strong>SPEAKER READY ROOM</strong>, Tremblant</td>
<td></td>
</tr>
<tr>
<td>7:00 pm – 9:00 pm</td>
<td><strong>NEW MEMBERS/WELCOME RECEPTION</strong>, Woodlands Terrace</td>
<td></td>
</tr>
</tbody>
</table>

### THURSDAY, JUNE 25, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00 am</td>
<td><strong>SAMSON FUN RUN</strong>, Start at Hotel Entrance</td>
<td></td>
</tr>
<tr>
<td>7:00 am – 12:30 pm</td>
<td><strong>REGISTRATION</strong>, MacDonald Foyer</td>
<td></td>
</tr>
<tr>
<td>7:00 am – 12:30 pm</td>
<td><strong>SPEAKER READY ROOM</strong>, Tremblant</td>
<td></td>
</tr>
<tr>
<td>7:00 am – 12:00 pm</td>
<td><strong>EXHIBITS</strong>, MacDonald C-F</td>
<td></td>
</tr>
<tr>
<td>7:00 am – 8:00 am</td>
<td><strong>BREAKFAST</strong>, MacDonald C-F</td>
<td></td>
</tr>
<tr>
<td>8:00 am – 9:00 am</td>
<td><strong>SCIENTIFIC SESSION I</strong></td>
<td>MacDonald A-B</td>
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<tr>
<td></td>
<td></td>
<td>(10 minutes presentation, 10 minutes discussion)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderators: John D. Mitchell, Michael S. Mulligan</td>
</tr>
<tr>
<td>1.</td>
<td><strong>Assessment and Surgical Management of T1b Esophageal Cancer: Esophagectomy Remains the Standard of Care in Appropriate Patients</strong></td>
<td>Kamran Mohiuddin, Russell Dorer, Hejin Hahn, *James Speicher, *Michal Hubka, *Donald E. Low Virginia Mason Medical Center, Seattle, WA</td>
</tr>
<tr>
<td></td>
<td><strong>DISCUSSANT: STEVEN R. DEMEESTER</strong></td>
<td></td>
</tr>
</tbody>
</table>

* WTSA Member
2. Lost to Follow-Up: The Lack of Right Ventricular Outflow Tract Surgery in Adult Congenital Heart Disease
   Joshua L. Hermsen¹, *D. Michael McMullan², *Edward D. Verrier¹
   ¹University of Washington, Seattle, WA; ²Seattle Children’s Hospital, Seattle, WA
   DISCUSSANT: BRIAN E. KOGON

+3. Hospital and Surgeon Volume As Well As Inter-Hospital and Inter-Surgeon Variability Are Independently Associated with Survival After Ascending Aortic Operations
   Justin M. Schaffer, Bharathi Lingala, *Michael P. Fischbein, Michael D. Dake,
   *Y. Joseph Woo, *R. Scott Mitchell, *D. Craig Miller
   Stanford Hospitals and Clinics, Stanford, CA
   DISCUSSANT: KARL F. WELKE

9:00 am – 9:10 am NEW MEMBER & SAMSON PRIZE FINALIST INTRODUCTIONS, MacDonald A-B

9:10 am – 9:55 am PRESIDENTIAL ADDRESS
   MacDonald A-B
   Introduced By: John D. Mitchell
   Achieving “Flow” in Surgery
   Michael S. Mulligan

9:55 am – 10:20 am COFFEE BREAK: VISIT EXHIBITS & POSTERS, MacDonald C-F

+ Samson Resident Prize Essay
* WTSA Member
10:20 am – 11:40 am **SCIENTIFIC SESSION II**

* MacDonald A-B
(10 minutes presentation, 10 minutes discussion)

Moderators: Tara B. Karamlou
Susan D. Moffatt-Bruce

**+4. Healthcare Utilization and Consequences of Readmission in the First Year Post Lung Transplantation**

Nathan M. Mollberg¹, Eric Howell², David I. Vanderhoff², *Michael S. Mulligan²

¹Bronson Methodist Hospital, Kalamazoo, MI; ²University of Washington Medical Center, Seattle, WA

DISCUSSANT: ROBERT A. MEGUID

**5. Compliance with the New Surgical Care Improvement Project Measure for Glycemic Control after Cardiac Surgery Is not Associated with Improved Postoperative Outcomes**

James M. Isbell, Damien J. LaPar, Robert H. Thiele, Ravi K. Ghanta, John A. Kern, Gorav Ailawadi, Irving L. Kron, Anthony L. McCall, Jennifer L. Kirby

University of Virginia, Charlottesville, VA

DISCUSSANT: DAVID A. FULLERTON

**+6. Patterns of Care in Hilar Node-Positive (n1) Non-Small Cell Lung Cancer: A Missed Treatment Opportunity?**


Washington University School of Medicine, Saint Louis, MO

DISCUSSANT: PAUL H. SCHIPPER

+ Samson Resident Prize Essay
* WTSA Member
+7. Defining Operative Mortality: Impact on Outcome Reporting

Steven Maximus¹, *Jeffrey C. Milliken¹,
Beate Danielsen², *Junaid Khan³, *Joseph S. Carey¹
¹UC Irvine, Orange, CA; ²Health Information Solutions, Rocklin, CA; ³East Bay Cardiac Surgery Center, Oakland, CA

DISCUSSANT: SUSAN D. MOFFATT-BRUCE

11:40 am – 12:25 pm

CONTROVERSIES DEBATE, MacDonald A-B
Should Patient and Physician Values/Expectations Be Consonant?

Moderator: Tara B. Karamlou
Speakers: Suzanne Arnold
James Matthew Brennan

12:25 pm

ADJOURN

1:30 pm

ATV WILDERNESS ADVENTURE**, Depart from Hotel Entrance

1:30 pm

ZIPTREK BEAR TOUR**, Depart from Hotel Entrance

6:00 pm – 10:00 pm

MOUNTAIN SPORTS STREET PARTY THEME
DINNER, Portobello Alley

+ Samson Resident Prize Essay
* WTSA Member
** Separate Subscription Required
FRIDAY, JUNE 26, 2015

6:00 am – 12:00 pm  REGISTRATION, MacDonald Foyer

6:00 am – 12:00 pm  SPEAKER READY ROOM, Tremblant

6:30 am – 7:50 am  SIMULTANEOUS BREAKFAST SESSIONS**, Empress B & C

I. Lung Cancer Screening in the Post-Approval Era**, Empress B
Douglas E. Wood
Richard I. Whyte

II. Prosthetic Valve Selection in the Era of Transcatheter Valves**, Empress C
Anson Cheung
Thomas K. Jones

7:00 am – 12:00 pm  EXHIBITS, MacDonald C-F

7:00 am – 8:00 am  BREAKFAST, MacDonald C-F

8:00 am – 8:50 am  POSTGRADUATE COURSE

MacDonald A-B
Supported by: White Memorial Medical Center and Foundation’s – Lyman A. Brewer, III, Fund and Thomas J. Fogarty

Innovations in the Access to New Medical Devices
Michael J. Mack
Medical Director of Cardiovascular Services
Baylor Scott & White Health

** Separate Subscription Required
8:50 am – 10:30 am  **SCIENTIFIC SESSION III**

MacDonald A-B

(10 minutes presentation, 10 minutes discussion)

Moderators: Nahush A. Mokadam
Patricia A. Thistlethwaite

8. The Ripple Effect of a Complication in Lung Transplantation: Evidence for Increased Long-Term Survival Risk  
**Ernest G. Chan**¹, Valentino Bianco, III¹, Thomas Richards¹, David D. Odell¹, Jeremiah Hayanga², Norihisa Shigemura¹, Maria Crespo¹, Joseph Pilewski¹, James D. Luketich¹, Christian Bermudez¹, Jonathan D’Cunha¹

¹University of Pittsburgh Medical Center, Pittsburgh, PA; ²Spectrum Health System – Michigan State University, Grand Rapids, MI

**DISCUSSANT: MICHAEL A. SMITH**

9. Hypoplastic Aortic Arch Growth Following Coarctation Repair  
**Daniel Labuz**, Lee Pyles, James Berry, John Foker

University of Minnesota Medical School, Minneapolis, MN

**DISCUSSANT: DAVID N. CAMPBELL**

10. Creation and Global Deployment of a Mobile, Application-Based Cognitive Simulator for Cardiac Surgical Procedures  
**Zachary E. Brewer**, *W. David Ogden*, *James I. Fann*, *Thomas A. Burdon*, *Ahmad Y. Sheikh

Stanford University, Stanford, CA

**DISCUSSANT: NAHUSH A. MOKADAM**

+ Samson Resident Prize Essay
* WTSA Member
11. Natural History of Coexistent Mitral Regurgitation Following Aortic Valve Replacement
University of Virginia, Charlottesville, VA
DISCUSSANT: JOSEPH WOO

+12. Inheriting the Learner’s View: A Wearable Computing Platform for Improving Surgical Trainee Performance
Stanford University, Stanford, CA
DISCUSSANT: CRAIG J. BAKER

10:30 am – 11:00 am COFFEE BREAK: VISIT EXHIBITS & POSTERS, MacDonald C-F

11:00 am – 12:00 pm SCIENTIFIC SESSION IV
MacDonald A-B
(10 minutes presentation, 10 minutes discussion)
Moderators: Craig J. Baker
Sean C. Grondin

13. Outcomes and Their Determinants for Combined Pediatric Heart-Visceral Organ Transplantation: Selection Criteria to Improve Triage to a Multi-Organ Strategy
University of California, San Francisco, San Francisco, CA
DISCUSSANT: JONATHAN M. CHEN

+ Samson Resident Prize Essay
* WTSA Member

Bryan M. Burt¹, Xiaopan Yao², *Joseph Shrager³, Sukhmani Padda³, Heather Wakelee³, Stacey Su⁴, James Huang⁵, Walter Scott⁴

¹Baylor College of Medicine, Houston, TX; ²Yale, New Haven, CT; ³Stanford University School of Medicine, Stanford, CA; ⁴Fox Chase Cancer Center, Philadelphia, PA; ⁵Memorial Sloan-Kettering Cancer Center, New York, NY

DISCUSSANT: JOHN D. MITCHELL

15. Impact of a TAVR Program Initiation on a Standard Aortic Valve Replacement Surgery Program

Niv Ad, Sari D. Holmes, Alan M. Speir, Anthony J. Rongione, Paul S. Massimiano, Graciela Pritchard

Inova Heart and Vascular Institute, Falls Church, VA

DISCUSSANT: DAVID A. FULLERTON

12:00 pm

ADJOURN

1:20 pm

GOLF TOURNAMENT**, Depart from Hotel Entrance via Shuttle to Golf Club at 12:30 pm

2:00 pm

TENNIS TOURNAMENT**, Tennis Club

FREE EVENING

** Separate Subscription Required
SATURDAY, JUNE 27, 2015

6:00 am – 12:00 pm  REGISTRATION, MacDonald Foyer

6:00 am – 11:30 am  SPEAKER READY ROOM, Tremblant

6:30 am – 10:30 am  EXHIBITS, MacDonald C-F

6:30 am – 7:30 am  BREAKFAST, MacDonald C-F

7:00 am – 8:15 am  CONCURRENT FORUMS

(5 minutes presentation, 3 minutes discussion)

ADULT CARDIAC

MacDonald A-B

Moderators:  Howard K. Song
             Joseph C. Cleveland, Jr.

CF1.  Fate of Patients with Acute Type B Aortic Dissection Initially Managed Medically


Hospital of the University of Pennsylvania, Philadelphia, PA

CF2.  Location of the Raphe in Type 1 Bicuspid Aortic Valve Correlates with Spatial Patterns in Antioxidant Gene Expression in the Proximal Ascending Aorta

Julie A. Phillippi, Jennifer C. Hill, Benjamin R. Green, Mary P. Kotlarczyk, Marie Billaud, Thomas G. Gleason

University of Pittsburgh, Pittsburgh, PA

* WTSA Member
CF3. Real-Time Magnetic Resonance Image Guided Transcatheter Aortic Valve Replacement
Justin G. Miller¹, Ming Li¹, Dumitru Mazilu¹, Timothy Hunt², Keith A. Horvath¹
¹CSRP/NHLBI/NIH, Bethesda, MD; ²LAMS/NIH, Bethesda, MD

CF4. WITHDRAWN

CF5. Staged Hybrid Maze: PVI Alone Is Sufficient in Half of Patients
Richard Lee¹, Dawn S. Hui¹, Chelsea Del Rosso¹, Jane Kruse², Patrick M. McCarthy²
¹Saint Louis University, Saint Louis, MO; ²Northwestern University, Chicago, IL

CF6. Systematic Donor Selection Review Process Improves Transplant Volumes and Outcomes
University of Washington, Seattle, WA

CF7. Delayed Sternal Closure After Continuous Flow Left Ventricle Assist Device Implantation: Analysis of Risk Factors and Impact on Outcomes and Costs
Mohammed Quader¹, Luke Wolfe¹, Damien Lapaar², Gorav Ailawadi³, Jeffrey Rich⁴, Alan Speir⁵, Clifford Fonner⁶, Vigneshwar Kasirajan¹
¹Virginia Commonwealth University, Richmond, VA; ²University of Virginia, Charlottesville, VA; ³University of Virginia, Charlottesville, VA; ⁴VCSQI, Norfolk, VA; ⁵Cardiovascular and Thoracic Associates, Falls Church, VA; ⁶VCSQI, Richmond, VA

* WTSA Member
CF8. Early and Medium-Term Outcomes in Patients with Dialyse-Dependent Chronic Renal Failure After Cardiac Surgery – A Single Centre Experience of 483 Patients
Sergey Leontyev, Knut A. Röhrig, Lisa-Marie Gaube, Piroze M. Davierwala, Sergey Belaev, Farhad Bakhtiary, Martin Misfeld, Friedrich W. Mohr
Department of Cardiac Surgery, Heart Center, University of Leipzig, Leipzig, Germany, Leipzig, Germany

GENERAL THORACIC

Empress B
Moderators: Jessica S. Donington
John D. Mitchell

CF9. Lung Adenocarcinoma: Are Skip N2 Metasasis Different from Non-Skip?
Hang Li, Sr., Haiquan Chen
Shanghai Cancer Center, Shanghai, China

CF10. Nodal Upstaging Is More Common with Thoracotomy Versus VATS During Lobectomy for Early Stage Lung Cancer: An Analysis from the National Cancer Data Base
Rachel L. Medbery, Theresa W. Gillespie, Joseph Lipscomb, Yuan Liu, Dana Nickleach, Manu S. Sancheti, Allan Pickens, Seth D. Force, Felix G. Fernandez
Emory University, Atlanta, GA

University of Washington, Seattle, WA

* WTSA Member
CF12. Adjuvant Chemotherapy Is Associated with Improved Survival in Node Negative NSCLC with Chest Wall Involvement
Usman Ahmad1, Traves D. Crabtree2, Aalok P. Patel3, Daniel Morgensztern4, Cliff G. Robinson5, A. Sasha Krupnick2, Daniel Kreisel2, G. Alexander Patterson2, Bryan F. Meyers2, Varun Puri2

1Thoracic Service, Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, NY; 2Department of Surgery, Division of Cardiothoracic Surgery, Washington University School of Medicine, St. Louis, MO; 3Department of Surgery, Division of Cardiothoracic Surgery, Washington University School of Medicine, St. Louis, MO; 4Department of Medicine, Division of Oncology, Washington University School of Medicine, St. Louis, MO; 5Department of Radiation Oncology, Washington University School of Medicine, St. Louis, MO

CF13. Minimally Invasive Esophagectomy for Esophageal Cancer Shortens Length of Stay Without Compromising Oncologic Outcomes: A Population-Based Analysis
Zhifei Sun1, Chi-Fu J. Yang1, Brian C. Gulack1, Paul J. Speicher1, Mohamed Adam1, Thomas A. D’Amico1, Mark F. Berry2, Matthew G. Hartwig1

1Duke University, Durham, NC; 2Stanford University, Palo Alto, CA

CF14. Venous Thromboembolism Risk Assessment Permits Patient Selection for Post-Discharge Prophylactic Anticoagulation in Resectable Lung Cancer Patients
Krista J. Hachey1, Philip D. Hewes2, Douglas G. Ridyard2, Liam P. Porter2, Pamela Rosenkranz3, David McAneny3, Hiran C. Fernando3, Virginia R. Litle3

1Boston University Surgery Residency Program, Boston, MA; 2Boston University Medical School, Boston, MA; 3Boston Medical Center, Department of Surgery, Boston, MA
CF15. Indications for Counseling and Intervention After Pulmonary Resection: Results of Post-Discharge Nursing Telephone Assessments
Mara B. Antonoff¹, William Ragalie², Arlene M. Correa¹, Jonathan D. Spicer¹, Boris Sepesi¹, Jack A. Roth¹, Garrett L. Walsh¹, Wayne L. Hofstetter¹, Stephen G. Swisher¹, David C. Rice¹, Ara A. Vaporciyan¹, Reza J. Mehran¹
¹UT MD Anderson Cancer Center, Houston, TX; ²Medical College of Wisconsin, Milwaukee, WI

CF16. Cervical Tracheal Resection and Tracheoplasty for Severe Cervical Malacia in Patients with Coexisting Severe Tracheobronchomalacia Is Associated with a High Rate of Recurrence
Jennifer L. Wilson, Scott Atay, Adnan Majid, Erik Folch, Michael S. Kent, *Richard Whyte, Sidhu P. Gangadharan
Beth Israel Deaconess Medical Center, Boston, MA

CONGENITAL HEART DISEASE

Empress C
Moderators: John J. Lamberti
D. Michael McMullan

CF17. Congenital Cardiac Surgery Fellowship Training: A Status Update
Brian E. Kogon¹, *Tara Karamlou², William Baumgartner³, Walter Merrill⁴, Carl Backer⁵
¹Emory University, Atlanta, GA; ²University of California San Francisco, San Francisco, CA; ³Johns Hopkins, Baltimore, MD; ⁴Vanderbilt, Nashville, TN; ⁵Northwestern University, Chicago, GA

CF18. Outcomes of Children Requiring Prolonged Intensive Care Unit Stay Following Surgical Repair of Congenital Heart Disease
Makoto Mori, Kevin Maher, Brian Kogon, William Mahle, Kirk Kanter, *Bahaaldin Alsoufi
Emory University School of Medicine, Atlanta, GA

* WTSA Member
CF19. Single Center Experience with the Senning Procedure in the Current Era  
Giuseppe Ferro, Vinod A. Sebastian, Kristine J. Guleserian, Joseph M. Forbess  
Children’s Medical Center, Dallas, TX

CF20. Outcomes After Mechanical Aortic Valve Replacement in Children and Young Adults with Congenital Heart Disease  
Suyog A. Mokashi, Patrick O. Myers, Edward Horgan, Michele Borisuk, John Mayer, Pedro J. del Nido, Christopher W. Baird  
Boston Children’s Hospital, Boston, MA

CF21. 25 Consecutive Years of ECMO Support at a Single Children’s Heart Center  
*Daniel J. DiBardino, Denise Suttner, Aaron Kemp, *Eric J. Devaney, Brian Lane, *John J. Lamberti  
University of California San Diego, San Diego, CA

CF22. Chronic Performance of Bioengineered Replacement Pulmonary Valves in Rapidly Growing Young Lambs  
Ward Family Heart Center, Children’s Mercy Kansas City, Kansas City, MO

CF23. Pump in Parallel – Mechanical Assistance of Partial Cavopulmonary Circulation Using a Conventional Ventricular Assist Device  
Pranava Sinha¹, Nina Deutsch¹, Dingchao He¹, Nobuyuki Ishibashi¹, Gerald Mikesell¹, Joseph Hearty¹, Erin Montague¹, Mark Nuszkowski², David Zurakowski², Kanishka Ratnayaka¹, Robert Lederman³, Richard Jonas¹  
¹Children’s National Medical Center, Washington, DC; ²Boston Children’s Hospital, Boston, MA; ³National Institutes of Health, Bethesda, MD

* WTSA Member
CF24. Current Outcomes of Multistage Palliation of Infants with Functional Single Ventricle and Heterotaxy Syndrome
*Bahaaldin Alsoufi*, Brian Schlosser, Courtney McCracken, Ritu Sachdeva, Andrew Well, Brian Kogon, William Border, Kirk Kanter
*Emory University School of Medicine, Atlanta, GA*

8:30 am – 9:50 am  **Scientific Session V**

*MacDonald A-B*

(10 minutes presentation, 10 minutes discussion)

Moderators: Jules Lin
Richard D. Weisel

16. Infectious Implications of Transplanting Center for Disease Control High Risk Donor Hearts
*Ann C. Gaffey*, George Hung, Stacey L. Doll, Arwin M. Thomasson, Carol W. Chen, Lee R. Goldberg, Emily A. Blumberg, Michael A. Acker, Francis Stone, Pavan Atluri
*Hospital of the University of Pennsylvania, Philadelphia, PA*

**DISCUSSANT: CRAIG H. SELZMAN**

17. Second Primary Lung Cancers Demonstrate Better Survival with Surgery Than Radiation When Detected Early
*Dong-Seok D. Lee*, Emanuela Taioli, Andrew Kaufman, Andrea Wolf, Faiz Bhora, Chris Hazzard, Suresh Ramanathan, Raja Michael Flores
*Mount Sinai Medical Center, New York, NY*

**DISCUSSANT: DAVID T. COOKE**

* WTSA Member
18. Pretreatment with Bone Marrow Derived Mesenchymal Stromal Cell Conditioned Media Confers Ischemic Tolerance  
Billanna Hwang\textsuperscript{1}, Conrad Liles\textsuperscript{1}, Beverly Torok-Storb\textsuperscript{2}, Rachel Warworuntu\textsuperscript{1}, *Michael S. Mulligan\textsuperscript{1}  
\textsuperscript{1}University of Washington, Seattle, WA; \textsuperscript{2}Fred Hutchinson Cancer Research Center, Seattle, WA  
DISCUSSANT: ROSS M. BREMNER

19. A Restrictive Blood Transfusion Strategy in Pediatric Cardiac Surgery: Do Children Undergoing Open Heart Surgery Routinely Require Blood Products?  
Hideyuki Kato, Victoria J. Harris, Andrew Campbell, *Sanjiv K. Gandhi  
BC Children’s Hospital, Vancouver, BC, Canada  
DISCUSSANT: IRVING SHEN

9:50 am – 10:10 am  
COFFE BREAK: VISIT EXHIBITS & POSTERS, MacDonald C-F

* WTSA Member
20. Cardiac Surgery Improves Survival in Advanced Left Ventricular Dysfunction: Multivariate Analysis of a Consecutive Series of 4491 Patients Over an 18-Year Period
Balakrishnan Mahesh¹, Prasanth Peddayyavarla², Lay P. Ong³, Sonya Gardiner⁴, Samer A.M. Nashef⁵
¹UPMC Presbyterian, Pittsburgh, PA; ²Camden CCG, London, United Kingdom; ³Department of Cardiothoracic Surgery, Papworth Hospital, Cambridgeshire, United Kingdom; ⁴Department of Cardiothoracic Surgery, Papworth Hospital, Cambridgeshire, United Kingdom; ⁵Department of Cardiothoracic Surgery, Papworth Hospital, Cambridgeshire, United Kingdom

DISCUSSANT: RICHARD J. SHEMIN

21. Socioeconomic Factors Are Associated with Readmission Following Lobectomy for Early Stage Lung Cancer
Rachel L. Medbery, Theresa W. Gillespie, Joseph Lipscomb, Yuan Liu, Dana Nickleach, Manu Sancheti, Allan Pickens, Seth D. Force, Felix G. Fernandez
Emory University, Atlanta, GA

DISCUSSANT: SEAN C. GRONDIN
22. Are Homografts Superior to Prosthetic Valves in the Setting of Infective Endocarditis?
Joon Bum Kim¹, Julius I. Ejiofor², Maroun Yammine², Janice M. Camuso¹, Conor W. Walsh³, Serguei I. Melnitchouk¹, James D. Rawn², Marzia Leacche², *Thomas E. MacGillivray¹, *Lawrence H. Cohn¹, *John G. Byrne², *Thoralf M. Sundt, III¹
¹Massachusetts General Hospital, Harvard Medical School, Boston, MA; ²Brigham and Women’s Hospital, Harvard Medical School, Boston, MA; ³Tufts University School of Medicine, Boston, MA
DISCUSSANT: TARA B. KARAMLOU

11:10 am – 12:00 pm C. WALTON LILLEHEI POINT/COUNTERPOINT SESSION

MacDonald A-B
Supported by: White Memorial Medical Center and Foundation’s – Lyman A. Brewer, III, Fund and Thomas J. Fogarty

Is the Proliferation of Portable ECMO Devices Beneficial to Society?

Moderator: Michael S. Mulligan
Pro: Craig H. Selzman
Con: David M. McMullan

12:00 pm – 12:30 pm ANNUAL BUSINESS MEETING (Members Only), MacDonald A-B

12:30 pm – 2:00 pm FAMILY LUNCHEON, Woodlands Terrace

7:00 pm – 11:00 pm PRESIDENT’S RECEPTION AND BANQUET, MacDonald A-C
(Black Tie Preferred)

* WTSA Member
# FULL SCIENTIFIC PROGRAM

## WEDNESDAY, JUNE 24, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>1:00 pm – 6:00 pm</td>
<td><strong>REGISTRATION</strong>, MacDonald Foyer</td>
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<tr>
<td>1:00 pm – 6:00 pm</td>
<td><strong>SPEAKER READY ROOM</strong>, Tremblant</td>
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<tr>
<td>7:00 pm – 9:00 pm</td>
<td><strong>NEW MEMBERS/WELCOME RECEPTION</strong>, Woodlands Terrace</td>
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## THURSDAY, JUNE 25, 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>6:00 am</td>
<td><strong>SAMSON FUN RUN</strong>, Start at Hotel Entrance</td>
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<tr>
<td>7:00 am – 12:30 pm</td>
<td><strong>REGISTRATION</strong>, MacDonald Foyer</td>
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<tr>
<td>7:00 am – 12:30 pm</td>
<td><strong>SPEAKER READY ROOM</strong>, Tremblant</td>
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<tr>
<td>7:00 am – 12:00 pm</td>
<td><strong>EXHIBITS</strong>, MacDonald C-F</td>
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<tr>
<td>7:00 am – 8:00 am</td>
<td><strong>BREAKFAST</strong>, MacDonald C-F</td>
</tr>
</tbody>
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**SCIENTIFIC SESSION I**

**MacDonald A-B**

(10 minutes presentation, 10 minutes discussion)

Moderators: John D. Mitchell
Michael S. Mulligan

1. **Assessment and Surgical Management of T1b Esophageal Cancer: Esophagectomy Remains the Standard of Care in Appropriate Patients**


*Virginia Mason Medical Center, Seattle, WA*

**DISCUSSANT: STEVEN R. DEMEESTER**

**OBJECTIVE:** Barrett’s surveillance programs are increasing the frequency of diagnosing early stage esophageal adenocarcinoma. Clinical stage (cT1a) cancers are now routinely treated endoscopically and highly selected (invasion limited to SM1, well differentiated tumors and no lympho-vascular invasion) cT1b cancers are now being assessed for non-surgical therapy. Although the accuracy of staging of early submucosal tumors is unclear. Appropriate cT1b patients have historically been managed with esophagectomy although concerns regarding morbidity and mortality continue.

**METHODS:** All patients in a prospective IRB-approved database with Clinical Stage (cT1b) and Pathological stage (pT1b) cancers were retrospectively reviewed. All patients had staging CT, PET and endoscopic ultrasound with selected patients also having endoscopic mucosal resection (EMR).

**RESULTS:** Between 2000 and 2013, 50 patients, 37 with pT1b and 13 cT1b, were assessed. In cT1b patients, all had EMR and 5 (38.5) % were found to be understaged at esophagectomy (T1bN1X2, T2N0, T2N1X2) and 8 (61.5) % were accurately staged. pT1b patients were a mean age of 66 years, mean BMI of 30, and 95% were adenocarcinoma. All patients were presented in multidisciplinary tumor board. All patients were treated surgically and no patient had neo-adjuvant or adjuvant therapy. The majority of patients 36 (97.3%) underwent open transthoracic operation with a median length of hospital stay of 9 days. Complications occurred in 13 (35%) patients; however, 11 of 13 had minor complication (Accordion score 1), and 30-day and in-hospital mortality was 0. Fourteen pT1b patients had pre-resection EMR with 2 (14.3%) clinically under-staged and 3 (21.4%) clinically over-staged. All EMR specimens were re-reviewed by a specialist Gastro-Intestinal pathologist. Level

* WTSA Member
of submucosal invasion (SM1, SM2), degree of differentiation and the presence of lympho-vascular invasion could be assessed in all EMR specimens. Median follow-up in pT1b patients was 3 years with Kaplan Meier 5-year overall survival of 76.6%.

**CONCLUSION:** Staging of early stage esophageal cancer can be inaccurate especially when dealing with submucosal tumors. Endoscopic mucosal resection should be a component of preoperative staging whenever feasible. Healthy patients with clinical tumor stage greater than cT1a should undergo multidisciplinary review and be considered for surgical resection as outcomes in high volume centers can be excellent with respect to morbidity, mortality and survival.
2. Lost to Follow-Up: The Lack of Right Ventricular Outflow Tract Surgery in Adult Congenital Heart Disease

Joshua L. Hermsen¹, *D. Michael McMullan², *Edward D. Verrier¹

¹University of Washington, Seattle, WA;
²Seattle Children’s Hospital, Seattle, WA

DISCUSSANT: BRIAN E. KOGON

BACKGROUND: All patients with Truncus Arteriosus (TA) and most patients with Tetralogy of Fallot (ToF) require lifelong serial intervention to maintain a functional right ventricular outflow tract (RVOT) and these procedures are among the most commonly performed in most adult congenital practices. However, many patients are lost to follow-up transitioning from pediatric to adult care and the proportion of adult congenital patients receiving appropriate surgical care is unknown.

METHODS: A statewide database capturing all hospital admissions from 1987 to 2013 was queried to identify hospital admissions identified by diagnostic ICD-9 codes for ToF or TA and ICD-9 procedure codes for ToF repair, TA repair or RVOT surgery (pulmonary valve replacement, right ventricle-to-pulmonary artery conduit, Melody® valve). The number of admissions for patients <1 year old during Era 1 was compared to admissions of patients ≥11 years old in Era 3 as the numbers should be roughly equivalent. Differences in length of stay (LOS) and hospital charges were also compared between eras.

RESULTS: One-hundred and four admissions for patients aged ≥10 undergoing RVOT surgery in Era 3 were identified compared to 202 admissions for patients <1 year old during Era 1 (51%). Twenty-six adult patients in Era 3 were born before 1987, and therefore not included in the study as infants. The corrected proportion of adults undergoing RVOT surgery is therefore 104/228, 46%). Median Charges, adjusted for inflation to 2013 dollars, increased significantly over time (Era 1 = $56,026, Era 3 = 163,286; p < 0.001 by Kruskal-Wallis test). The median LOS decreased significantly over time (Era 1 = 10 d, Era 3 = 7 d; p < 0.0001 by Kruskal-Wallis test).

* WTSA Member
CONCLUSIONS: Adult patients with TA and ToF are undergoing RVOT intervention at a rate less than 50% of expected. This gap highlights the need for effective transition of pediatric cardiac patients to adult providers trained in their care. The results of this study should inform outreach efforts, workforce calculations, and budget decisions to “find” and care for these missing patients.
+3. Hospital and Surgeon Volume As Well As Inter-Hospital and Inter-Surgeon Variability Are Independently Associated with Survival After Ascending Aortic Operations


Stanford Hospitals and Clinics, Stanford, CA

DISCUSSANT: KARL F. WELKE

OBJECTIVES: Surgical treatment of patients with ascending aortic disease is not currently concentrated at referral centers with special expertise and experience. We hypothesized that while a hospital and surgeon volume-outcome relationship is associated with postoperative outcomes, inter-hospital and inter-surgeon variability might also be associated with outcomes.

METHODS: We analyzed Medicare patients undergoing ascending aortic surgery from 1999 to 2010 (n = 51,645). ICD-9 codes were used to determine aortic disease, while Current Procedural Terminology codes were used to identify operative procedures performed; operations included ascending aortic replacement (n = 18,672), separate valve graft (n = 14,833), composite valve graft (n = 17,773), and valve sparing aortic root replacement (n = 367). Patient demographics, comorbidities, previous operations, operative characteristics, and hospital and surgeon characteristics were included as covariates. Cox proportional hazards identified predictors of death. Inter-hospital and inter-surgeon variability were modeled as random effects in a mixed-effect Cox model. Cubic-spline analyses were used to assess individual hospital/surgeon-outcome relationships.

RESULTS: Survival estimates were 78%, 63%, and 39%, respectively at 1-, 5-, and 10-years. Patient demographics, comorbidities, aortic disease type, prior operations, surgeon and hospital variables, and operative characteristics varied by operation (Table 1). During the 11 year study period, Medicare patients underwent surgery of the ascending aorta at 1,325 U.S. hospitals and by 3,307 U.S. surgeons; the median number of Medicare ascending aortic operations per hospital was 99 (IQR: 44–242) and per surgeon was 34 (IQR: 16–78). Multivariable analysis (Table 2) identified multiple predictors of death including age, gender, race, aortic pathology, patient comorbidities, prior cardiac surgery, year of operation, operative complexity, and both hospital and surgeon volume as well as inter-hospital and inter-surgeon variability. A transition point was identified in the surgeon-volume and hospital-volume relationships suggesting a volume beyond which additional case numbers improved outcomes minimally (Figure 1). The independent relationship between individual hospitals/surgeons and postoperative survival approximated linearity (Figure 2).

* Samson Resident Prize Essay
* WTSA Member
Table 1. Baseline Characteristics of Patients Undergoing Surgery of the Ascending Aorta

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<thead>
<tr>
<th></th>
<th>All Operations Involving Ascending Aorta (n = 51,645)</th>
<th>Ascending Aorta Repair (n = 18,672)</th>
<th>Separate Valve Graft (n = 14,833)</th>
<th>Composite Valve Graft (n = 17,773)</th>
<th>Valve Sparing Aortic Root Replacement (n = 367)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at operation (y) ± 1 SD</td>
<td>71.7 ± 9.0</td>
<td>72.3 ± 8.3</td>
<td>72.6 ± 8.3</td>
<td>70.4 ± 9.9</td>
<td>67.5 ± 13.2</td>
</tr>
<tr>
<td>Gender (male, %)</td>
<td>29,444 (57)</td>
<td>9,725 (52)</td>
<td>8,582 (58)</td>
<td>10,893 (61)</td>
<td>234 (64)</td>
</tr>
<tr>
<td>Race (Caucasian, %)</td>
<td>46,496 (90)</td>
<td>16,547 (89)</td>
<td>13,697 (92)</td>
<td>15,929 (90)</td>
<td>323 (88)</td>
</tr>
<tr>
<td>Diagnosis of isolated thoracic aortic aneurysm (%)</td>
<td>20,895 (40)</td>
<td>6,106 (33)</td>
<td>7,563 (51)</td>
<td>7,054 (40)</td>
<td>172 (47)</td>
</tr>
<tr>
<td>Diagnosis of acute aortic dissection (%)</td>
<td>10,199 (20)</td>
<td>6,762 (36)</td>
<td>1,229 (8)</td>
<td>2,102 (12)</td>
<td>106 (29)</td>
</tr>
<tr>
<td>Concomitant coronary artery bypass grafting (%)</td>
<td>19,334 (37)</td>
<td>6,454 (35)</td>
<td>5,925 (40)</td>
<td>6,872 (39)</td>
<td>83 (23)</td>
</tr>
<tr>
<td>Number of Medicare cases performed by surgeon, 1999–2010 (IQR: inter-quartile range)</td>
<td>34 (IQR: 16–78)</td>
<td>28 (IQR: 14–63)</td>
<td>35 (IQR: 18–78)</td>
<td>40 (IQR: 19–97)</td>
<td>34 (IQR: 12–75)</td>
</tr>
</tbody>
</table>
Table 2. Multivariable Cox Analysis of Predictors of Survival Following Ascending Aortic Surgery

<table>
<thead>
<tr>
<th>Predictors of Survival Following Asc Ao Surgery</th>
<th>Multi-variable HR (95% CI)</th>
<th>P-Value</th>
<th>Predictors of Survival Following Asc Ao Surgery</th>
<th>Multi-variable HR (95% CI)</th>
<th>P-Value</th>
<th>Predictors of Survival Following Asc Ao Surgery</th>
<th>Multi-variable HR (95% CI)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at operation</td>
<td>1.029 (1.027–1.031)</td>
<td>&lt;0.001</td>
<td>Low-volume hospital for Asc Ao repair (&lt;75 Medicare pts, 1999–2010)</td>
<td>Reference</td>
<td></td>
<td>Aortic disease: thoracic aortic aneurysm</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Gender (male)</td>
<td>0.95 (0.92–0.97)</td>
<td>0.001</td>
<td>Moderate-volume hospital for Asc Ao repair (75–149 Medicare pts, 1999–2010)</td>
<td>0.93 (0.90–0.97)</td>
<td>0.001</td>
<td>Aortic disease: thoracoabdominal aortic aneurysm</td>
<td>1.68 (1.52–1.84)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Operation: isolated repair of ascending aorta</td>
<td>Reference</td>
<td></td>
<td>High-volume hospital for Asc Ao repair (≥150 Medicare pts, 1999–2010)</td>
<td>0.88 (0.85–0.92)</td>
<td>&lt;0.001</td>
<td>Aortic disease: chronic aortic dissection</td>
<td>1.99 (1.88–2.11)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Operation: separate valve graft</td>
<td>0.97 (0.94–1.01)</td>
<td>0.19</td>
<td>Low-volume surgeon for Asc Ao repair (&lt;38 Medicare pts, 1999–2010)</td>
<td>Reference</td>
<td>&lt;0.001</td>
<td>Aortic disease: acute aortic dissection</td>
<td>2.70 (2.60–2.82)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Operation: composite valve graft</td>
<td>1.12 (1.10–1.18)</td>
<td>&lt;0.001</td>
<td>Moderate-volume surgeon for Asc Ao repair (38–75 Medicare pts, 1999–2010)</td>
<td>0.84 (0.81–0.87)</td>
<td>&lt;0.001</td>
<td>Aortic disease: aortic rupture</td>
<td>3.56 (3.29–3.85)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Predictors of Survival Following Asc Ao Surgery</td>
<td>Multi-variable HR (95% CI)</td>
<td>P-Value</td>
<td>Predictors of Survival Following Asc Ao Surgery</td>
<td>Multi-variable HR (95% CI)</td>
<td>P-Value</td>
<td>Predictors of Survival Following Asc Ao Surgery</td>
<td>Multi-variable HR (95% CI)</td>
<td>P-Value</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>----------------------------</td>
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<td>----------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Operation: valve sparing aortic root replacement</td>
<td>1.15 (0.92–1.44)</td>
<td>0.23</td>
<td>High-volume surgeon for Asc Ao repair (≥75 Medicare pts, 1999–2010)</td>
<td>0.74 (0.71–0.78)</td>
<td>&lt;0.001</td>
<td>Aortic disease: aortic trauma</td>
<td>3.23 (2.34–4.44)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Inter-hospital variability: Bottom-tier performers (&gt;1 SD below median survival)</td>
<td>Reference</td>
<td>0.04</td>
<td>Inter-surgeon variability: Bottom-tier performers (&gt;1 SD below median survival)</td>
<td>Reference</td>
<td>0.87 (0.84–0.91)</td>
<td>&lt;0.001</td>
<td>Aortic disease: endocarditis</td>
<td>2.14 (1.97–2.33)</td>
</tr>
<tr>
<td>Inter-hospital variability: Middle-tier performers (within 1 SD of median survival)</td>
<td>0.74 (0.70–0.79)</td>
<td>&lt;0.001</td>
<td>Inter-surgeon variability: Middle-tier performers (within 1 SD of median survival)</td>
<td>0.67 (0.65–0.70)</td>
<td>&lt;0.001</td>
<td>Aortic disease: isolated aortic valve disease</td>
<td>1.56 (1.50–1.63)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Inter-hospital variability: Top-tier performers (&gt;1 SD above median survival)</td>
<td>0.43 (0.41–0.46)</td>
<td>&lt;0.001</td>
<td>Inter-surgeon variability: Top-tier performers (&gt;1 SD above median survival)</td>
<td>1.68 (1.57–1.80)</td>
<td>&lt;0.001</td>
<td>Aortic disease: missing aortic diagnosis</td>
<td>1.68 (1.57–1.80)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
A

Hazard Ratio for Death, From Multivariable Model
(Using hospital with highest association with death as reference)

95% Confidence Intervals
Hazard Ratio for Death of Each Individual Hospital, Demonstrating Inter-hospital Variability

Individual Hospitals, Sorted by Association With Death (From Highest to Lowest)

B

Hazard Ratio for Death, From Multivariable Model
(Using surgeon with highest association with death as reference)

95% Confidence Intervals
Hazard Ratio for Death of Each Individual Surgeon, Demonstrating Inter-surgeon Variability

Individual Surgeons, Sorted by Association With Death (From Highest to Lowest)
CONCLUSIONS: Survival after operations involving the ascending aorta is influenced by hospital and surgeon volume as well as by inter-hospital and inter-surgeon variability. The number of annual cases per surgeon (median = 3; IQR: 1–7 per year) and per hospital (median = 9; IQR: 4–22 per year) were low, indicating that future Medicare health policy changes regionalizing surgical care for patients with aortic disease would be expected to improve outcomes. Inter-hospital and inter-surgeon variability might be due to patient selection, operative expertise, and quality of post-operative care, but in aggregate reflect the effects of unmeasured or unmeasurable variables contained in the Medicare database.
9:00 am – 9:10 am  NEW MEMBER & SAMSON PRIZE FINALIST INTRODUCTIONS, MacDonald A-B

9:10 am – 9:55 am  PRESIDENTIAL ADDRESS

  MacDonald A-B
  Introduced By: John D. Mitchell
  Achieving “Flow” in Surgery
  Michael S. Mulligan

9:55 am – 10:20 am  COFFEE BREAK: VISIT EXHIBITS & POSTERS, MacDonald C-F
+4. Healthcare Utilization and Consequences of Readmission in the First Year Post Lung Transplantation

Nathan M. Mollberg1, Eric Howell2, David I. Vanderhoff2, *Michael S. Mulligan2
1Bronson Methodist Hospital, Kalamazoo, MI; 2University of Washington Medical Center, Seattle, WA

DISCUSSANT: ROBERT A. MEGUID

OBJECTIVES: Hospital readmissions are costly, and as such have become a focus for quality improvement. To date there has been no studies that have reported on hospital readmissions for lung transplant recipients in the first year, or their long-term clinical implications. We sought to characterize the relationship between hospital readmissions and long-term survival after lung transplantation.

METHODS: We conducted a retrospective cohort study of all lung transplant recipients ≥18 years of age that had undergone an initial transplant (2004 to 2013) and survived through the first year. The number and dates for emergency department (ED) presentations, ED admissions, clinic admissions, and inpatient operations/procedures were recorded and analyzed. Logistic regression was used to identify independent predictors of readmission, while Cox regression was used to explore the relationship between readmission and the long-term risk of death while adjusting for potential confounders.

RESULTS: There were 458 patients who underwent transplantation during the study period, of which 387 (84%) met inclusion criteria. Two hundred fifty-three patients (65%) were readmitted within one year after lung transplantation, for a total of 584 readmissions (average ± SD, 1.5 ± 2; range: 1–15). The majority of readmissions were short with 85% lasting ≤7 days, 58% lasting ≤4 days, and 22% lasting only 1 day. 23% of hospital readmissions occurred within 30 days post-discharge. Pulmonary (55%) and infectious (20%) complications accounted for the majority of readmissions. Airway complications were found to be a significant risk factor for any readmission (HR: 4.18; 95% CI [1.78–9.54]; p = 0.001) or multiple readmissions (HR: 3.23; 95% CI [1.74–6.00]; p < 0.001). Overall conditional 5-year survival

* Samson Resident Prize Essay
* WTSA Member
was 77% (95% CI [72%–84%]). Patients who had no readmissions during the first postoperative year had significantly better 3-year survival (89% vs. 67%, p < 0.001) and 5-year survival (80% vs 48%, p < 0.001) than those with multiple readmissions. In addition, the number of admissions in the first year was predictive of survival at 3 years (HR: 1.30; 95% CI [1.15–1.47]; p < .0001) and 5 years (HR, 1.30; 95% CI: 1.30–2.46, p < 0.0001). After adjustment, the overall risk of death was significantly higher for patients with increasing intensive care unit length of stay during their index admission (HR: 1.04; 95% CI [1.02–1.05]; p < .0001), and for each readmission experienced in the first year (HR: 1.22; 95% CI [.13–1.31]; p < .0001).

**CONCLUSIONS:** A majority of patients who survive the first postoperative year will experience at least one readmission, with patients who experience airway complications at particular risk. The cumulative burden of multiple readmissions is associated with worse long-term survival. Patients who survived the first postoperative year had excellent 5-year survival. As such, readmission rates should be interpreted in the context of survival when used as a quality indicator. As the vast majority of readmissions resulted in short hospital stays, future research efforts should focus on identifying “quality readmissions” which resulted in changes in patient care.
5. Compliance with the New Surgical Care Improvement Project Measure for Glycemic Control after Cardiac Surgery Is not Associated with Improved Postoperative Outcomes

James M. Isbell, Damien J. LaPar, Robert H. Thiele, Ravi K. Ghanta, John A. Kern, Gorav Ailawadi, Irving L. Kron, Anthony L. McCall, Jennifer L. Kirby

University of Virginia, Charlottesville, VA

DISCUSSANT: DAVID A. FULLERTON

OBJECTIVES: The Surgical Care Improvement Project (SCIP) measure for controlled postoperative glycemic control after cardiac surgery was modified in January 1, 2014. The new measure identifies an outlier as any postoperative cardiac surgery patient with more than one glucose level >180 mg/dL in the timeframe of 18 to 24 hours following anesthesia end time. As has been shown with the prior SCIP glucose control measure, we hypothesized that compliance with the new SCIP glucose measure would not result in improved postoperative outcomes.

METHODS: The data were retrospectively analyzed by applying the new glucose control SCIP measure to all patients with Society of Thoracic Surgeons (STS)-predicted risk scores who underwent cardiac surgery between January 1, 2010 to July 30, 2014 at a single institution. The patients were categorized into two groups based on glucose SCIP measure compliance: SCIP compliant and SCIP outliers. Multiple regression analyses were performed to assess the association between SCIP measure compliance and risk-adjusted outcomes.

RESULTS: Of the 3,584 patients, 3,345 (93%) were compliant with the new SCIP glycemic control measure. Preoperative diabetes was more common in the SCIP noncompliant group ($P < .001$). After adjustment for STS-predicted risk, SCIP noncompliance was not associated with increased mortality ($P = .18$), composite major morbidity ($P = .83$), major sternal complications ($P = .19$), total intensive care unit duration ($P = .13$) or postoperative length of stay ($P = .34$). Similar risk-adjusted results were obtained among the subgroup of patients who underwent isolated coronary artery bypass grafting.

CONCLUSIONS: Although improved outcomes have been reported with post-operative glycemic control after cardiac surgery, compliance with the newest SCIP cardiac glucose control measure was not associated with reduced postoperative mortality, morbidity or hospital resource utilization. These data challenge the validity of the latest glucose control SCIP measure as an indicator of postoperative cardiac surgical quality. The results of this study highlight the need for a quality measure that links glycemic control to postoperative outcomes following cardiac surgery.
+6. Patterns of Care in Hilar Node-Positive (n1) Non-Small Cell Lung Cancer: A Missed Treatment Opportunity?

Washington University School of Medicine, Saint Louis, MO

DISCUSSANT: PAUL H. SCHIPPER

OBJECTIVES: For patients with non-small cell lung cancer (NSCLC) metastatic to hilar lymph nodes (N1), guidelines recommend surgery followed by adjuvant chemotherapy. For those deemed technically or medically inoperable, standard treatment is chemoradiation (CRT). However, it is unclear how these treatment recommendations are applied nationally across institutions.

METHODS: The National Cancer Database (NCDB) was queried to identify patients with tumors <7 cm (T1 or T2) with clinically positive hilar lymph nodes (N1). Information on patient- and tumor-related variables, therapy modalities, and outcomes was abstracted. Patients undergoing CRT (chemotherapy and radiation >45 Gy in any order) or surgical resection were considered adequately treated. Remaining patients were classified as receiving inadequate or no treatment.

RESULTS: Between 1998 and 2010, 20,366 patients met study criteria. Of these, 12,857 (63%) underwent adequate treatment (9,719 [48%] surgical resection, 3,138 [15%] CRT). The remaining 7,509 (37%) received inadequate CRT or no treatment (inadequate CRT, n = 4,640 [23%], no treatment, n = 2,869 [14%]). In univariate analysis, patients undergoing inadequate or no treatment were older, more likely non-Caucasian, had lower annual income, and a higher Charlson comorbidity score than those undergoing adequate treatment. Patients undergoing either surgical resection or adequate CRT had improved overall survival (OS) compared with patients receiving inadequate or no treatment (median OS = 34.0 vs. 11.7 months; p < 0.001). Even inadequate treatment was associated with improved OS compared to no therapy (median OS = 13.7 vs. 8.1 months; p < 0.001).

For individuals who received adequate treatment, the clinical characteristics of patients undergoing surgery vs. definitive CRT are summarized in the table. Logistic regression modeling identified several variables associated with surgical resection including treatment at an academic facility (OR: 1.91; 95% CI [1.7–2.1]), Caucasian race (OR: 1.34; 95% CI [1.16–1.54]), and annual income >$35,000 (OR: 1.22; 95% CI
[1.10–1.35]). Increasing age (OR: 0.96; 95% CI [0.96–0.97]) and T2 stage (OR: 0.72; 95% CI [0.65–0.80]) were associated with non-operative management. Unadjusted median OS was greater with surgery than CRT (41.5 vs. 21.4 months; p < 0.001). Propensity score matching of patients receiving surgery or adequate CRT on age, race, gender, income, type of treating facility, comorbidity score, and tumor size revealed 2,308 matched pairs. Surgical resection was associated with longer median OS in the propensity-matched group (34.1 vs. 22.0 months; p < 0.001).

**Table**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Chemoradiation (n = 3,138)</th>
<th>Surgical Resection (n = 9,719)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at diagnosis (years)</td>
<td>69.4</td>
<td>66.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>1,793 (57)</td>
<td>5,306 (55)</td>
<td>0.013</td>
</tr>
<tr>
<td>Annual income &gt;$35,000, n (%)</td>
<td>1,811 (60)</td>
<td>6,069 (66)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Academic center</td>
<td>645 (21)</td>
<td>3,283 (34)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Charlson score, n (%)</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>0</td>
<td>1,864 (59)</td>
<td>5,411 (56)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>895 (28)</td>
<td>3,226 (33)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>379 (12)</td>
<td>1,082 (11)</td>
<td></td>
</tr>
<tr>
<td>Surgical resection, n (%)</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>None</td>
<td>3,138 (100)</td>
<td>.</td>
<td>0</td>
</tr>
<tr>
<td>Wedge</td>
<td>0</td>
<td>612 (6)</td>
<td></td>
</tr>
<tr>
<td>Lobectomy</td>
<td>0</td>
<td>7,657 (79)</td>
<td></td>
</tr>
<tr>
<td>Pneumonectomy</td>
<td>0</td>
<td>1,450 (15)</td>
<td></td>
</tr>
<tr>
<td>Median overall survival (months)</td>
<td>21.4</td>
<td>41.5</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**CONCLUSIONS:** Despite established guidelines, many patients with T1-2N1 NSCLC fail to receive adequate treatment. Surgical resection is associated with improved survival in selected patients. Surgical input in the multidisciplinary evaluation of these patients should be mandatory.
+7. Defining Operative Mortality: Impact on Outcome Reporting
Steven Maximus1, *Jeffrey C. Milliken1, Beate Danielsen2, *Junaid Khan3, *Joseph S. Carey1
1UC Irvine, Orange, CA; 2Health Information Solutions, Rocklin, CA; 3East Bay Cardiac Surgery Center, Oakland, CA
DISCUSSANT: SUSAN D. MOFFATT-BRUCE

OBJECTIVE: Death is the most important, as well as the most definitive, outcome of procedural interventions. The Death rate, or Mortality rate, is subject to variability by definition. The STS-NDB definition of “operative” mortality originally included all in-hospital deaths as well as deaths occurring within 30 days of the procedure. In recent versions of the STS-NDB, “in-hospital” has been modified to include “patients transferred to other acute care facilities,” and “deaths within 30 days unless clearly unrelated to the procedure” has been changed to “deaths within 30 days regardless of cause.” This study addresses the impact of these redefinitions on outcome reporting.

METHODS: The California Office of Statewide Health Planning and Development hospitalized patient discharge database was queried for the year 2009, the most recent year in which data files could be linked to the vital statistics death files to include all-cause mortality. Isolated CABG, Isolated Valve, CABG-valve, and PCI procedures were identified by ICD-9-CM procedure codes. PCI procedures were further divided into acute coronary syndrome (PCI-ACS) and all other PCI (PCI-noACS). Deaths were counted by four methods depending on the time and place of occurrence: 1) in-hospital, or during the index hospitalization; 2) In-hospital + connected hospitalization, defined as a transfer to another acute care facility on the same day or within 24 hours of discharge; 3) in-hospital + 30 day, death during index hospitalization or within 30 days after the procedure; and 4) in-hospital + connected + 30 day.
RESULTS:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>2009 N =</th>
<th>In-Hospital</th>
<th>In-Hospital + Connected</th>
<th>In-Hospital + 30 Day</th>
<th>In-Hospital + Conn + 30 Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated CABG</td>
<td>13,312</td>
<td>227 (1.7)</td>
<td>272 (2.1)</td>
<td>273 (2.1)</td>
<td>309 (2.5)</td>
</tr>
<tr>
<td>CABG/Valve</td>
<td>3,098</td>
<td>152 (4.9)</td>
<td>179 (5.8)</td>
<td>172 (5.8)</td>
<td>194 (6.5)</td>
</tr>
<tr>
<td>Isolated Valve</td>
<td>5,777</td>
<td>190 (3.3)</td>
<td>213 (3.7)</td>
<td>212 (3.7)</td>
<td>231 (4.2)</td>
</tr>
<tr>
<td>PCI with ACS</td>
<td>23,051</td>
<td>749 (3.2)</td>
<td>808 (3.6)</td>
<td>1013 (4.4)</td>
<td>1033 (5.0)</td>
</tr>
<tr>
<td>PCI without ACS</td>
<td>30,878</td>
<td>166 (0.5)</td>
<td>184 (0.6)</td>
<td>300 (1.0)</td>
<td>306 (1.0)</td>
</tr>
</tbody>
</table>

For the three surgical groups, 22% (165 of 734) of deaths occurred after the index hospitalization. There was little difference between the in-hospital + connected transfer and in-hospital + 30 day method, indicating that most surgical deaths within the first 30 days occur “in-hospital”. An additional 10% of deaths occur beyond 30 days during connected transfers.

In the PCI groups, a larger percentage of deaths occur after hospital discharge and within 30 days of the procedure: 27% (284 of 1,033) for PCI-ACS and 46% (140 of 306) for PCI-noACS. Only a few more deaths were counted after 30 days in connected transfers of PCI patients.

CONCLUSION: A significant percentage of procedural deaths occur after transfer or discharge from the index hospital. This is especially evident in the PCI group. These findings illustrate the importance of the definition of “operative” mortality, and the need to insure accuracy in the reporting of data to voluntary clinical registries such as the STS-NDB and NCDR. Public reporting of unaudited data to groups such as the Consumers Union should be discouraged.
11:40 am – 12:25 pm **CONTROVERSIES DEBATE, MacDonald A-B**
Should Patient and Physician Values/Expectations Be Consonant?
Moderator: Tara B. Karamlou
Speakers: Suzanne Arnold
           James Matthew Brennan

12:25 pm **ADJOURN**

1:30 pm **ATV WILDERNESS ADVENTURE**, Depart from Hotel Entrance

1:30 pm **ZIPTREK BEAR TOUR**, Depart from Hotel Entrance

6:00 pm – 10:00 pm **MOUNTAIN SPORTS STREET PARTY THEME DINNER**, Portobello Alley

** Separate Subscription Required
FRIDAY, JUNE 26, 2015

6:00 am – 12:00 pm  REGISTRATION, MacDonald Foyer

6:00 am – 12:00 pm  SPEAKER READY ROOM, Tremblant

6:30 am – 7:50 am  SIMULTANEOUS BREAKFAST SESSIONS**, Empress B & C

I. Lung Cancer Screening in the Post-Approval Era**, Empress B
Douglas E. Wood
Richard I. Whyte

II. Prosthetic Valve Selection in the Era of Transcatheter Valves**, Empress C
Anson Cheung
Thomas K. Jones

7:00 am – 12:00 pm  EXHIBITS, MacDonald C-F

7:00 am – 8:00 am  BREAKFAST, MacDonald C-F

8:00 am – 8:50 am  POSTGRADUATE COURSE

MacDonald A-B
Supported by: White Memorial Medical Center and Foundation’s – Lyman A. Brewer, III, Fund and Thomas J. Fogarty

Innovations in the Access to New Medical Devices
Michael J. Mack
Medical Director of Cardiovascular Services
Baylor Scott & White Health

** Separate Subscription Required
BACKGROUND: Lung transplantation (LTX) is a life-saving procedure for patients with end-stage lung disease (ESLD). To date, the frequency and severity of the complication profile has not been fully characterized. Our hypothesis was that an early in-hospital, postoperative complication would lead to decreased long-term survival. Thus, we sought to profile and determine the potential impact of an in-hospital complication on long-term survival.

METHODS: Utilizing our prospective database, we retrospectively identified in-hospital complications in patients who underwent LTX for ESLD between January 2007 and October 2013. Each complication was graded according to the extended Accordion Severity Grading System (ASGS). Complications were rigorously categorized by specific event and by organ system. Kaplan-Meier method was used to assess the association between in-hospital, 90-day postoperative complications and outcome (P < 0.05 was significant).

RESULTS: We identified 748 total patients that had 3,811 postoperative complications. 52 patients (7%) died before discharge and were excluded from long-term analysis. In the 681 patients that met criteria for analysis, there was an in-hospital, postoperative complication rate of 93.4%. Overall median follow-up time was 5.1 years. When complications were categorized by organ system, the most significant decrease in overall survival was renal (HR: 2.19; 95% CI [1.11–6.49]; P < 0.0001),
The Fairmont Chateau Whistler, British Columbia 41ST ANNUAL MEETING

hepatic (HR: 3.53; 95% CI [2.12–5.87]; P < 0.0001), musculoskeletal (HR: 2.78; 95% CI [1.73–4.44]; P < 0.0001); followed by vascular (HR: 1.89; 95% CI [1.35–2.64]; P < 0.0009), and pleural space disease (HR: 1.58, 95% CI [1.20–2.08]; P < 0.0009) (Table 1). When stratifying patients according to their highest ASGS score, 5-year survival did not differ significantly between those with an ASGS score of 1–4 (65.1%; P = 0.39) and those who did not have an in-hospital postoperative complication (68.1%). Survival was significantly reduced in patients who had a grade 5 complication (16.1%; P = 0.0001) (Figure 1A). When analyzing patients based on the sum of their weighted ASGS scores, patients with a sum 0 < X ≤ 10 did not differ statistically from those with no complications (62.3%; P = 0.31). Survival was significantly reduced in patients whose weighted ASGS score sum was greater than 10 (21.9%; P = 0.000012) (Figure 1B).

Table 1. List of Complication with Overall Survival

<table>
<thead>
<tr>
<th>Complication Type</th>
<th>% of Complications</th>
<th>N (% of Patients)</th>
<th>Hazard Ratio (Standard Error)</th>
<th>Overall Survival P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any complications</td>
<td>98.79</td>
<td>703 (93.98)</td>
<td>2.68 (0.45)</td>
<td>0.0236</td>
</tr>
<tr>
<td>Renal</td>
<td>7.66</td>
<td>271 (36.23)</td>
<td>2.19 (0.14)</td>
<td>0.000000025</td>
</tr>
<tr>
<td>Hepatic</td>
<td>1.36</td>
<td>49 (6.55)</td>
<td>3.53 (0.26)</td>
<td>0.00000018</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>1.39</td>
<td>47 (6.28)</td>
<td>2.78 (0.24)</td>
<td>0.0000078</td>
</tr>
<tr>
<td>Vascular</td>
<td>3.81</td>
<td>114 (15.24)</td>
<td>1.89 (0.17)</td>
<td>0.000121</td>
</tr>
<tr>
<td>Pleural space</td>
<td>14.96</td>
<td>367 (49.06)</td>
<td>1.58 (0.14)</td>
<td>0.000859</td>
</tr>
<tr>
<td>Psychiatric episode</td>
<td>3.78</td>
<td>126 (16.84)</td>
<td>1.62 (0.17)</td>
<td>0.00314</td>
</tr>
<tr>
<td>Cardiac</td>
<td>9.19</td>
<td>272 (36.36)</td>
<td>1.51 (0.14)</td>
<td>0.00356</td>
</tr>
<tr>
<td>Neurologic</td>
<td>3.46</td>
<td>89 (11.9)</td>
<td>1.71 (0.20)</td>
<td>0.00743</td>
</tr>
<tr>
<td>Wound healing complication</td>
<td>0.76</td>
<td>29 (3.88)</td>
<td>2.01 (0.29)</td>
<td>0.013</td>
</tr>
<tr>
<td>Infection</td>
<td>26.51</td>
<td>536 (71.66)</td>
<td>1.51 (0.17)</td>
<td>0.0162</td>
</tr>
<tr>
<td>GI</td>
<td>1.86</td>
<td>50 (6.68)</td>
<td>1.74 (0.25)</td>
<td>0.0231</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>19.55</td>
<td>542 (72.46)</td>
<td>1.43 (0.16)</td>
<td>0.0273</td>
</tr>
<tr>
<td>Hematologic</td>
<td>0.18</td>
<td>6 (0.8)</td>
<td>3.12 (0.71)</td>
<td>0.0916</td>
</tr>
<tr>
<td>Endocrine</td>
<td>1.47</td>
<td>38 (5.08)</td>
<td>0.59 (0.41)</td>
<td>0.2</td>
</tr>
<tr>
<td>Ear, nose &amp; throat</td>
<td>2.05</td>
<td>68 (9.09)</td>
<td>1.19 (0.23)</td>
<td>0.445</td>
</tr>
</tbody>
</table>
Figure 1

A. Kaplan Meier Curves Depicting the Impact of Complications by Accordion Group

B. Kaplan Meier Curves Depicting the Impact of Complications by Weighted Accordion Score
CONCLUSIONS: Rigorous delineation of complications following LTX demonstrated an illuminating profile. Importantly, Grade 5 ASGS in-hospital postoperative complications as well as having a weighted ASGS sum of >10 were an independent predictor of long-term survival well beyond the initial perioperative period. These findings have important implications for patient/family counseling and candidacy for LTX. Finally, these results may identify important targets for best practice guidelines and quality of care measures following LTX.
9. Hypoplastic Aortic Arch Growth Following Coarctation Repair

Daniel Labuz, Lee Pyles, James Berry, John Foker
University of Minnesota Medical School, Minneapolis, MN

DISCUSSANT: DAVID N. CAMPBELL

OBJECTIVE: Infants with coarctation of the aorta (CoA) often have an associated hypoplastic transverse aortic arch (H-TAA) which can complicate complete surgical repairs. Congenital defects including hypoplastic valves, ventricles, and also H-TAAs may be considered primarily genetic in origin and therefore require direct repair or bypass for adequate function. Our hypothesis, however, is that H-TAA is a developmental consequence of reduced arch flow caused by the CoA and should be reversible by providing the specific growth signal. Our purpose was to determine if the increased aortic flow following CoA repair would provide a reliable signal for TAA catch-up growth and reduce the need for extended arch repairs.

METHODS: Infants with CoA and H-TAA (a hypoplastic transverse aortic arch between the left common carotid and subclavian arteries) who had repair by the subclavian flap (SCF) technique with ductal ligation at less than 6 months of age were reviewed. Inclusion required satisfactory initial, early postoperative, and follow up (f/u) echocardiographic/Doppler studies. H-TAA diameters were measured by echo before repair and sequentially at f/u. These were compared to the expected diameters and Z-scores calculated (Z-score = standard deviations below or above expected). Hypoplasia was a Z-score < –2.0.

RESULTS: All infant CoA patients (N = 19) had H-TAAs (diameter = 3.8 ± 0.7 mm, with Z-score = –3.7 ± 1.3). The CoA repair and ductal ligation, which established flow to the lower body through the transverse arch, were usually done in the newborn period (median age: 8; range: 2–178 days). After CoA repair, the H-TAAs grew rapidly and reached normal size a median of 56 days later (Figure). The TAA diameters were 6.0 ± 1.6 mm (Z = –1.0 ± 1.5) within one year f/u. Growth thereafter continued at normal rates and at intermediate f/u (2 to 6 years) arch size was 9.3 ± 1.4 mm (Z = –1.1 ± 1.4).

At longer term f/u (6 to 13 years) (N = 17), arch diameter was 11.8 ± 1.3 mm (Z = –0.6 ± 0.9) and all (17/17) had appropriate TAA size without significant gradient along the arch. Additionally, 15/17 were normotensive, 13/17 were not on medications, and 4/17 had a >30 mmHg gradient only at the CoA site.

Patients (N = 38) with SCF CoA repair in infancy but without adequate studies for complete analysis and inclusion showed similar H-TAA normalization: At f/u of 3–25 years, the TAA Z-scores = –0.7 ± 1.1.
CONCLUSIONS: 1) H-TAAs grew rapidly to normal size (<3 months in 15/19) following CoA repair. 2) After rapid catch-up growth, the TAAs continued to grow normally into adolescence. 3) TAA growth appeared to result from increased flow rather than another biomechanical signal such as pressure, which would be lowered by repair. 4) The results suggest H-TAAs are developmental defects, reliably reversible with increased flow. 5) Hypoplastic arch segments, therefore, may not need to be corrected surgically if flow can be significantly increased.
Background: Several modern learning frameworks (e.g., cognitive apprenticeship, anchored instruction, and situated cognition) posit the utility of non-traditional methods for effective experiential learning. Moreover, data from the aviation industry suggests that the majority of errors occurring in team-based, high complexity procedural environments result from errors in cognitive processing rather than technical mishaps. To this end, development of novel educational tools emphasizing the cognitive framework of operative sequences may be of benefit to surgical trainees. We hypothesized that an effective, tablet/smartphone-based mobile cognitive cardiac surgical simulator could be developed and globally deployed using an existing software platform.

Methods: Educational modules were created utilizing the Touch Surgery (London, UK) platform. Surgical procedures were captured on video and 3-D animations rendered and punctuated with key operative steps. A total of 4 modules were created under the umbrella term of Sternotomy and Cardiopulmonary Bypass: 1. Median Sternotomy, 2. Cannulation for Cardiopulmonary Bypass and Cardiac Arrest, 3. Decannulation following Separation from Cardiopulmonary Bypass, and 4. Sternotomy Closure. Each module contains between 200 and 400 distinct animated surgical steps. Modules can be downloaded onto a smartphone/mobile computing device and are made available free of charge. Once downloaded, the modules can be used in “learning” or “testing” modes. In the learning mode, users interact with the virtual OR, using finger swipes to proceed through the operation. In the testing mode, the simulated operation proceeds as the user answers interactive questions and correctly performs finger swipes. The cognitive task analysis (CTA) engine collects user profile data and demographics, logged simulation time, and learner performance on the modules as a function of “percent correct” achieved in the testing mode. Performance data are available to the users for self-analysis and improvement.

Results: The Touch Surgery platform was used to successfully create and globally deploy cardiac surgery cognitive task simulators (Figure 1). Over the first 3 weeks of its release, the modules were downloaded 3,386 times amongst 1,333 unique users (60% by medical personnel). The CTA engine logged 32,356 minutes of simulation.

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There were 14,789 interactions; 3,854 learning sessions and 1,764 testing sessions. The average score for physicians with an interest in cardiothoracic surgery was 69% ± 20.4% compared to 60% ± 25% for others. The module was downloaded globally, including the USA, Brazil, UK, Italy, Canada, South Africa, Australia, China, Russia, and India. Percent usage by countries included: USA (37%), Brazil (15.7%), UK (4.8%), Italy (3.6%), and Australia (3.6%).

**CONCLUSIONS:** This study represents the first effort to create a mobile-based, interactive cognitive task simulator for cardiac surgery. In conjunction with novel blended learning tools (e.g., Thoracic Surgery Curriculum), simulators of this type may be effective for the training and assessment of surgical students. Ongoing efforts by our group are focused on development of additional modules, further collection of CTA data, and comprehensive study evaluating the efficacy of this new tool against current gold standards.
11. Natural History of Coexistent Mitral Regurgitation Following Aortic Valve Replacement
University of Virginia, Charlottesville, VA
DISCUSSANT: JOSEPH WOO

OBJECTIVES: The long term evolution of coexistent mitral regurgitation (MR) following aortic valve replacement (AVR) for aortic stenosis (AS) remains poorly defined. Prior studies have demonstrated that acute improvement in MR following AVR is modest and more aggressive approaches have been advocated. This study examines the evolution of MR following AVR and identifies prognostic indicators for MR improvement.

METHODS: We retrospectively evaluated demographic and echocardiographic data on 423 patients who underwent primary isolated AVR with coexistent mild (n = 314), moderate (n = 99), or moderate-severe (n = 10) MR at our institution from 2003 to 2013. For each patient, preoperative and postoperative MR was extracted from 903 echocardiograms and graded on a 0 to 4+ scale. Hierarchical generalized linear models were used to estimate postoperative residual MR over a 4-year follow-up period. Patients were then stratified by improvement in MR and preoperative risk factors were compared between groups.

RESULTS: The overall acute reduction in MR was ~0.23 degrees per patient. Patients with moderate or greater MR had a ~0.53 degree reduction in MR, whereas patients with mild MR had only a ~0.13 degree reduction in MR (p < 0.001). Residual MR, however, worsened over time and regressed back to baseline, particularly in patients with preoperative moderate or greater MR. At last follow-up, 70 (17%) patients returned to 2+ or worse MR. Mid-term residual MR was not affected by left-ventricular ejection fraction (LV EF), severity of preoperative aortic valve gradient, magnitude of reduction of aortic valve gradient, or other comorbidities.
### Mid-Term Residual MR

<table>
<thead>
<tr>
<th></th>
<th>No Improvement (n = 237)</th>
<th>Improvement (n = 186)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in MR (degree, SD)</td>
<td>0.18 ± 0.40</td>
<td>-0.77 ± 0.37</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Residual MR (degree, SD)</td>
<td>1.32 ± 0.56</td>
<td>0.56 ± 0.40</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Preoperative LV EF (%), SD</td>
<td>53 ± 19</td>
<td>50 ± 13</td>
<td>0.96</td>
</tr>
<tr>
<td>Preoperative Peak Aortic Valve Gradient (mmHg, SD)</td>
<td>74 ± 24</td>
<td>74 ± 26</td>
<td>0.98</td>
</tr>
<tr>
<td>Reduction in Peak Aortic Valve Gradient (mmHg, SD)</td>
<td>-48.8 ± 24</td>
<td>-51 ± 26</td>
<td>0.48</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>103 (43%)</td>
<td>87 (47%)</td>
<td>0.65</td>
</tr>
<tr>
<td>Chronic Lung Disease</td>
<td>62 (26%)</td>
<td>52 (28%)</td>
<td>0.73</td>
</tr>
<tr>
<td>Renal Insufficiency</td>
<td>64 (27%)</td>
<td>54 (29%)</td>
<td>0.75</td>
</tr>
<tr>
<td>Hypertension</td>
<td>169 (71%)</td>
<td>140 (75%)</td>
<td>0.17</td>
</tr>
<tr>
<td>Diabetes</td>
<td>57 (24%)</td>
<td>47 (25%)</td>
<td>0.67</td>
</tr>
</tbody>
</table>

**CONCLUSION**: Coexistent MR following AVR initially modestly improves; however, it regresses back to baseline or worsens over time in many patients. Reduction of aortic valve gradient is not predictive of improvement of residual MR. More aggressive approaches for coexistent moderate MR should be considered in patients who present for AVR for AS.
+12. Inheriting the Learner’s View: A Wearable Computing Platform for Improving Surgical Trainee Performance
Stanford University, Stanford, CA
DISCUSSANT: CRAIG J. BAKER

BACKGROUND: Balancing resident autonomy with adequate supervision remains challenging, especially when visualization of the operative field is limited (e.g. traditional mitral valve exposure). It is speculated that real-time visualization of the trainee’s viewpoint by the instructor may improve performance and teaching efficacy. We hypothesized that introduction of a wearable computing solution allowing the instructor to visualize otherwise “blind” areas in the operative field could improve trainee performance in a simulated operative setting.

METHODS: The Google (Mountain View, Ca) Glass wearable computing platform running proprietary software from CrowdOptic (San Francisco, Ca) was utilized for creation of the wearable surgical visualization system. Both the learner and trainer wore Glass devices and video was streamed from the learner’s Glass unit in real-time to the trainer (image latency <1 ms). A specialized simulator was constructed whereby the operative field (consisting of a standardized black and white template) was obscured from the trainer’s view, but readily visualized by the learner. Using a suture placement key and standard script, the trainer directed the learner as to where needles should be placed. The learner had no a priori knowledge of the placement objectives, but simply followed the commands of the trainer. Each participant (n = 4) performed a total of 10 needle swings, 5 with the wearable on and 5 with it removed. Needles were left in place and a composite error score calculated based on the accuracy of needle placement per the instructor’s key. Mean completion time was also measured and participants completed a questionnaire following the experimental session.

RESULTS: Introduction of the wearable did not affect mean time to task completion (234 ± 28 vs. 238 ± 33 seconds; NS). However, mean composite error score (MCES) fell significantly once the wearable system was deployed (17 ± 6 vs. 12 ± 4 mm; P = 0.05), suggesting improved accuracy of needle placement (Figure 1). Three out of four participants deemed the device unobtrusive, easy to operate, and useful for communication and instruction. All participants reported a similar device would be useful in the actual OR.

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CONCLUSIONS: The findings suggest that wearable technologies allowing for adoption of the learner’s perspective may be a useful educational adjunct in the operating room. Additional experience and larger sample size will better define the task components that would benefit from this technology.

10:30 am – 11:00 am  **COFFEE BREAK: VISIT EXHIBITS & POSTERS, MacDonald C-F**
11:00 am – 12:00 pm  Scientific Session IV

MacDonald A-B
(10 minutes presentation, 10 minutes discussion)

Moderators: Craig J. Baker
Sean C. Grondin

13. Outcomes and Their Determinants for Combined Pediatric Heart-Visceral Organ Transplantation: Selection Criteria to Improve Triage to a Multi-Organ Strategy

Joseph Rodrigues, Billie-Jean Martin,
*Gordon Cohen, Sarah Tabbutt, *Tara Karamlou
University of California, San Francisco, San Francisco, CA

DISCUSSANT: JONATHAN M. CHEN

OBJECTIVES: Contemporary outcomes for pediatric simultaneous heart-kidney (HKTx) and heart-liver (HLTx) transplant (Tx) recipients are not known. Further, clinical criteria that would favor combined pediatric HKTx or HLTx transplantation are undefined. We aimed to: 1) characterize outcomes of pediatric HKTx and HLTx and their determinants over time; 2) create and test a novel liver severity score (LSS) that could improve triage to a HLTx strategy; and 3) determine whether, as we had done in adults, estimated glomerular filtration rate (eGFR) could be utilized as a metric to identify those HTx recipients that would benefit from a combined Tx strategy.

METHODS: A supplemented United Network Organ Sharing Dataset identified pediatric (age ≤18) HTx, HKTx, and HLTx recipients from 2002 to 2013. eGFR was estimated using the Schwartz (≤12 years) and MDRD (>12 years) formulas, with subsequent grouping into eGFR quintiles. LSS was created using variables derived from propensity score models defining the probability of combined HLTx. Kaplan-Meier plots compared post-Tx mortality between recipients. Multivariable factors for time-related death were sought using Cox proportional hazard models.

RESULTS: We identified 4,200 pediatric HTx recipients, 26 of whom were HKTx, and 9 of whom were HLTx. Frequency of HTx increased by 37% over time while frequency of HKTx and HLTx remained constant. HTx recipients were younger (7 vs. ~13 years P < .0001) than combined recipients, had lower creatinine at Tx compared to HKTx recipients (0.6 vs. 2.8 mg/dl; P = .0008), and slightly higher albumin (3.5 vs. 3.3 g/dL P = 0.415) than HLTx. Risk-unadjusted survival at 5 years tended to be lower among HTx than among combined recipients: (HTx (77%), HKTx recipients (83%) and HLTx recipients (100%; P = 0.14)). HTx recipients in the lowest eGFR

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quintile had lower post-Tx survival compared to HTx recipients with better renal function, and compared to combine HKTx recipients (Figure 1). On multivariable analysis, lowest eGFR quintile (HR: 1.21; 95% CI [1.03–1.42]) and higher LSS (HR: 1.20; 95% CI [1.01–1.45]) predicted worse survival among HTx patients. In addition, multivariable analysis demonstrated heart-visceral multi-organ transplant to be protective from treatment of acute rejection at 1 year (HR: 0.29; 95% CI [0.10–0.84]).

CONCLUSIONS: Combined HKTx and HLTx among pediatric recipients have at least equivalent survival to isolated HTx. Novel LSS and eGFR quintile can stratify time-related mortality risk among HTx. Combined HKTx restores post-Tx survival in recipients within the lowest eGFR quintile (<67 ml/min) and is a reasonable approach for patients with renal failure below this threshold value.

Bryan M. Burt1, Xiaopan Yao2, *Joseph Shrager3, Sukhmani Padda3, Heather Wakelee3, Stacey Su4, James Huang5, Walter Scott4

1Baylor College of Medicine, Houston, TX; 2Yale, New Haven, CT; 3Stanford University School of Medicine, Stanford, CA; 4Fox Chase Cancer Center, Philadelphia, PA; 5Memorial Sloan-Kettering Cancer Center, New York, NY

DISCUSSANT: JOHN D. MITCHELL

OBJECTIVES: Complete resection is a critical predictor of recurrence-free and overall survival for thymoma. Although minimally invasive approaches to thymectomy are gaining popularity, concerns regarding completeness of resection remain. We analyzed determinants of complete (R0) resection among patients undergoing open thymectomy (OT) and minimally invasive thymectomy (MIT) in a large international database.

METHODS: The retrospective database of the International Thymic Malignancy Interest Group (ITMIG) was queried. OT was defined by sternotomy or thoracotomy approaches, and MIT was defined by video-assisted thoracoscopic (VATS) or robotic-assisted thoracoscopic (RATS) procedures. Chi-Square and Wilcoxon rank-sum tests were used to compare variables between OT and MIT groups. A multivariate logistic regression model was built to test the association between resection status and surgical approach (MIT vs. OT). Propensity matching was performed to balance covariates between MIT and OT groups.

RESULTS: A total of 2,514 patients underwent thymectomy for thymoma from 1997 to 2012. 2,053 (82%) patients underwent OT (85% sternotomy, 15% thoracotomy), 461 (18%) patients underwent MIT (68% VATS, 32% RATS), and the use of MIT steadily increased over time (Figure 1A). Compared with patients in the MIT group, patients in the OT group were more likely to be older (53.7 vs. 51.6 years, respectively, p = 0.002), male (50.3% vs. 44.9%, p = 0.04), have larger tumor sizes (6.5 cm vs. 4.6 cm; p < 0.0001), have more advanced WHO histology (p = 0.01), have more advanced stage (stage III–IV in 26.4% vs. 9.2%, p < 0.0001), have a paraneoplastic syndrome (44% vs. 44.9%, p = 0.04), have undergone total vs. partial thymectomy (91.3% vs. 73.1%, p < 0.0001), and have undergone chemotherapy (15.5% vs. 3%, p < 0.0001) or radiotherapy (37.4% vs. 31.4%, p = 0.02). There were 2,058 (90.0%) R0 resections in the OT group and 427 (93.9%) R0 resections in the MIT group (p < 0.0001), and the percentage of R0 resections increased over time in each group.

* WTSA Member
Independent predictors of R0 resection included stage (p < 0.0001), complete (vs. partial) thymectomy (p = 0.0002), absence of radiotherapy (p = 0.007), absence of paraneoplastic syndrome (p = 0.04), and continent on which the surgery was performed (p < 0.0001). Surgical approach (MIT vs. OT) was not an independent predictor of R0 resection (p = 0.92). Propensity matching was used to balance MIT and OT groups (n = 204 each group) for covariates that were predictive of R0 resection (stage, extent of thymectomy, radiotherapy, paraneoplastic syndrome, continent), as well as clinically important covariates (tumor size, time period). The rate of R0 resection did not differ significantly between balanced MIT and OT groups (96% and 93%, respectively, p = 0.29).

CONCLUSIONS: In a large international cohort of patients with thymoma, the use of MIT is increasing significantly over time. Although a lower percentage of patients underwent total thymectomy in the MIT group, a minimally invasive approach did not result in lesser rates of complete resection than an open approach.
15. Impact of a TAVR Program Initiation on a Standard Aortic Valve Replacement Surgery Program

Niv Ad, Sari D. Holmes, Alan M. Speir, Anthony J. Rongione, Paul S. Massimiano, Graciela Pritchard

Inova Heart and Vascular Institute, Falls Church, VA

DISCUSSANT: DAVID A. FULLERTON

OBJECTIVES: The introduction of transcatheter AVR (TAVR) to treat aortic stenosis (AS) resulted in a revolution in how AS is approached and treated. The purpose of this study was to determine the impact of the TAVR program on our surgical AVR (SAVR) practice with regard to patient selection, perioperative outcomes, 1-year survival, and number of SAVR cases performed.

METHODS: The TAVR program was initiated at our center in August 2011. All patients since 2008 with isolated SAVR that occurred before the TAVR program (n = 282 in 42 months) were compared to all patients with isolated SAVR that occurred after the TAVR program began (n = 274 in 34 months).

RESULTS: The proportion of patients who underwent isolated SAVR out of all cardiac surgery patients was higher post-TAVR (9.6% vs. 6.9%; P < 0.001). This difference resulted from a significant decline in CABG, which decreased by an average of 150–180 cases per year. SAVR increased by an average of 1 case per month (~10%) and remained 21% of total valve procedures post-TAVR. No significant differences between pre- and post-TAVR groups was found for the majority of preoperative or intraoperative characteristics except for CHF prevalence (30% vs. 21%; P = 0.016), minimally invasive approach (38% vs. 50%; P = 0.004), and cross-clamp time (78 vs. 74 min; P = 0.041). Although mean STS predicted risk was not different between pre- and post-TAVR patients (2.3% vs. 2.2%; P = 0.514), the distribution shifted slightly toward reduced STS risk post-TAVR (Figure; TAVR = gray line, pre-TAVR = black line, post-TAVR = dashed line). A similar result was found for distribution of patient age, with a slight decrease in octogenarians. Operative mortality was similar pre- and post-TAVR (2.1% vs. 1.8%; P = 0.798), as were the O/E ratios pre- and post-TAVR (0.91 vs. 0.82). No difference was found for 1-year survival between pre- and post-TAVR patients (95.7% vs. 94.3%; log rank = 0.76; P = 0.382). The only outcome differences were greater incidence of perioperative atrial fibrillation post-TAVR (14% vs. 26%; P = 0.001) and slightly longer median LOS (4 vs. 5 days; P = 0.007), but there was no difference in AF prevalence at discharge (2.5% vs. 1.5%; P = 0.387). There was no difference in stroke/TIA incidence (1.1% vs. 1.5%; P = 0.721) or percent discharged to home (82% vs. 86%; P = 0.175) between pre- and post-TAVR eras.
CONCLUSIONS: Contrary to reports based on industry data, results of this study demonstrate that in our program the number of patients operated for SAVR did not change significantly after introduction of the TAVR program and Heart Team concept. When clinical recommendations for use of TAVR are followed, patient characteristics for SAVR did not change significantly, and acceptable outcomes were maintained throughout the study period. Special attention should be paid to TAVR patients with lower STS risk, as they represent a unique subgroup with pertinent risk not necessarily captured well by the STS risk model.
12:00 pm  ADJOURN

1:20 pm  GOLF TOURNAMENT**, Depart from Hotel Entrance via Shuttle to Golf Club at 12:30 pm

2:00 pm  TENNIS TOURNAMENT**, Tennis Club

FREE EVENING

** Separate Subscription Required
SATURDAY, JUNE 27, 2015

6:00 am – 12:00 pm  **REGISTRATION, MacDonald Foyer**

6:00 am – 11:30 am  **SPEAKER READY ROOM, Tremblant**

6:30 am – 10:30 am  **EXHIBITS, MacDonald C-F**

6:30 am – 7:30 am  **BREAKFAST, MacDonald C-F**

7:00 am – 8:15 am  **CONCURRENT FORUMS**

*(5 minutes presentation, 3 minutes discussion)*

ADULT CARDIAC

*MacDonald A-B*

Moderators:  Howard K. Song
             Joseph C. Cleveland, Jr.

**CF1. Fate of Patients with Acute Type B Aortic Dissection Initially Managed Medically**

*Nimesh Desai*, Jean-Paul Gottret, Wilson Szeto, Fenton McCarthy, Prashanth Vallabhajosyula, Pat Moeller, Ronald Fairman, Grace Wang, *Joseph E. Bavaria*

*Hospital of the University of Pennsylvania, Philadelphia, PA*

**OBJECTIVES:** Little is known about the fate of patients with acute onset uncomplicated Type B aortic dissection. We present mid-term results of Type B dissection patients who were initially managed with medical therapy in a large comprehensive aortic clinic with routine follow-up.

**METHODS:** Between 2006 and 2013, there were 293 admissions for new acute type B aortic dissection. Among these, 75 underwent urgent intervention within 48 hours of diagnosis due to presenting complications related to the dissection (acute-early intervention for acute complicated type B dissection). These cases were excluded from this analysis. 218 other patients were managed initially with medical therapy only. Patients were followed in a clinical registry. Standard univariate and survival methods were used.

* WTSA Member
RESULTS: Among the 218 patients initially managed medically, 170 were discharged home without intervention. 48 patients required intervention during the initial hospitalization for new clinical indications including new malperfusion (23/48 [48%]) or rupture/impending rupture (25/48 [52%]). Interventions included open repair in 3 (6%) patients and TEVAR in 45 patients (94%). 30-day mortality occurred in 1 patient (0.6%) in the initially medically managed group and 2 patients in the intervention group (4.1%). Late interventions after the index hospitalization occurred in 42 of the 170 patients initially discharged without intervention. Among these, there were 11 TEVARs, 15 thoracic or thoracoabdominal aortic open repairs, 10 proximal aortic repairs, and 6 others including peripheral bypasses. Indications for intervention included aneurysmal degeneration in 53% of cases, need for proximal intervention in 31%, and new malperfusion in 16% of cases. Mortality at the time of late intervention was 9.5%, predominantly in the open thoracoabdominal repair group. At five years, actuarial survival was 95.2% in the patients who had no intervention and 87.3% in the patients who required intervention (p = 0.038).
CONCLUSIONS: Among patients initially managed medically for type B aortic dissection, new indications for intervention were fairly frequent in the early and intermediate periods. Careful monitoring of these patients is needed to achieve acceptable mid-term survival.
OBJECTIVES: Congenital bicuspid aortic valve (BAV) is typically associated with asymmetric dilatation of the proximal ascending aorta. Risk assessment for aortic catastrophe in BAV patients is challenging due to a lack of knowledge in the governing cell-mediated mechanisms of the associated aortopathy. Previously we have demonstrated abnormal smooth muscle cells susceptibility to oxidative stress in BAV-aneurysmal aorta and thus hypothesize that antioxidant expression is spatially-defined and correlates with BAV morphology.

METHODS: Human aortic specimens were harvested from patients (n = 63) undergoing elective ascending aortic/aortic valve replacement and from heart transplant donors and/or recipients with IRB approval and informed patient consent. Patient demographics including age, sex, maximum orthogonal diameter of the proximal ascending aorta, valve morphology and degree of valvulopathy were recorded. BAV valve morphology was defined according to number of raphes: (Type 0 [0 raphes], Type 1 [1 raphe] or Type 2 [2 raphes]), and raphe location among the left (L), right (R) or non- (N) coronary cusps. Ascending aortic specimens were partitioned into three circumferential regions corresponding to the sinuses of Valsalva, denoted R (approximating the greater curve) and L and N (together approximating the lesser curve). Gene expression for superoxide dismutase (Sod1) was quantified from total RNA of the aortic media from all three circumferential regions.

RESULTS: Sod1 expression was found to be up-regulated in both aneurysmal and non-aneurysmal specimens from the R region of patients exhibiting the Type 1 (L-R) morphology when compared to the L and N regions (p < 0.005) and the R region of degenerative aneurysms (p < 0.05). Sod1 expression was reduced in specimens from patients with Type 1 (L-R) morphology when compared with patients exhibiting Type 1 (R-N) morphology for L and N regions (p < 0.001). A trend toward decreased Sod1 expression was demonstrated in the R region when mild aortic insufficiency was present among Type I (L-R) non-aneurysmal patients and when mild aortic insufficiency was absent among aneurysmal patients (p = 0.08 and p = 0.07, respectively).
CONCLUSIONS: The finding of elevated Sod1 expression within the greater curve (R region) amidst a reduced expression in the lesser curve (L region) in the most common BAV morphotype, Type 1 (L-R), when compared to Type 1 (R-N) deepens our understanding of the influence of BAV morphology on spatially differential antioxidant gene expression in the proximal ascending aorta. These findings highlight the diverse pathobiology of the BAV phenotype which may help stratify risk for aortic catastrophe and lead to the development of novel diagnostics and therapeutics to identify and treat the BAV aortopathy.
OBJECTIVES: Transcatheter aortic valve replacement (TAVR) has become a treatment option for otherwise inoperable or high risk patients. Currently TAVR is performed with a combination of fluoroscopy and transesophageal echocardiography, which has visual limitations including a two dimensional view and poor soft tissue contrast. Real-time magnetic resonance image (rtMRI) guidance overcomes these limitations with improved two dimensional visualization, and allows pinpoint accuracy of device delivery. To date a device clinically available in the United States has not been used for rtMRI TAVR. We present our results using the Medtronic CoreValve® device.

METHODS: The Medtronic CoreValve® delivery device was minimally modified by the investigators to be MRI compatible by replacing the stainless steel components with fluoroplastic resin and high density polyethylene components. Eight swine ranging between 60 and 90 kg underwent rtMRI guided TAVR from a left subclavian approach.

RESULTS: Eight swine underwent a left subclavian cutdown with insertion of a 20Fr sheath. Two imaging planes (long-axis view and short-axis view) were used to create a virtual-real-time 3D reconstruction via MRI (1.5T Siemens Aera). Successful deployment was performed without rapid ventricular pacing or cardiopulmonary bypass. Post-deployment images were acquired to evaluate the final valve position in addition to valvular and cardiac function.

CONCLUSIONS: Our results show that the CoreValve® can be easily and effectively deployed from the left subclavian approach by utilizing rtMRI and a modified valve delivery device. In conclusion, this method allows superior visualization prior to deployment, allowing us to deploy the valve with pinpoint accuracy. rtMRI has the added benefit of an immediate post-procedural functional assessment, while eliminating the morbidity of radiation exposure to the patient and medical team, rapid ventricular pacing, contrast media renal toxicity, and a more invasive procedure. Use of commercially available device brings this rtMRI guided approach closer to a clinical reality.
CF4. WITHDRAWN
**CF5. Staged Hybrid Maze: PVI Alone Is Sufficient in Half of Patients**

Richard Lee¹, Dawn S. Hui¹, Chelsea Del Rosso¹, Jane Kruse², Patrick M. McCarthy²

¹Saint Louis University, Saint Louis, MO; ²Northwestern University, Chicago, IL

**OBJECTIVES:** We sought to examine outcomes after a staged hybrid Maze procedure for lone atrial fibrillation (AF) and to identify predictors for the second stage.

**METHODS:** Retrospective chart review of consecutive patients undergoing staged hybrid Maze by a single surgeon at two institutions between October 2007 and May 2014. Stage I consisted of beating heart, bilateral thoracoscopic assisted pulmonary vein island isolation with bi-polar radiofrequency (RF) ablation and left atrial appendage ligation. Stage II consisted of endovascular trans-septal unipolar island connection and extension to the mitral annulus with right-sided flutter lesions when elicited. Multivariable logistic regression analysis was used to identify independent predictors of need for second-stage ablation and rhythm, freedom from antiarrhythmic drug (FFAAD) use, and freedom from anticoagulant (FFAC) use at follow-up.

**RESULTS:** 56 patients were identified (mean age 61 ± 11; 76% male). Preop AF type was paroxysmal in 38% (n = 21); persistent in 27% (n = 15); long-standing persistent in 36% (n = 20). Follow-up data was available for 98% (n = 55) (Figure). At mean follow-up of 3.5 years, 96% (n = 54) are alive. 48% (n = 27) are in normal sinus rhythm (NSR), FFAAD, and FFAC without requiring Stage II. Eight (15%) have either undergone (n = 4) or are planned for (n = 4) Stage II. Of the 4 that have undergone ablation, 50% remain in aфиб/аfl utter (n = 2), whereas 50% are in sinus rhythm (n = 2). 18% have undergone cardioversion (n = 10); of these 2 are in NSR/FFAD/FFAC, 2 had Stage II, and 3 are planned for Stage II. The remaining 3 are in AF with no plans for Stage II. Of the entire cohort, 76% (n = 42) are in NSR, and 51% (n = 28) are in NSR/FFAD/FFAC. There have been no thromboembolic events. Logistic regression identified age as a predictor of AAD use (p = 0.04), with a 9.8% increase per additional year of age. No significant predictors of persistent AF, AC use, or second-stage ablation were found.
CONCLUSIONS: Using a staged approach to a hybrid Maze procedure, first-stage ablation alone allows nearly 50% of patients to achieve sinus rhythm and long-term freedom from AAD and AC use. No independent predictors of need for second-stage ablation were found, suggesting that a staged approach to hybrid Maze is a reasonable approach for the treatment of lone AF and may avoid unnecessary potential complications of intra-atrial procedures in half of the patients.

**NSR, normal sinus rhythm; AF, atrial fibrillation; FFAD, freedom from; AAD antiarrhythmic drugs; AC, anticoagulation; *1 of 5 planned for ablation; **3 of 6 planned for ablation**
OBJECTIVES: Heart transplant remains the definitive therapy for advanced heart failure patients but is severely limited by organ availability. Regional barriers can also play a major role in limiting the number of available hearts. We identified a large number of donor hearts in our OPO being exported and implanted in other regions. In an effort to both understand this phenomenon and to intervene we began a quality assurance project to evaluate our donor offers.

METHODS: We engaged in a review of our donor selection process to identify opportunities to improve our process and increase our organ utilization rate.

RESULTS: Every donor offer made to our program was reviewed on a monthly basis over a one-year period. Hearts declined by our program were identified and investigated to determine if those hearts were subsequently utilized by another center. All locally declined offers that were subsequently implanted by another center were reviewed in depth in a quarterly meeting of heart transplant faculty to discuss the rationale in a retrospective, non-confrontational setting. Faculty members taking donor call were encouraged to email at the time an offer with detailed reasons for decline. Otherwise, data about all offers was obtained from Donornet. We also were able to obtain data on long-term graft function of organs exported to other centers after being locally declined. Data for the review period was compared to the prior 12-month period during which there were 325 heart offers, 78 of those were ultimately transplanted and 20 were transplanted at our institution. This gave us an overall utilization rate of 6% and an adjusted rate of 26%. At the end of the 12-month review process the total number of offers was 292, with 66 hearts ultimately transplanted and 31 of those were performed at our institution. This led to an improvement in the overall utilization rate to 11% and the adjusted rate to 47%. We reviewed the short-term patient outcomes, which demonstrated an improvement in one-year mortality from 20% to 6% over the same time intervals.

CONCLUSIONS: Donor evaluation is a subjective process prone to a great deal of variability. We found the simple act of systematically reviewing donor turn down events as a group tended to reduce variability, increase confidence and result in improved donor organ utilization and transplant volumes, without increasing cost or complexity of organ procurement.

* WTSA Member
CF7. Delayed Sternal Closure After Continuous Flow Left Ventricle Assist Device Implantation: Analysis of Risk Factors and Impact on Outcomes and Costs

Mohammed Quader1, Luke Wolfe1, Damien Lapaar2, Gorav Ailawadi3, Jeffrey Rich4, Alan Speir5, Clifford Fonner6, Vigneshwar Kasirajan1
1Virginia Commonwealth University, Richmond, VA; 2University of Virginia, Charlottesville, VA; 3University of Virginia, Charlottesville, VA; 4VCSQI, Norfolk, VA; 5Cardiovascular and Thoracic Associates, Falls Church, VA; 6VCSQI, Richmond, VA

OBJECTIVE: A state-wide study of both patient and institutional factors influencing the practice of delayed sternal closure (DSC), as well as the impact of DSC on clinical and cost outcomes when compared to primary sternal closure (PSC) following continuous-flow left ventricular assist device (CF-LVAD) implantation.

METHODS: State-wide STS and hospital cost data on CF-LVADs implanted between January 2007 and December 2013 were analyzed using standard statistical methods by dividing the patients into two groups: PSC and DSC. Multivariable analysis was done to identify predictors of DSC and the impact of DSC on mortality.

RESULTS: During the 7 years of study, 558 CF-LVADs were implanted (PSC = 464, 83.2%; DSC = 94, 16.8%). Among the six institutions implanting CF-LVADs, DSC practice ranged from 3.1% to 37.8%. Although age and gender distribution was similar between the two groups, DSC patients had higher BMIs, higher MELD scores, renal failure, anemia, ventricular arrhythmias, significant tricuspid valve regurgitation, cardiogenic shock requiring resuscitation, and ECMO support (Table). Significantly more patients in the DSC group were on IIb/IIIa inhibitors (1% vs. 4.4%; p = 0.04) and required emergent surgery (6.7% vs. 18%; p = 0.0001). When compared to the PSC group, the DSC group had longer total operative time (281 ± 88 min vs. 322 ± 92 min), time on bypass (107.6 ± 42 min vs. 139 ± 63 min) and intra-operative use of blood products (69% vs. 82%; all p values < 0.05). More patients in the DSC group required RVAD support (0.2% vs. 4.3%; p = 0.003). Post-operative morbidities such as return to OR for bleeding, prolonged ventilation, prolonged ICU stay, pneumonia, blood product use, renal failure, anticoagulation events, multisystem failure, and surgical wound infections were significantly higher in the DSC group (Table). Post-operative mortality was higher in the DSC group compared to PSC: 6.5% vs. 23.4%; p = <0.0001. Factors predictive of DSC by multivariable analysis include: institution with higher percent DSC practice, OR 78 (16.9–363), pre-operative ECMO support, OR 31 (6–158), pre-operative use of IIb/IIIa inhibitors, OR 5.6 (1.1–28), tricuspid valve surgery OR 2.3 (1.0–5.3) and intra-operative RBC transfusion OR 1.3 (1.1–1.5). Logistic regression analysis identified DSC as an independent risk factor for post-operative mortality, OR 3.0 (1.2–7.2). The mean hospital cost for DSC was higher than PSC ($249,144 ± 123,273 vs. $155,915 ± 95,032; p = <0.0001).
<table>
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<tr>
<th>Pre-Operative Variable</th>
<th>Primary Sternal Closure n = 464 (83.2%)</th>
<th>Delayed Sternal Closure n = 94 (16.8%)</th>
<th>p-value</th>
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<tr>
<td>Age in years</td>
<td>54.0 ± 12.8</td>
<td>56.2 ± 12.9</td>
<td>0.1409</td>
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<td>Gender (% male)</td>
<td>76.9</td>
<td>71.3</td>
<td>0.2367</td>
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<td>BMI</td>
<td>28.2 ± 5.7</td>
<td>29.5 ± 6.1</td>
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<td>Hypertension (%)</td>
<td>65.7</td>
<td>75.5</td>
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<td>Diabetes (%)</td>
<td>41.8</td>
<td>50.0</td>
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<td>Hematocrit (g/dl, mean ± SD)</td>
<td>34.7 ± 5.7</td>
<td>32.4 ± 6.1</td>
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<td>MELD score</td>
<td>11.7 ± 5.0</td>
<td>13.2 ± 5.6</td>
<td>0.0508</td>
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<td>Creatinine (mg/dl, mean ± SD)</td>
<td>1.30 ± 0.54</td>
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<td>Re-operative cardiovascular surgery</td>
<td>24.8</td>
<td>28.7</td>
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<td>ASA (%)</td>
<td>58.8</td>
<td>66.0</td>
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<td>Glycoprotein IIb/IIIa Inhibitors (%)</td>
<td>1.1</td>
<td>4.4</td>
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<td>Tricuspid insufficiency (% moderate or severe)</td>
<td>33.7</td>
<td>48.4</td>
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<td>Pre-operative ECMO support (%)</td>
<td>0.9</td>
<td>10.6</td>
<td>&lt;0.0001</td>
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<td>Operative Variables</td>
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<td>Status</td>
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<td>Elective (%)</td>
<td>22.8</td>
<td>7.5</td>
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<td>Urgent (%)</td>
<td>69.8</td>
<td>72.3</td>
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<tr>
<td>Emergent (%)</td>
<td>6.7</td>
<td>18.1</td>
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<td>Emergent salvage (%)</td>
<td>0.7</td>
<td>2.1</td>
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<td>CBP utilization time (minutes, mean ± SD)</td>
<td>107.6 ± 42.0</td>
<td>139.0 ± 63.6</td>
<td>&lt;0.0001</td>
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<td>Intra-operative blood products used (%)</td>
<td>69.0</td>
<td>81.9</td>
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<td>RVAD implantation (%)</td>
<td>0.2</td>
<td>4.3</td>
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Outcome Variables

<table>
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<tr>
<th></th>
<th>Mortality at 30 days after Surgery (%)</th>
<th>Operative mortality (%)</th>
<th>Reoperation for bleeding (%)</th>
<th>Initial hours ventilated (mean ± SD)</th>
<th>ICU hours (mean ± SD)</th>
<th>Pneumonia (%)</th>
<th>Renal failure (%)</th>
<th>Surgical site infection (%)</th>
<th>Post-op blood products used (%)</th>
<th>LOS surgery (discharge in days mean ± SD)</th>
<th>Total hospital cost in (USD, mean ± SD)</th>
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<tbody>
<tr>
<td>Mortality at 30 days after Surgery (%)</td>
<td>6.2</td>
<td>17</td>
<td>&lt;0.0001</td>
<td>65 ± 157</td>
<td>276.6 ± 343.9</td>
<td>7.4</td>
<td>8.5</td>
<td>1.4</td>
<td>68.3</td>
<td>24.9 ± 20.0</td>
<td>$155,915 ± 95,032</td>
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<tr>
<td>Operative mortality (%)</td>
<td>6.5</td>
<td>23.4</td>
<td>&lt;0.0001</td>
<td>197 ± 296</td>
<td>498.4 ± 562.5</td>
<td>18.1</td>
<td>19.2</td>
<td>12.5</td>
<td>80.7</td>
<td>36.0 ± 29.3</td>
<td>$249,144 ± 123,273</td>
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<tr>
<td>Reoperation for bleeding (%)</td>
<td>12.2</td>
<td>35.1</td>
<td>&lt;0.0001</td>
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<td>Initial hours ventilated (mean ± SD)</td>
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<td>ICU hours (mean ± SD)</td>
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<tr>
<td>Pneumonia (%)</td>
<td>7.4</td>
<td>18.1</td>
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<td>Renal failure (%)</td>
<td>8.5</td>
<td>19.2</td>
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<tr>
<td>Surgical site infection (%)</td>
<td>1.4</td>
<td>12.5</td>
<td>0.001</td>
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<tr>
<td>Post-op blood products used (%)</td>
<td>68.3</td>
<td>80.7</td>
<td>0.0242</td>
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<td>LOS surgery (discharge in days mean ± SD)</td>
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<td>Total hospital cost in (USD, mean ± SD)</td>
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Risk Factor For DSC by Multivariable Analysis

<table>
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<tr>
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<th>Odds Ratio (95% CI)</th>
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<tr>
<td>Hospital with low (3.1%) vs. high (37.8%) DSC practice</td>
<td>78.4 (16.9–363.6)</td>
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<tr>
<td>Pre-OP ECMO support (yes vs. no)</td>
<td>31.2 (6.2–157.8)</td>
</tr>
<tr>
<td>Pre-OP glycoprotein IIb/IIIa inhibitor (yes vs. no)</td>
<td>5.6 (1.17–28.4)</td>
</tr>
<tr>
<td>Tricuspid valve procedure (yes vs. no)</td>
<td>2.3 (1.03–5.3)</td>
</tr>
<tr>
<td>Intra-OP blood products use - RBC units</td>
<td>1.3 (1.1–1.5)</td>
</tr>
</tbody>
</table>

BMI = Body Mass Index, HTN = Hypertension, MELD = Model for End-stage Liver Disease, SD = Standard Deviation, ASA = Acetyl Salicylic Acid, ECMO = Extra Corporeal Membrane Oxygenation, CPB = Cardio-Pulmonary Bypass support, RVAD = Right Ventricular Assist Device Support, ICU = Intensive Care Unit, OP = operative, LOS = Length of Stay

CONCLUSION: DSC practice following CF-LVAD implantation varies by institutions and is associated with increased post-operative morbidity, mortality and cost of care. Modifiable risk factors for DSC include institution practice, limited use of blood products and pre-operative IIb/IIIa inhibitors. DSC is an independent risk factor for mortality following CF-LVAD implantation.
CF8. Early and Medium-Term Outcomes in Patients with Dialyse-Dependent Chronic Renal Failure After Cardiac Surgery – A Single Centre Experience of 483 Patients

Sergey Leontyev, Knut A. Röhrig, Lisa-Marie Gaube, Piroze M. Davierwala, Sergey Belaev, Farhad Bakhtiyari, Martin Misfeld, Friedrich W. Mohr

Department of Cardiac Surgery, Heart Center, University of Leipzig, Leipzig, Germany

OBJECTIVE: Cardiac surgery in patients with dialysis-dependent chronic renal failure (CRF) is still associated with a high morbidity and mortality. The aim of this study was to determine the preoperative predictors of in-hospital and medium-term mortality in patients with dialysis-dependent CRF undergoing cardiac surgery and create an easy-to-use score to predict in-hospital mortality.

METHODS: Between January 1996 and January 2014, 483 consecutive patients with dialysis-dependent CRF underwent various cardiac surgical procedures at our institute. Mean age was 65 ± 11 years and 32.8% were female. Isolated coronary artery bypass graft, or isolated aortic valve and isolated mitral valve surgeries were performed in 39.8%, 17% and 6%, of patients, respectively. In all other patients (37.2%) combined surgical procedure were necessary. Endocarditis was an indication for surgery in 11% of patients. Overall, 15% of patients had undergone previous operations and 49.3% underwent urgent or emergent surgery. A multivariable logistic regression model was created to identify the independent predictors of in-hospital mortality. The results were used to create a score that could predict the operative risk.

RESULTS: The 30-day mortality was 23.8%. Postoperative respiratory failure, gastrointestinal complications, low cardiac output, stroke and sepsis occurred in 22.7%, 12.6%, 11.9%, 5.6% and 5.2% of patients, respectively. The independent predictors of in-hospital mortality were combined mitral and aortic valve pathology (OR: 3.7; 95% CI [1.5–9]; p = 0.003), chronic obstructive pulmonary disease (OR: 2.6; 95% CI [1.1–5.9]; p = 0.03), peripheral vascular disease (OR: 1.9; 95% CI [1.04–3.5]; p = 0.03), left ventricular ejection fraction <30% (OR: 2.9; 95% CI [1.3–6.4]; p = 0.008) and active endocarditis (OR: 2.2; 95% CI [1.04–4.6]; p = 0.04).

The estimated 1-, 3- and 5-year survival was 58 ± 2%, 41 ± 2%, and 25 ± 2%, respectively with a mean survival time of 3.4 ± 0.2 years. Previous cerebrovascular accident, active endocarditis, prior cardiac surgery and combined aortic/mitral valve pathology were independent predictors of medium-term mortality. We created an easy-to-use mortality risk score based on these variables. The patients were stratified into four risk categories according to the predicted in-hospital mortality: <10%, 10–25%, 25–50%, and >50%.
CONCLUSIONS: Patients with dialysis-dependent CRF undergoing cardiac surgery have a high perioperative and medium-term mortality, particularly in the presence of combined aortic and mitral valve pathology, active endocarditis and poor left ventricular function.
OBJECTIVES: This study investigated the association between clinical-pathological features, especially adenocarcinoma subtypes and prognosis, and skip N2 metastasis in lung adenocarcinoma patients.

METHODS: In this study, 177 patients with lung adenocarcinoma and N2 metastasis were enrolled. Patients had N2 lymph node metastases without N1 lymph node involvement were defined as skip N2, otherwise as non-skip N2. We investigated the difference of clinicopathologic characteristics, recurrence-free survival (RFS), overall survival (OS) and spectrum of well-identified molecular alterations in EGFR, KRAS, HER2, BRAF, ALK, ROS1, and RET genes in the two groups.

RESULTS: Skip N2 metastasis was found in 45 patients, in which remarkably lower incidence of lymphovascular invasion was revealed (p = 0.01). Skip N2 phenomenon also associated with acinar subtype, well differentiation and right lung lesion location. The RFS and OS is significantly better in skip N2 group (5-year RFS; 37.4% vs. 5.7%; log rank p = 0.005; 5-year OS; 60.7% vs. 32.1%; log rank p = 0.024). The predictive value of skip N2 was more significant in patients with lesion in right lung (5-year RFS; 36.6% vs. 0.0%; log rank p = 0.002; 5-year OS; 57.2% vs. 27.9%; log rank p = 0.016), as well as in patients whose tumor diameter was less than 3 cm (5-year RFS; 43.1% vs. 6.7%; log rank p = 0.01; 5-year OS; 74.6 vs. 27.6%; log rank p = 0.04).

CONCLUSIONS: There were distinct differences in clinicopathological features and prognosis in patients with or without skip N2 metastasis. Considering the results of our study, sub-classifications of mediastinal lymph node metastases would have potential clinical significance for patients with lung adenocarcinoma.
CF10. Nodal Upstaging Is More Common with Thoracotomy Versus VATS During Lobectomy for Early Stage Lung Cancer: An Analysis from the National Cancer Data Base

Rachel L. Medbery, Theresa W. Gillespie, Joseph Lipscomb, Yuan Liu, Dana Nickleach, Manu S. Sancheti, Allan Pickens, Seth D. Force, Felix G. Fernandez

Emory University, Atlanta, GA

OBJECTIVES: Questions remain regarding nodal evaluation and upstaging between thoracotomy (open) and Video Assisted Thoracic Surgery (VATS) approaches to lobectomy for early stage lung cancer. Potential differences in nodal staging based on operative approach remains as the final significant barrier to widespread adoption of VATS lobectomy. Our objective was to examine differences in nodal staging between open and VATS lobectomy in a large, national, generalizable dataset.

METHODS: The National Cancer Data Base (NCDB), an oncology outcomes database through both the American Cancer Society and the American College of Surgeons, was queried for non-small cell lung cancer patients with clinical stage ≤T2N0M0 who underwent lobectomy in 2010–2011. VATS and open approaches were compared using ANOVA and Chi-square, as appropriate. Propensity score matching was performed to compare nodal upstaging and short-term clinical outcomes between cohorts by paired T-test and McNemar’s test/Bowker’s test, as appropriate. Additional sub-group analysis was performed among patients treated in an Academic/Research Program Facility or who had ≥7 lymph nodes examined to assess whether or not rates of lymph node upstaging differed by specific clinical settings.

RESULTS: A total of 16,983 lobectomies were analyzed; 4,935 (29.1%) were performed via VATS. Mean age (66.6 vs. 66.8 years; p = 0.16) and race (white 88.2 vs. 88.3%; p = 0.84) were similar between open and VATS. Open approach was associated with larger tumors (mean 2.9 vs. 2.7 cm), longer length of hospital stay (mean 7.4 vs. 6.1 days) and greater 30-day mortality (2.1 vs. 1.3%) than VATS (all p < .001). Nodal upstaging was more frequent in the open group (12.8 vs. 10.3%; p < .001). Results from the propensity-matched sample are shown in the Table. In 4,437 matched pairs, nodal upstaging remained more common for open approaches. Upstaging with thoracotomy compared to VATS was more common at N1, but not N2, nodal stations. For a sub-group of patients whose number of lymph nodes examined was ≥7, propensity matching (n = 2,825 per group) revealed that nodal upstaging remained more common following open vs. VATS (14.0 vs. 12.1%; p = 0.03). However, for patients who were treated in an Academic/Research Program Facility, the difference in nodal upstaging during VATS vs open lobectomy was no longer significant (10.5 vs. 12.2%, p = 0.08; n = 2,008 per group).
Table. Postoperative Outcomes in Early-Stage Lung Cancer Patients in Propensity-Matched\(^{(a)}\) Sample

<table>
<thead>
<tr>
<th>Outcome, n (%)</th>
<th>Surgical Approach: Open N = 4,437</th>
<th>Surgical Approach: VATS(^{(b)}) N = 4,437</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lymph nodes examined (%)</td>
<td>636 (14.3)</td>
<td>621 (14.0)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>0–3</td>
<td>1,054 (23.8)</td>
<td>991 (22.3)</td>
<td></td>
</tr>
<tr>
<td>4–6</td>
<td>1,004 (22.6)</td>
<td>898 (20.3)</td>
<td></td>
</tr>
<tr>
<td>7–9</td>
<td>1,743 (39.3)</td>
<td>1,927 (43.3)</td>
<td></td>
</tr>
<tr>
<td>&gt;9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of lymph nodes examined (mean ± SD)</td>
<td>9.7 (±7.2)</td>
<td>10.3 (±7.7)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Total nodal upstaging (%)</td>
<td>529 (11.9)</td>
<td>450 (10.1)</td>
<td>0.008*</td>
</tr>
<tr>
<td>N1 upstaging</td>
<td>357 (8.0)</td>
<td>307 (6.9)</td>
<td>0.046*</td>
</tr>
<tr>
<td>N2 upstaging</td>
<td>172 (3.9)</td>
<td>143 (3.2)</td>
<td>0.098</td>
</tr>
<tr>
<td>Surgical margins positive (%)</td>
<td>93 (2.1)</td>
<td>107 (2.4)</td>
<td>0.322</td>
</tr>
<tr>
<td>30-day mortality (%)</td>
<td>69 (1.6)</td>
<td>61 (1.4)</td>
<td>0.483</td>
</tr>
<tr>
<td>Postoperative length of stay, days (mean, SD)</td>
<td>7.2 (±6.4)</td>
<td>6.2 (±5.8)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Unplanned 30-day hospital readmission (%)</td>
<td>158 (3.6)</td>
<td>240 (5.4)</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

\(^{(a)}\)Significant

\(^{(b)}\)The following covariates have been balanced between the two groups: facility type, sex, race, insurance, income, education, urban/rural, Charlson/Deyo comorbidity score, year of diagnosis, primary site, histology, grade, age, and tumor size (cm)

**CONCLUSION:** From these national data, nodal upstaging was more frequently observed with thoracotomy compared to VATS for early stage lung cancer, even when a sufficient number of lymph nodes had been examined. However, nodal upstaging appears to be impacted by facility type, which may represent a surrogate for surgeon specialty. Standardized quality assurance of lymph node staging during VATS lobectomy is needed with the goal of eliminating differences in staging when compared to an open approach. An analysis of long-term survival between VATS and thoracotomy approaches to lobectomy for early stage lung cancer remains a critical unmet need in thoracic surgery.
CF11. **Plasma Levels of Vascular Endothelial Growth Factor-C Improve the Predictive Performance of Positron Emission Tomography for Nodal Staging in Lung Cancer**  
University of Washington, Seattle, WA

**OBJECTIVES:** Vascular endothelial growth factor (VEGF)-C and VEGF-D are biologically rational markers of nodal disease that could improve the accuracy of lung cancer staging. The objective of this study was to determine whether these biomarkers compliment positron emission tomography (PET) in predicting nodal disease among individuals with suspected or confirmed non-small cell lung cancer (NSCLC).

**METHODS:** A cross-sectional study (2010–2013) was performed of individuals with suspected or confirmed non-metastatic NSCLC staged by computed tomography, PET, and invasive nodal staging. Patients who consented to participate in a prospective lung nodule biorepository were eligible for study. Enzyme-linked immunosorbent assay was used to measure biomarker levels in plasma from blood drawn prior to invasive procedures. Likelihood ratio testing was used for hypothesis testing. This statistical approach was recently determined to be the preferred methodology for evaluating the relative added predictive value of a biomarker when independent validation is not feasible. Five pairwise model comparisons were performed (see Table). Using the Bonferroni correction for multiple comparisons, p-values < 0.01 were considered significant.

**RESULTS:** Among 62 patients (median age 67 years, 48% men, 87% white, 84% NSCLC), 36 (58%) had FDG uptake within hilar and/or mediastinal lymph nodes. Twenty-five patients (40%) had pathologically confirmed lymph nodes. The prevalence of nodal disease increased linearly across higher levels of VEGF-C and VEGF-D (see Figures 1 and 2), but this relationship was only significant for VEGF-C (p-trend = 0.004). A model inclusive of PET findings and VEGF-C levels was better at predicting nodal disease compared to a model inclusive of PET findings alone (0.0069). Likewise, a model inclusive of PET findings and VEGF-C and VEGF-D levels was better at predicting nodal disease compared to a model inclusive of PET findings and VEGF-D levels (p = 0.0095). In the model with both PET findings and VEGF-C levels, both FDG uptake (OR: 2.56; 95% CI [0.80–8.12]) and higher VEGF-C levels (OR: 2.96; 95% CI [1.26–6.90]) were associated with an increased risk of nodal disease, but only the association between VEGF-C and nodal disease was statistically significant.

* WTSA Member
**Table. Comparison of Prediction Models**

<table>
<thead>
<tr>
<th>Prediction Model Comparisons</th>
<th>Likelihood ratio test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model(<em>{PET/VEGF-C}) vs. Model(</em>{PET})</td>
<td>p = 0.0069</td>
</tr>
<tr>
<td>Model(<em>{PET/VEGF-D}) vs. Model(</em>{PET})</td>
<td>p = 0.1886</td>
</tr>
<tr>
<td>Model(<em>{PET/VEGF-C/VEGF-D}) vs. Model(</em>{PET})</td>
<td>p = 0.0146</td>
</tr>
<tr>
<td>Model(<em>{PET/VEGF-C/VEGF-D}) vs. Model(</em>{PET/VEGF-C})</td>
<td>p = 0.2818</td>
</tr>
<tr>
<td>Model(<em>{PET/VEGF-C/VEGF-D}) vs. Model(</em>{PET/VEGF-D})</td>
<td>p = 0.0095</td>
</tr>
</tbody>
</table>
CONCLUSION: Plasma levels of VEGF-C complimented the ability of PET to predict nodal disease, but VEGF-D did not. This work motivates the development and validation of a risk-prediction model for nodal disease among individuals with suspected or confirmed NSCLC. A model inclusive of other radiographic predictors of nodal disease may further improve prediction. Risk-prediction provides an opportunity to individualize care, mitigate provider-level variation in staging practices, improve outcomes, and increase value.
CF12. **Adjuvant Chemotherapy Is Associated with Improved Survival in Node Negative NSCLC with Chest Wall Involvement**

**Usman Ahmad¹, Traves D. Crabtree², Aalok P. Patel³, Daniel Morgensztern⁴, Cliff G. Robinson⁵, A. Sasha Krupnick², Daniel Kreisel², G. Alexander Patterson², Bryan F. Meyers², Varun Puri²**

¹Thoracic Service, Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, NY; ²Department of Surgery, Division of Cardiothoracic Surgery, Washington University School of Medicine, St. Louis, MO; ³Department of Surgery, Division of Cardiothoracic Surgery, Washington University School of Medicine, St. Louis, MO; ⁴Department of Medicine, Division of Oncology, Washington University School of Medicine, St. Louis, MO; ⁵Department of Radiation Oncology, Washington University School of Medicine, St. Louis, MO

**OBJECTIVES:** Non-small cell lung cancer (NSCLC) with chest wall or diaphragm invasion (T3) constitutes a unique subset in which incidence of lymph node metastases is less frequent than tumors classified as T3 based upon size alone. The role of adjuvant chemotherapy after chest wall resection remains unclear. The objective of this study is to understand predictors of adjuvant chemotherapy and its impact on overall survival (OS) in node-negative patients who undergo lung and chest wall resection for NSCLC.

**METHODS:** Patients who underwent concomitant lung and chest wall/diaphragm resection for NSCLC were abstracted from the participant user file of the National Cancer Database (NCDB). Clinical, pathologic, treatment, and follow up data were obtained. Patients with pathologic nodal metastases were excluded and the cohort was dichotomized based upon administration of adjuvant postoperative chemotherapy. A logistic regression model was fitted to understand predictors of adjuvant chemotherapy after resection and a cox proportional hazards model fitted to study predictors of long-term survival.

**RESULTS:** Between 1998 and 2010, 2,012 patients underwent primary surgery via lobectomy with chest wall (1,912 [95%]) or diaphragm (100 [5%]) resection for treatment of NSCLC. In this cohort, adjuvant chemotherapy was administered to 863 (43%) patients. Pathologic T3 tumors constituted the vast majority of cases in both chemotherapy (660 [77%]) and no chemotherapy (820 [71%]) groups.

In univariate analysis patients in the chemotherapy group were younger (61 years vs. 68 years; p < 0.001) and had fewer comorbidities (Charlson/Deyo score 0; 58% versus 50%; p < 0.001). Patients in the chemotherapy group had larger tumors (6.0 cm vs. 5.3 cm; p = 0.001) and a higher rate of incomplete resection (23% vs. 17%);
Patients in the chemotherapy group were more likely to have received preoperative radiation (18% vs. 1.3%; \( p < 0.001 \)). A greater proportion of chemotherapy group patients also received adjuvant radiation (38% vs. 17%; \( p < 0.001 \)).

In multivariable analysis, younger age, higher final pathologic stage, and use of adjuvant radiation (OR: 2.94 [2.07–4.16]) were associated with a greater likelihood of receiving adjuvant chemotherapy. Patients with longer hospital stay or unexpected postoperative readmission (OR: 0.41 [0.22–0.77]) were less likely to receive adjuvant chemotherapy.

In multivariate Cox proportional hazards analysis increasing age (HR: 1.02 [1.01–1.03]), higher Charlson comorbidity score, higher pathologic stage, larger tumor size (HR: 1.28 [1.04–1.57]), and positive margins (HR: 1.44 [1.15–1.80]) were independently associated with greater risk of long-term mortality. Longer postoperative hospital stay and unexpected readmission (HR: 1.48 [1.09–2.04]) were also associated with shorter OS. Postoperative chemotherapy was independently protective for long-term OS (HR: 0.68 [0.54–0.84]).

The median overall survival was longer in adjuvant chemotherapy group (38 vs. 22 months, \( p < 0.001 \)).
CONCLUSIONS: Patients who undergo lobectomy with chest wall or diaphragm resection for locally advanced NSCLC should be strongly considered for postoperative adjuvant chemotherapy even in the absence of nodal disease. Actual selection of patients for adjuvant chemotherapy is significantly affected by perioperative adverse events.
**OBJECTIVES:** Minimally invasive esophagectomy (MIE) is being increasingly utilized for patients with esophageal cancer, with good outcomes reported from single-institutional series. The objective of this study was to evaluate short and mid-term outcomes of minimally invasive approaches to esophagectomy using population-level data.

**METHODS:** Multivariable logistic regression modeling was used to determine predictors associated with the use of minimally invasive approaches for patients in the National Cancer Data Base who underwent resection of middle and distal clinical T1-3N0-3M0 esophageal cancers from 2010–2012. Perioperative outcomes and overall survival (OS) were compared between propensity-matched groups of patients with esophageal cancer who underwent MIE or an open approach, using a 1:1 nearest neighbor algorithm and classified by intent to treat. Variables matched include age, Charlson comorbidity score, tumor size and location, induction therapy use, and clinical T and N stage. A subgroup analysis was performed to evaluate the impact of utilizing robotics as part of the minimally invasive approach.

**RESULTS:** A minimally invasive approach was used in 1,308 (31%) of the 4,266 patients who met study criteria. Robotics were used in 231 (18%) of the 1,308 minimally invasive cases. After adjusting for clinical and pathologic factors, MIE was more likely to be used in patients treated at academic (AOR: 10.07; 95% CI [4.17–33.11]) or comprehensive cancer facilities (AOR: 6.39; 95% CI [2.63–21.09]) than patients treated at community hospitals. Compared to propensity-matched patients who had an open approach, MIE patients had a greater median number of lymph nodes removed (15 vs. 13; p < 0.001) and slightly shorter hospital length of stay (10 vs. 11 days, p < 0.001), but similar rates of positive margins, 30-day readmission, and 30-day mortality (Table 1). Overall survival was not significantly different among matched patients at 3 years (51% for open patients versus 54% for MIE patients; p = 0.434; Figure 1). Compared with minimally invasive approaches that did not involve robotics, the use of a robotic approach was not associated with any significant differences in lymph node removal, positive margin rate, length of stay, 30-day readmission, or 30-day mortality (Table 2).
Table 1. Outcomes of Open vs. Minimally Invasive Groups, After Propensity Matching

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Open (N = 1,044)</th>
<th>Minimally Invasive (N = 1,044)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive surgical margins</td>
<td>5% (51)</td>
<td>7% (69)</td>
<td>0.102</td>
</tr>
<tr>
<td>Regional lymph nodes examined (median, IQR)</td>
<td>13 (8, 20)</td>
<td>15 (9, 21)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospital length of stay (median, IQR)</td>
<td>11 (8, 16)</td>
<td>10 (8, 14)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>30-day readmission rate</td>
<td>7% (77)</td>
<td>8% (78)</td>
<td>0.933</td>
</tr>
<tr>
<td>30-day mortality rate</td>
<td>4% (30)</td>
<td>3% (19)</td>
<td>0.189</td>
</tr>
</tbody>
</table>

Table 2. Outcomes of Robotic vs. Standard Minimally Invasive Techniques, After Propensity Matching

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Laparoscopic (N = 543)</th>
<th>Robotic (N = 181)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive surgical margins</td>
<td>6% (33)</td>
<td>6% (11)</td>
<td>0.983</td>
</tr>
<tr>
<td>Regional lymph nodes examined (median, IQR)</td>
<td>15 (8, 21)</td>
<td>15 (10, 21)</td>
<td>0.074</td>
</tr>
<tr>
<td>Hospital length of stay (median, IQR)</td>
<td>10 (8, 14)</td>
<td>10 (8, 14)</td>
<td>0.920</td>
</tr>
<tr>
<td>30-day readmission rate</td>
<td>7% (40)</td>
<td>6% (11)</td>
<td>0.538</td>
</tr>
<tr>
<td>30-day mortality rate</td>
<td>3% (9)</td>
<td>3% (3)</td>
<td>0.683</td>
</tr>
</tbody>
</table>
CONCLUSIONS: In this population-based analysis, the use of minimally invasive techniques to perform esophagectomy for esophageal cancer was associated with the removal of more lymph nodes and a shorter length of stay than with an open approach, but similar mid-term survival. Use of robotics during MIE did not significantly alter perioperative outcomes compared to alternative MIE techniques. Prospective studies should be performed to assess whether there are other advantages of MIE over open approaches.
Venous Thromboembolism Risk Assessment Permits Patient Selection for Post-Discharge Prophylactic Anticoagulation in Resectable Lung Cancer Patients

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¹Boston University Surgery Residency Program, Boston, MA; ²Boston University Medical School, Boston, MA; ³Boston Medical Center, Department of Surgery, Boston, MA

OBJECTIVE: The risk of dying from a postoperative venothromboembolic (VTE) event can reach 20% following lung cancer resection. Furthermore, up to 30% of postoperative VTEs occur after discharge. The Caprini Risk Assessment Model (RAM) has been used by other specialties to calculate the risk of a post-operative VTE. The RAM contains several variables including age, body mass index, prior VTE history, chemotherapy and surgical approach (minimally invasive versus open). Patients deemed high risk by the RAM are candidates for prophylactic anticoagulation after discharge, which has been shown to reduce the risk of VTE by 60%. The primary aims of this study were to determine the frequency of post-discharge VTE events and evaluate whether the Caprini RAM could risk stratify patients undergoing lung resection for cancer.

METHODS: Patients undergoing lung resection from 2005–2013 were evaluated. After excluding those with preoperative caval filter placement or discharged on chronic or therapeutic anticoagulation, 232 patients with evaluable data were reviewed and Caprini RAM scores calculated. Subjects were risk stratified into one of three risk groups: low risk (0–4), high risk (5–8), or highest risk (9+). VTE events (deep vein thrombosis or DVT; pulmonary emboli or PE) were recorded as documented by history and imaging reports.

RESULTS: The overall 60-day postoperative VTE incidence was 5.17% (12/232), with 33.3% occurring post-discharge (n = 4). 50% (6/12) had pulmonary emboli (PE), including 3 after discharge. The one death from a PE occurred in the patient with a high score of 16 during the inpatient hospitalization. The net VTE incidence increased with increasing Caprini score (Figure). The mean Caprini scores for the non-VTE and VTE groups were 8.07 (±2.84) and 11.83 (±3.74), respectively. The score distribution in these two groups was significantly different (p < 0.001). Scores in the low, high and highest risk groups were associated with a VTE incidence of 0%, 1.67%, and 10.42%. As scores 9+ are highest risk, the sensitivity, specificity and accuracy with a score cut off of 9 are 80%, 60.9% and 61.2%.
CONCLUSIONS: One-third of post-operative VTE events occurred after discharge. Overall VTE incidence was associated with increasing Caprini RAM scores. Patients in the highest risk group had a VTE incidence of 10.42%. Patients with high RAM scores may benefit with strategies such as inpatient ultrasound screening and prophylactic anticoagulation following discharge.
OBJECTIVES: Following hospital discharge, surgical patients may have a number of questions or complaints that surface or remain inadequately addressed. However, the dominant concerns and indications for further intervention among recently discharged patients following pulmonary resection have not been well described. In order to identify concerns, provide follow-up interventions as needed, and improve patient satisfaction, nurses from our Thoracic Center attempt to call all patients following discharge. The aims of this study were to characterize the dominant problems and concerns of pulmonary resection patients identified following discharge and to elucidate any relevant risk factors for their development.

METHODS: A retrospective review was conducted of all patients who underwent pulmonary resection at a single institution over a 12-month period. Records of post-discharge telephone calls were reviewed, and data were collected pertaining to complaints requiring counseling over the phone as well as need for escalation to a higher level of care. Demographic, operative, and hospital data were examined by multivariate analyses to assess predictors of need for counseling or escalation of care.

RESULTS: 523 patients underwent pulmonary resection during the study period, and 245 (46.8%) had nursing-documented telephone conversations at mean follow-up of 4.7 (±0.18) days after discharge. Among those individuals reached, 79 (32.2%) had problems requiring counseling during the call (Table). 31 (12.7%) reported concerns requiring escalation of care, handled via subsequent telephone call (7 [22.6%]), clinic appointment (22 [71.0%]), or emergency room referral (2 [6.5%]). Age, gender, race, and proximity of home to the hospital were not predictive of need for counseling nor need for escalation of care. Likewise, need for counseling or intervention could not be predicted by operative approach, extent of resection, development of in-hospital complication, length of stay, or weekday vs. weekend discharge.
**Issues Requiring Counseling During Post-Discharge Telephone Call**

<table>
<thead>
<tr>
<th>Concern</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any problem requiring counseling</td>
<td>81</td>
<td>32.2%</td>
</tr>
<tr>
<td>Constipation</td>
<td>36</td>
<td>14.8%</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>24</td>
<td>9.84%</td>
</tr>
<tr>
<td>Inadequate pain control</td>
<td>18</td>
<td>7.35%</td>
</tr>
<tr>
<td>Incision problems</td>
<td>11</td>
<td>4.51%</td>
</tr>
<tr>
<td>Medication confusion</td>
<td>9</td>
<td>3.69%</td>
</tr>
<tr>
<td>Activity questions</td>
<td>2</td>
<td>0.82%</td>
</tr>
</tbody>
</table>

**CONCLUSIONS:** Patient issues following pulmonary resection were frequently revealed during post-discharge telephone calls, with the majority of these problems resolved via telephone counseling. However, while concerns were highly prevalent, significant predictors of need for counseling or escalation of care were not identified, suggesting ongoing utility in the practice of telephoning all patients. Further, this study serves as a needs assessment, identifying key areas in which to improve patient education and discharge planning.
OBJECTIVES: To define the prevalence of symptomatic cervical malacia and evaluate outcomes of surgical management in patients with severe tracheobronchomalacia who have undergone tracheobronchoplasty.

METHODS: A prospectively maintained database of patients after tracheobronchoplasty for severe tracheobronchomalacia was retrospectively reviewed for cases performed from April 2005 to May 2013. Patient demographics, surgical procedure performed, complications and recurrence were reviewed.

RESULTS: One hundred thirty seven patients with tracheobronchomalacia who underwent right transthoracic posterior airway splinting of the intrathoracic trachea, right and left mainstem bronchi and bronchus intermedius using polypropylene mesh. Nine of these patients (9/137 [6.6%]) also required surgical treatment of severe cervical tracheal malacia. Operative strategies included tracheal resection (5), cervical tracheoplasty (3) and T tube placement (1). Cervical tracheoplasty was accomplished with posterior mesh splinting (1), posterior membrane resection (1) and rib graft with omental buttress and T tube placement (1) which was left in place for 2 years. The most common comorbidity was gastroesophageal reflux (7/9 [77.8%]). Four patients had been previously intubated, 3 had a prior tracheostomy and 1 had a prior tracheal resection for a tracheoesophageal fistula.

The mean operative time was 204 minutes. Complications included pneumonia (2), RLN palsy (1), wound infection (1) and posterior tracheal wall necrosis (1). One patient developed posterior membrane necrosis after a posterior membrane resection which was managed non-operatively. The most common complication was pneumonia (2/9 [22.2%]). Median length of hospital stay was 7.5 days and no patients died postoperatively. Five patients (55.6%) had recurrent symptomatic cervical malacia documented on dynamic bronchoscopy or CT at a median follow-up of 26.5 months. More recurrent disease was observed in patients that had a cervical tracheal resection than tracheoplasty (4/5 [80%] vs. 1/4 [25%]). Mean time to recurrence was 13 months (range: 5–29 months).

* WTSA Member
CONCLUSIONS: Coexisting severe symptomatic cervical tracheal malacia requiring cervical tracheal resection or plasty was observed in 6.6% of patients that underwent tracheobronchoplasty for tracheobronchomalacia over the course of 8 years. Despite surgical intervention, 55.6% of these patients developed recurrent symptomatic cervical tracheal malacia during the follow up period. There is a paucity of data regarding the optimal treatment of symptomatic cervical malacia. This is the first review to describe surgical outcomes of this challenging surgical problem and more data are clearly need to optimize surgical therapy of this disease.
BACKGROUND: In 2008, congenital cardiac surgery became a recognized fellowship by the Accreditation Council of Graduate Medical Education (ACGME), and leads to board certification through the American Board of Thoracic Surgery (ABTS). We aim to highlight the strengths and weaknesses in the current system of congenital cardiac surgical training.

METHODS: Data was collected from program directors, the ACGME, and the ABTS. Surveys were also sent to the individual graduates of accredited training programs. Topics of interest included: Program entrance/exit from accreditation; Number of fellows trained per year and per program; Match results; Fellow operative experience; Fellow satisfaction with training; Post-fellowship employment status.

RESULTS: There are currently 12 active accredited programs (13 programs gradually gained accreditation, with 1 program subsequently withdrawing). 43 trainees have completed an accredited fellowship program. Of the active programs, each has trained a median of 3.5 fellows (range: 0–6).

In the 2013 match, 6 programs waived participation. 3 applicants participated, all of whom successfully matched, leaving 3 unmatched programs. In the 2014, 6/12 programs waived participation. 7 applicants participated, 5 of whom successfully matched, leaving 2 unmatched applicants and 1 unmatched program.

The median number of total cases (minimum requirement of 75) was 124 (range: 75–236). For complex neonates (combined minimum requirement of 5), the median number of cases was 6 (range: 2–8). Some fellows failed to meet the minimum requirements.
By survey, 31/42 (74%) of graduates responded. Of the respondents, most fellows were satisfied with their overall operative experience, but less so with their neonatal operative experience. 84% are currently practicing congenital cardiac surgery (>75 major cases/year, of which >75% are congenital), and 74% secured jobs prior to fellowship completion.

**CONCLUSION:** Congenital cardiac surgery training programs are now accredited by the ACGME. Although many aspects of training have improved since accreditation began in 2008, shortcomings remain. Hopefully, this study will highlight these issues and allow for further improvement in the future.
OBJECTIVES: Following surgery for congenital heart defects, a number of children have prolonged post-operative intensive care unit (ICU) stay. Those patients require tremendous resources and strain the capacity of cardiac units. To date, we have little knowledge of early and late survival for this challenging population. We examined outcomes of children who required ICU stay >30 days following cardiac surgery at our institution.

METHODS: From 2002 to 2012, our patient cohort was 173 children who required post-operative ICU stay >30 days (~3% of all surgical patients). Multivariable regression analyses examined factors associated with hospital death and late survival.

RESULTS: Overall, 159/173 (92%) were infants including 112/173 (65%) neonates. Forty-six (28%) were premature ≤36 weeks, 91 (53%) had associated extra-cardiac/genetic malformations and 74 (43%) had single ventricle (SV) anomalies. Cardiopulmonary bypass was used in 140 (81%) of surgeries. Forty-one patients (24%) required post-operative mechanical support (ECMO) and 55 (32%) required cardiac reoperation during same admission.

Median (IQR) post-operative ventilation, ICU and hospital stay were 27.6 (15.3–42.0), 44.7 (36.0–60.0) and 54.0 (44.0–76.0) days, respectively. Hospital mortality was 42 (24%). On multi-variable analysis, factors affecting hospital mortality were ECMO use (OR: 2.8; 95% CI [1.7–8.8]; p = 0.001) and cardiac reoperation (OR: 0.4; 95% CI [0.1–0.9]; p = 0.04). Overall survival at 1 and 8 years was 59% and 52%. On multi-variable analysis, ECMO need at index admission was associated with late mortality (HR: 1.7; 95% CI [1.0–2.7]; p = 0.04).

Comparison of survival following discharge was made between neonates who had prolonged post-operative ICU stay >30 days (n = 112) and contemporaneous neonates who did not have prolonged post-operative ICU stay (n = 1,366) and is shown in the supplementary figure. Eight-year survival following hospital discharge (after excluding hospital mortalities) was lower in those who had prolonged ICU stay (68% vs. 91%; p < 0.0001); however, the difference was more pronounced in patients with two-ventricle anomalies (68% vs. 95%; p < 0.0001) than in patients with SV anomalies (68% vs. 82%; p = 0.03). Overall, 82% of SV hospital survivors proceeded to Glenn with 84% of them reaching or qualifying for subsequent Fontan.
Comparison Between Patients Who Survived to Hospital Discharge and Those Who Did Not

<table>
<thead>
<tr>
<th></th>
<th>Hospital Death n = 42 (24%)</th>
<th>Hospital Survival n = 131 (76%)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age (IQR) in days</td>
<td>9 (3–46)</td>
<td>11 (4–82)</td>
<td>0.75</td>
</tr>
<tr>
<td>Neonates (%)</td>
<td>28 (67%)</td>
<td>84 (64%)</td>
<td>0.68</td>
</tr>
<tr>
<td>Prematurity ≤36 weeks (%)</td>
<td>11 (26%)</td>
<td>35 (27%)</td>
<td>0.96</td>
</tr>
<tr>
<td>Extra-cardiac/genetic anomalies (%)</td>
<td>21 (50%)</td>
<td>70 (53%)</td>
<td>0.70</td>
</tr>
<tr>
<td>Single ventricle (%)</td>
<td>23 (55%)</td>
<td>51 (39%)</td>
<td>0.07</td>
</tr>
<tr>
<td>Cardiopulmonary bypass use (%)</td>
<td>34 (81%)</td>
<td>106 (81%)</td>
<td>0.99</td>
</tr>
<tr>
<td>ECMO use (%)</td>
<td>18 (43%)</td>
<td>23 (18%)</td>
<td>0.0008</td>
</tr>
<tr>
<td>Reoperation same admission (%)</td>
<td>10 (24%)</td>
<td>45 (34%)</td>
<td>0.20</td>
</tr>
<tr>
<td>Median ventilation duration (IQR) in days</td>
<td>38.4 (32.3–47.5)</td>
<td>22.1 (11.3–38.1)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
CONCLUSIONS: Inherent patient and anatomic factors (prematurity, extra-cardiac/genetic malformations, SV anomalies) and post-operative factors (ECMO and cardiac reoperation need) are common in children who require prolonged ICU stay following cardiac surgery. Prolonged post-operative ICU stay is associated with high hospital mortality and significant post-discharge attrition, mainly during the first year. In children with underlying SV anomalies, prolonged ICU stay is associated with high hospital mortality but acceptable progression pattern towards subsequent palliation stages. On the other hand, prolonged ICU stay following surgery in patients with two-ventricle anomalies is associated with high hospital mortality and considerable decrease in late survival, suggesting a more pronounced deviation from expected survival in children with two-ventricle anomalies requiring prolonged post-operative ICU stay.
BACKGROUND: We have reviewed our institutional outcomes after the Senning procedure in a contemporary series.

METHODS: A retrospective analysis of all patients who underwent the Senning procedure at our institution was performed. Hospital records were reviewed, and follow-up data were obtained to evaluate outcomes.

RESULTS: Nineteen patients underwent a Senning procedure between August 2005 and July 2014. Median age at repair was 594 days (range: 5 days to 15 years). Median weight was 11 kg (range: 3–67). The primary diagnosis was congenitally corrected transposition of the great arteries (cc-TGA) in 17 patients. One patient had heterotaxy with isolated ventricular inversion, and another had D-Transposition with complex left ventricular outflow tract (LVOT) obstruction not amenable to conventional repair. Among the 17 patients with cc-TGA, 7 underwent a combined Senning-Rastelli operation and 10 underwent double switch (arterial switch/atrial switch). Associated lesions included ventricular septal defect (n = 10), pulmonary stenosis/atresia (n = 7), and Ebstein’s anomaly of the tricuspid valve (n = 4). Fourteen patients (74%) underwent previous palliation with a pulmonary artery band or a systemic-to-pulmonary artery shunt. A total of seven patients (37%) required the use of non-autologous patch material for Senning completion. Four patients had systemic venous pathway baffle augmentation with a pulmonary homograft patch (n = 3) or bovine pericardium (n = 1). The pulmonary venous pathway was enlarged using an expanded polytetrafluoroethylene patch (n = 1) or pulmonary homograft (n = 2). Two patients required immediate superior vena cava baffle revision in the operating room, but no new pulmonary venous or systemic venous baffle obstruction has been noted during follow-up. There was one operative mortality (5%). One patient developed supraventricular tachycardia (SVT) after double switch, requiring extracorporeal membrane oxygenation (ECMO), necessitating bridge to transplantation due to problematic neo-aortic insufficiency on ECMO. Five patients (26%) in this series underwent pacemaker implantation. Of these 5 patients, two (11%) developed complete atrio-ventricular block prior to the Senning procedure. Two patients developed heart-block at the time of the Senning due to either concomitant LVOT resection, or VSD enlargement for Rastelli pathway creation. One patient, who had undergone a pre-Senning transcatheter ablation for SVT, developed recurrent SVT and subsequent sino-atrial node dysfunction necessitating pacemaker implantation. Actuarial survival in the study population is 81% at 5 years with a median follow-up of 32 months. Surviving patients (n = 15) are all well at last clinical follow-up with normal biventricular function. There have been three late reoperations, two for right ventricle-to-pulmonary artery conduit change, and one for neo-aortic valve replacement.
CONCLUSIONS: The Senning procedure allows for complete atrial inversion in patients of all sizes, offering excellent outcomes with regard to systemic and pulmonary venous baffle patency. The incidence of atrial arrhythmias and sinus node dysfunction during this relatively brief follow-up period is low. Atrial inversion was achieved in all patients, the majority with viable all-autologous venous pathways, and no patient underwent cavopulmonary anastomosis. Double switch and Senning-Rastelli results in this population, however, are affected by other significant factors that should be considered during patient selection and surgical planning.
CF20. Outcomes After Mechanical Aortic Valve Replacement in Children and Young Adults with Congenital Heart Disease
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OBJECTIVES: Aortic valve replacement in children and young adults is sometimes required, despite improvements in complex aortic valve reconstruction. There is relatively little recent data on this patient population, and the outcomes using newly available devices haven’t been reported in this group of patients. The aim of this study is to review our single institutional experience with aortic valve replacement in children and young adults.

METHODS: The demographic, procedural and outcome data were obtained for all patients who underwent valve replacement with a mechanical prosthetic valve from 2000 to 2014 at our institution. Patient follow-up was obtained by reviewing institutional records or by direct contact of referring cardiologist. The primary endpoints were mortality and reoperation for valve dysfunction. Secondary endpoints were structural valve failure and thrombo-embolic or bleeding complications.

RESULTS: 127 patients (90 male) were included during the study period, with a median age of 16 years (IQR: 12–22.8). Fifty patients (39.4%) previously had one aortic valve operation, 26 (20.5%) had 2 prior operations, and 4 (3.1%) had 3 prior operations. The fundamental diagnosis was congenital aortic stenosis in 50 patients (39.4%), borderline left heart hypoplasia or Shone’s complex in 14 (11%), conotruncal anomalies in 24 (18.9%), other congenital lesions in 33 (26%) and acquired aortic valve disease in 6 (4.7%). Forty-two patients (33.1%) required aortic root enlargement. Seventy-nine patients (62.2%) received a St Jude valve, 45 (35.4%) received an On-X valve and 3 (2.4%) received a Carbomedics valve. The median valve size was 23 mm (IQR: 21–25). There were 5 early deaths (3.9%). Sixteen patients were lost to follow-up and excluded from further analysis. The median follow-up was of 5 years (IQR: 1.6–9.2 years; 600.2 patient-years), and was 6.1 years for patients with a St Jude valve, 3.9 years with On-X valves and 8.6 years with Carbomedics valves. There were 14 late deaths and survival was 90.6 ± 2.8% at 1 year, 85.4 ± 3.7 at 5 years and 81.5 ± 4.5% at 10 years. Freedom from aortic valve reoperation was 98 ± 1.4% at 1 and 5 years, 91.5 ± 3.9% at 7 years and 78.4 ± 6.9% at 10 years to latest follow-up, and was significantly better with the On-X valve (P < 0.001). All patients were treated with warfarin (goal INR: 2–3), 42 patients also received aspirin (33.1%), and 1 received clopidogrel (0.8%). Four patients (0.66/100 patient-years) presented thrombo-embolic complications (3 strokes), and 5 patients (0.83/100 patient-years) had bleeding events during follow-up. One patient presented prosthetic valve endocarditis that required reoperation.
CONCLUSIONS: Mechanical aortic valve replacement is a safe and effective treatment for patients with congenital heart disease. Long-term survival and freedom from reoperation were acceptable, with a low incidence of thrombo-embolic and bleeding events.
CF21. 25 Consecutive Years of ECMO Support at a Single Children’s Heart Center
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University of California San Diego, San Diego, CA

OBJECTIVES: Extracorporeal membrane oxygenation (ECMO) is potentially life-saving therapy. We sought to characterize and analyze our experience from a 25-year continuously operated pediatric cardiac ECMO program.

METHODS: We obtained records from the Extracorporeal Life Support Organization registry and collated this with our own ECMO service line and hospital records. The ECMO conditions were characterized, survival described and univariate analysis performed to identify factors associated with hospital survival; relevant variables were tested in multivariable analysis (Cox regression).

RESULTS: There were 264 runs in 240 patients; 204/240 patients (85%) were placed on ECMO soon after having cardiac surgery/therapy catheterization and 36 (15%) were placed on as initial procedure. A single run was utilized in 220 patients (41% hospital survival), 2 runs in 16 patients (25% survival) and 3 runs in 4 (0% survival). Complications were common; renal (creatinine ≥1.5) in 98 (40.8%), neurologic (any seizure/significantly abnormal brain imaging) in 91 (39.7%), and infectious (positive cultures) in 25 (10.4%). Patients having ECMO as first procedure of admission had 50% survival with pulmonary vein abnormalities (n = 11, 64% survival) and single ventricle requiring shunt placement/revision (n = 3; 100% survival) most favorable. ECMO following cardiac procedures yielded 38% survival, highest for those after shunt placement/revision (70%). Younger age (p = 0.04498), smaller weight (p = 0.02085), subsequent cardiac surgery procedure after cannulation (p = 0.02627), lower initial and peak lactate levels (p ≤ 0.001), absence of renal and neurologic complications (p ≤ 0.001) and shorter duration of ECMO support (p = 0.0412) were associated with hospital survival; single ventricle diagnosis and pre-ECMO arrest were unrelated. Only lower weight (p = 0.04282), subsequent cardiac surgery/therapeutic catheterization (p = 0.00968) and shorter support time (p = 0.00101) were independently associated with survival to discharge. Lactate levels, however, were only measured in the latter half of the series and thus could not be included.

CONCLUSIONS: Cannulation during arrest was not associated with worse survival but univariate lactate trends likely reflect the advantage of superior pre-ECMO resuscitation. Almost 20% of the survivors had undergone “subsequent” cardiac procedures to reverse the pathology leading to ECMO support and this was independently associated with survival. For patients requiring ECMO first, pulmonary

* WTSA Member
venous anomalies and single ventricle requiring shunt placement/revision survived more frequently. For ECMO after cardiac procedures, survival was more frequent for shunt placement/revision. Newborns and infants continue to have an independent survival advantage compared to older patients requiring ECMO for cardiac disease but complications are common.
OBJECTIVES: Rapid somatic growth of pediatric patients with cardiac valve replacements can lead to patient-prosthesis size mismatch and valve dysfunction. Current xenogeneic, bioprosthetic and allogeneic cryopreserved (Cryo) non-viable replacement heart valves (HVs) implanted into infants and young children must be replaced multiple times throughout life due to calcific degradation and lack of synchronous patient-prosthesis allometric growth. The development of bioengineered (BE) HVs with capacity to constructively and adaptively remodel valve matrix could reduce the need for repeated surgeries by preserving better valve function. This study was performed to test functional, viscoelastic, dimensional, and biological responses of BEHVs as compared to traditional Cryo HVs implanted in the RVOT of very young lambs during rapid somatic growth and at an age during which in this species aggressive rapid calcific degradation of biological valves is well documented.

METHODS: The pulmonary valves (PVs) of nine weanling lambs (19.6 ± 1.4 kg) were replaced with allogeneic PVs either bioengineered by eliminating cells and then collagen conditioned in the OR to improve biological and mechanical performance (BEHV; n = 6) or traditionally cryopreserved PVs (n = 3). After 6 months, implanted valves (9) and 3 additional untreated herd-mates (Native) were assessed by TEE and simultaneous cardiac cath (valve dimensions, function, hemodynamics; visco-elasticity) followed by explant pathology. Data reported as median (range); nonparametric statistical tests applied (Kruskal-Wallace; Wilcoxon Rank Sum).

RESULTS: There were no differences between Cryo, BEHV, and native in somatic growth (body surface area, weight), increases in valve geometric dimensions and effective orifice areas (EOA, EOAI). As compared to BEHV cusps, Cryo cusps were thicker (P = 0.059) and had reduced coaptation (P = 0.03). BEHVs had higher median cusp area coaptation indices (34.55% vs. 13.20%), with physiologic normal gradients even at maximum cardiac outputs. Cryo demonstrated reduced compliance (0.7 (0.3) vs. 4.3 (4.2) mm²/mmHg; P = 0.048) with larger elastic moduli (i.e., stiffer) than BEHV. The increased regurgitation and stiffness in Cryo resulted in almost a 50% increase in total (mean + pulsatile) RV stroke work. Histologically, Cryo demonstrated loss of pan-tissue cellularity, whereas the initially acellular BEHVs demonstrated re-endothelialization (FactorVIII+) of the cuspal surfaces, and extensive recellularization with myofibroblasts (by α-SMA, Vimentin, HSP-47 immunohistochemistry) in the sinus walls (conduit) and variable influx into cusp bases (but not mid-distal cusps). HSP-47+ myofibroblasts suggest active collagen synthesis.
CONCLUSIONS: BEHVs (prepared as previously reported by us) had compliance and valve functional measurements more similar to Native valves than Cryo, despite equivalent increases in body mass indices and valve dimensions. Cryo valves had progressive regurgitation with increasing diameters but without recell suggesting secondary dilatation without cuspal enlargement or any actual allometric tissue growth. Equivalent radial enlargements with better retention of competence, viscoelasticity, and coaptation indices in BEHVs could result from better biomechanics due to the preimplantation collagen conditioning-treatment, or active postimplant matrix remodeling in the sinus walls and cusp bases where autologous phenotype appropriate cell homing and repopulation occurred, or both.
**OBJECTIVE:** We have previously shown that a conventional ventricular assist device (VAD) allows effective mechanical circulatory assistance in a cavopulmonary circuit when placed parallel to the systemic ventricle. However arterial desaturation is a risk of this strategy with superior cavopulmonary connections secondary to increased inferior caval flow. We hypothesized that overall augmentation in cardiac output with mechanical assistance compensates for any drop in oxygen saturation thereby maintaining total oxygen delivery to tissues.

**METHODS:** Bidirectional Glenn (BDG) was established in each of 7 Yorkshire pigs (25 kg) after a common atrium had been established previously by balloon septostomy. Mechanical circulatory assistance of the single systemic ventricle was achieved using an axial flow pump with systemic ventricular inflow and proximal ascending aortic outflow. Cardiac output was measured using an ultrasonic flow meter placed on the distal ascending aorta and compared between assisted and non-assisted circulation. Mean pulmonary artery pressure (PAP), common atrial pressure (LAP), arterial oxygen saturation (SaO₂), partial pressure of arterial oxygen (PaO₂) and oxygen delivery (DO₂) were calculated.

**RESULTS:** Significant augmentation of cardiac output was achieved with mechanical assistance in BDG circulation (BDG, 0.87 ± 0.31 L/min vs. Assisted BDG, 1.46 ± 0.63 L/min, \(P = 0.05\)). While oxygen saturations and PaO₂ trended to be lower with mechanical assistance (SaO₂-BDG, 45 ± 14% vs. Assisted BDG, 30 ± 17% \(P = 0.07\); PaO₂-BDG, 25 ± 6 mmHg vs. Assisted BDG, 19 ± 3 mmHg \(P = 0.08\)), oxygen delivery trended higher with mechanical assistance (BDG, 79 ± 44 ml/min vs. 86 ± 51 ml/min; \(P = 0.81\)). No significant change in the LAP or PAP was observed with mechanical assistance (Table).
Table. Pump in Parallel- Mechanical Assistance of Partial Cavopulmonary Circulation Using a Conventional Ventricular Assist Device

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline (Biventricular Circulation)</th>
<th>BDG</th>
<th>Assisted BDG</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac output</td>
<td>2.17 ± 0.57</td>
<td>0.87 ± 0.31</td>
<td>1.46 ± 0.63</td>
<td>0.05*</td>
</tr>
<tr>
<td>SaO₂ (%)*</td>
<td>95 ± 10</td>
<td>45 ± 14</td>
<td>30 ± 17</td>
<td>0.07</td>
</tr>
<tr>
<td>PaO₂ (mmHg)*</td>
<td>247 ± 179</td>
<td>25 ± 6</td>
<td>19 ± 3</td>
<td>0.08</td>
</tr>
<tr>
<td>DO₂ (ml/min)*</td>
<td>269 ± 48</td>
<td>79 ± 44</td>
<td>86 ± 51</td>
<td>0.81</td>
</tr>
<tr>
<td>LAP (mmHg)</td>
<td>10.6 ± 4.2</td>
<td>14.9 ± 5.3</td>
<td>13.1 ± 5.7</td>
<td>0.57</td>
</tr>
<tr>
<td>PAP (mmHg)</td>
<td>21.3 ± 2.7</td>
<td>23.1 ± 3.4</td>
<td>24.3 ± 4.2</td>
<td>0.59</td>
</tr>
</tbody>
</table>

BDG = Bidirectional Glenn; CO = Cardiac Output; DO₂ = Oxygen Delivery; LAP = Left Atrial Pressure; PaO₂ = Partial Pressure of oxygen in arterial blood; PAP = Pulmonary Artery Pressure; SaO₂ = Arterial Oxygen Saturation.

Data are mean ± SD. BDG vs Assisted BDG compared by repeated-measures ANOVA. *Statistically significant difference between BDG and Assisted BDG conditions. *n = 5 for these variables.

CONCLUSIONS: In the setting of superior cavopulmonary connection and single ventricle, the increased cardiac output achieved with a systemic VAD may compensate for any decrease in arterial oxygen saturation. Takedown to a BDG and systemic VAD may be the optimal strategy for mechanical assistance of the failing Fontan.
**OBJECTIVES:** Multiple reports showed that multistage palliation of infants with heterotaxy syndrome and functional single ventricle is associated with high morbidity and mortality. We examined current-era palliation results of those patients with focus on operative morbidity and mortality, progression to subsequent palliation stages and late survival.

**METHODS:** From 2002 to 2012, 67 infants with heterotaxy syndrome underwent multistage palliation. Forty-three patients (64%) had right atrial isomerism (RAI) while 24 (36%) had left atrial isomerism (LAI). Among those, 31 (46%) had total anomalous pulmonary venous connection (TAPVC, obstructed in 10/31), 54 (81%) had atrioventricular septal defect, 57 (85%) had conotruncal malformations, and 23 (34%) had interrupted inferior vena cava. Antegrade pulmonary blood flow was absent in 16 (24%), restricted in 27 (40%) and unrestricted in 24 (36%) while systemic outflow tract obstruction was evident in 13 (19%). Competing risks analyses were performed to model events after first palliative surgery (death, transition to Glenn or transplantation) and to examine associated risk factors affecting survival. Additionally, early and late outcomes were compared in heterotaxy neonates who had first-stage palliation with a matching control group (2:1 ratio) of contemporaneous single ventricle patients without heterotaxy who had first-stage palliation.

**RESULTS:** Median age was 11 days (IQR: 5–50) and median weight was 3.1 Kg (IQR: 2.6–3.8) with 14 (21%) ≤2.5 Kg. Seventeen (25%) were premature ≤36 weeks. Fifty-eight patients (87%) required early palliation, including modified Blalock-Taussig shunt (n = 34 [51%]), Norwood (n = 12 [18%]), pulmonary artery band (n = 12 [18%]), whereas Glenn was the first surgery in the remaining patients (n = 9 [13%]). Concomitant TAPVC repair was performed in 19 (28%).

Competing risks analysis showed that at 1 year following first-stage palliation, 29% had died, 63% had progressed to Glenn and 8% were alive awaiting Glenn. The hazard of death was the highest in the initial 6 months following first-stage surgery however it decreased significantly then after. (Figure 1) Overall survival 8 years following initial surgery was 66% and was worse for RAI (60% vs. 81%; p = 0.15) and although survival was 100% following Glenn, it was not different following other

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first-stage palliation surgeries (Norwood 65%, band 66%, shunt 59%; p = 0.17). On multivariable analysis, risk factors for early phase mortality were ECMO use (HR: 9.9; p < 0.001), unplanned reoperation (HR: 3.7; p = 0.004) and TAPVC repair (HR: 2.9; p = 0.01).

Comparison with the contemporaneous matching single ventricle patients showed that first-stage palliation in heterotaxy patients was associated with higher hospital death (27% vs. 7%, p < 0.001), longer ventilation hours (169 vs. 98, p = 0.006), ICU hours (266 vs. 139, p < 0.001) and hospital days (23 vs. 14, p = 0.002). Nonetheless, interstage mortality, survival after Glenn and progression to Fontan were comparable (p > 0.1 for all). [Figure 2]
CONCLUSIONS: The management of heterotaxy infants with functional single ventricle remains challenging. First-stage palliation is associated with high operative mortality and increased resource utilization due to surgical morbidity. Nonetheless, outcomes beyond hospital discharge are comparable to other single ventricle patients. Efforts to improve survival in those patients should focus on perioperative care.
BACKGROUND: Heart transplant is the gold standard for end-stage heart failure. Short- and long-term outcomes have been excellent but the shortage of organs persists. The number of potential recipients who die awaiting orthotopic heart transplantation (OHT) increases yearly. The label “high-risk donor” (HRD) was applied to any organ donor which met the Center for Disease Control (CDC) criteria for high-risk behavior of infection in 2004, by the United Network for Organ Sharing (UNOS). Despite organ shortages, HRD grafts are often declined due to infectious concerns. We undertook this study to analyze our large experience with OHT of CDC-HRD grafts, and to determine the short- and long-term outcomes associated with recipients of CDC-HRD hearts, in particular infectious transmission.

METHODS: We have performed 367 heart transplants at our center from September 2008 to September 2014, a time-frame consistent with the initiation of the CDC-HRD label. Of the total OHTs performed, 15% of patients (n = 55) received CDC-HRD organs. We reviewed demographic, perioperative and short- and long-term outcomes. The recipients of CDC-HRD grafts were closely followed with 3- and 12-month surveillance lab testing of human immunodeficiency virus viral load, Hepatitis B viral load, and Hepatitis C core and surface antigen serologies as well as Hepatitis C viral load.

RESULTS: All 55 patients (72.7% male) underwent a successful transplant. One patient was excluded from follow-up analysis because he was re-transplanted within 4 days given post-transplant finding of metastatic lung adenocarcinoma within the donor. Primary etiology of heart failure was ischemic in 18 of the patients. The most common blood type was O positive with 20 patients (37.1%) followed by A positive with 19 patients (35.2%). A total of 19 patients (35.2%) were supported with a mechanical device prior to transplant. Average allograft ischemic time was 173 ± 96 minutes. The median hospital stay was 19.5 days. There was a low incidence of the post-operative complications of stroke (1.9%), dialysis (3.9%), and complete heart
block (3.9%). Kaplan-Meier analysis demonstrated excellent short-term survival (1 year, 94%) and long-term survival (3 years, 80%). Allograft function was excellent at time of discharge with left ejection fraction of 67.8 ± 7.3%. Interestingly, only one patient (1.9%) was noted to have hepatitis C virus seroconversion at 105 days from transplantation. Following anti-viral treatment, the patient has undetectable viral loads to date. All other patients had undetectable plasma viral loads of HIV, HCV, and HBV with rigorous testing.

CONCLUSIONS: We present the only single center series of heart transplant recipients of CDC-HRD. This potential source of suitable donor organs is shown to have excellent survival without an increased incidence of perioperative or post-operative complications. Furthermore, there appears to be minimal risk of infectious transmission from the donor in this sub-group.
17. Second Primary Lung Cancers Demonstrate Better Survival with Surgery Than Radiation When Detected Early
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DISCUSSANT: DAVID T. COOKE

BACKGROUND: Patients who have had curative surgery for lung cancer are at the highest risk of developing a new lung cancer. There is no consensus on the modality and frequency of screening in these patients. Individual studies are usually underpowered to describe the clinical characteristics and outcomes in second primary lung cancer. The goal of this study is to determine which therapy is best associated with survival in patients who develop a new primary lung cancer.

METHODS: All pathologically proven stage I lung cancer cases that received cancer-directed surgery included in The Survival Epidemiology and End Results (SEER) database between 2004 and 2010 were selected. Cases that received radiation therapy were excluded. Cases which developed a second primary lung cancer 6 or more months after the diagnosis of the first cancer were analyzed. The original data set consisted of 9,564 stage I lung cancer cases treated with surgery; 520 of them developed a second primary and completed data were available for 494 of them.

RESULTS: Stage I disease was diagnosed in 272 patients with second primary lung cancers (58.5%); 45.8% of these underwent cancer surgery alone, 31.6% received radiation alone. Surgery was performed more frequently in early stages (79.3% of surgical cases were stage I versus 38% of non-surgical cases; p < .0001), and younger patients (66 versus 70 years, p < .0001). Surgical patients had statistically significant longer survival than patients treated with radiation (log-rank p < 0.0001) or not treated with surgery or radiation (log-rank p < 0.0001). Among Stage I second primaries, independent predictors of survival were surgery (HR: 0.4; 95% CI [0.2–0.9]), and age; radiation was marginally associated with survival (HR: 0.5; 95% CI [0.2–1.2]). Time between the first and second lung cancer was not significantly associated with survival.
CONCLUSIONS: The incidence of second primary lung cancers was 5.4%. Stage I second primaries had improved survival compared to later stage disease and surgery conferred an increased survival benefit as compared to radiation. This underscores the importance of surveillance imaging in the early detection of these lesions.
OBJECTIVES: Mesenchymal stromal cells (MSCs) are pluripotent stem cells found within the bone marrow niche and are capable of differentiating into several different cell types. In preclinical and clinical studies, MSC based strategies have shown potent potential in treating a wide variety of pulmonary diseases including acute respiratory distress syndrome (ARDS) and interstitial lung disease. MSCs secrete multiple paracrine factors which are potentially capable of immune modulating abnormalities in lung injury, making this an appealing therapeutic strategy. The purpose of this study was to use a novel "cell-free therapy" by pretreating with MSC conditioned media to induce ischemic tolerance prior to LIRI.

METHODS: Conditioned media was collected from four clonal rat MSC cell lines at a maximum confluency of ~90%. 30 minutes prior to LIRI, conditioned media was instilled intratracheally (IT), followed by 90 minutes of ischemia and 4 hours of reperfusion. Samples were procured including BAL, peripheral blood, and lung biopsies. Evans blue dye lung permeability assays were used to determine the degree of injury after pretreatment with conditioned media and IR. Cell counts, flow cytometry, and quantitative PCR studies were performed on BAL, peripheral blood mononuclear cells (MNC), and cells isolated from lung biopsies to determined cell subset compositions.

RESULTS: Pretreatment with conditioned media provided significant protection against LIRI compared to controls (p = .0028). Total leukocyte and neutrophil counts from BAL were not significantly different between controls and treated animals (p = .393 and p = .072, respectively). Interestingly, the total number of macrophages and lymphocytes were significantly increased (p = .003 and p = .0043, respectively). Characterization of the mononuclear cell population shows a dramatic shift towards regulatory subsets including M2 macrophages and FOxP3+ regulatory T cells. Cytokine data from BAL supernatant show decreases in TNFα and IL1β, with an increase in IL10.

CONCLUSIONS: The current study shows that pretreatment with conditioned media prior to IR confers significant protection. This is the first study that provides strong evidence that MSC conditioned media based therapy has profound effects in an acute injury model and significant impact on LIRI outcomes. Preliminary data is suggestive that these protective mechanisms are mediated by multiple paracrine factors.
factors contained within conditioned media that significantly change both the adaptive and innate immune responses. These changes are characterized by infiltrating regulatory MNC and alterations in residential cells towards a regulatory phenotype.

The use of conditioned media provide significant clinical advantages over cell based strategies including controllability, ease of administration, speed of production, and cost effectiveness. Furthermore, the enrichment of regulatory subsets after pretreatment has potential for significant clinical impact in the field of lung transplantation. The demonstrated increase in infiltrating regulatory subsets, like FoxP3+ regulatory T cells, would be expected to foster the development of donor specific tolerance and therefore long term graft acceptance.
OBJECTIVE: The transfusion of allogeneic blood products, though common in pediatric cardiac surgery, has associated potential deleterious consequences, including prolonged duration of mechanical ventilation and length of hospital stay. We retrospectively reviewed pediatric open-heart surgery cases to investigate the feasibility and clinical outcomes of a restrictive blood transfusion strategy in children.

METHODS: Between January 2012 and December 2013, 372 consecutive patients undergoing open-heart surgery were retrospectively reviewed. Twenty patients requiring extracorporeal membrane oxygenation were excluded. Patients were divided into two groups based on body weight (BW): group 1 (BW >8 kg) and group 2 (BW ≤8 kg). The cardiopulmonary bypass (CPB) circuit was routinely primed with blood for patients ≤8 kg. Asanguineous primes were used for children greater than 8 kg, unless clinically indicated. Patient demographics, peri-operative blood product usage, CPB time, serum lactate on post-operative day (POD) 1, creatinine rise postoperatively, duration of mechanical ventilation (MV), and ICU and hospital lengths of stay were analyzed.

RESULTS: See Table 1. A total of 352 patients were analyzed. No blood products were used in 78.8% (145/184) of group 1 patients. Of group 1 patients with a BW >10 kg and a CPB time <90 min, 94.9% (111/117) received no blood products and 100% (117/117) were extubated intraoperatively. There were no differences (mean ± SD) in serum lactate level on POD 1 (1.1 ± 0.5 vs. 1.2 ± 0.5 mmol/L; p = 0.23), creatinine rise (3.6 ± 7.5 vs. 5.7 ± 15.2 μmol/L; p = 0.44), or ICU lengths of stay (1.1 ± 0.4 vs. 2.5 ± 4.3 days; p = 0.06) between non-transfused and transfused patients in group 1, respectively. Non-transfused patients had shorter CPB times (66.4 ± 43.3 vs. 121.6 ± 66.0 min; p < 0.01), durations of MV (0.2 ± 2.0 vs. 3.8 ± 8.5 hours; p = 0.02), and hospital lengths of stay (4.6 ± 3.3 vs. 7.4 ± 6.5 days; p = 0.02) compared to transfused patients in group 1. Though all group 2 patients (168/168) received 1 unit of blood to prime the bypass circuit, 85.1% (143/168) of these patients, including 66% (21/33) of neonates, did not receive any additional blood products during their hospitalization. These patients demonstrated shorter CPB times (86.4 ± 36.5 vs. 133.6 ± 56.8 min; p < 0.01), lower lactate levels on POD 1 (1.3 ± 0.7 vs. 2.8 ± 2.9 mmol/L;
p = 0.02), shorter durations of MV (11.4 ± 36.0 vs. 55.9 ± 47.3 hours; p < 0.01), and shorter ICU lengths of stay (2.8 ± 5.6 vs. 9.0 ± 14.2 days; p = 0.04), compared to those who required additional blood products.

**Table 1: Transfusion rate**

<table>
<thead>
<tr>
<th>Group weight (kg)</th>
<th>N</th>
<th>Blood transfusion only for CPB prime</th>
<th>Blood CPB prime + additional transfusion</th>
<th>Asanguineous CPB prime + additional transfusion</th>
<th>Zero transfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1: &gt;8 kg</td>
<td>184</td>
<td>11 (6.0%)</td>
<td>4 (2.2%)</td>
<td>24 (13.0%)</td>
<td>145 (78.8%)</td>
</tr>
<tr>
<td>Group 2: ≤8 kg</td>
<td>168</td>
<td>143 (85.1%)</td>
<td>25 (14.9%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>352</td>
<td>154 (43.8%)</td>
<td>29 (8.2%)</td>
<td>24 (6.8%)</td>
<td>145 (41.2%)</td>
</tr>
</tbody>
</table>

**CONCLUSIONS:** Our data suggest a restrictive transfusion strategy can be safely implemented in pediatric cardiac surgery. Most children with BW >8 kg require no blood products and most with BW ≤8 kg require only 1 unit of blood to prime the bypass circuit. Cardiopulmonary bypass time less than 90 minutes with BW >10 kg is highly predictive for zero transfusion cases.

9:50 am – 10:10 am **COFFEE BREAK: VISIT EXHIBITS & POSTERS,**  
*MacDonald C-F*
20. Cardiac Surgery Improves Survival in Advanced Left Ventricular Dysfunction: Multivariate Analysis of a Consecutive Series of 4491 Patients Over an 18-Year Period
Balakrishnan Mahesh¹, Prasanth Peddayyavarla², Lay P. Ong³, Sonya Gardiner⁴, Samer A.M. Nashef⁵
¹UPMC Presbyterian, Pittsburgh, PA; ²Camden CCG, London, United Kingdom; ³Department of Cardiothoracic Surgery, Papworth Hospital, Cambridgeshire, United Kingdom; ⁴Department of Cardiothoracic Surgery, Papworth Hospital, Cambridgeshire, United Kingdom; ⁵Department of Cardiothoracic Surgery, Papworth Hospital, Cambridgeshire, United Kingdom

DISCUSSANT: RICHARD J. SHEMIN

OBJECTIVES: Risks of conventional cardiac surgery in advanced left ventricular [LV] dysfunction are considered prohibitive. We examine our results in this cohort of patients to determine the value of conventional cardiac surgery compared with optimal medical management.

METHODS: Data was prospectively collected and retrospectively analyzed from 4,491 consecutive patients referred for cardiac surgery over 18 years from 1994 to 2013; 3,890 patients underwent cardiac surgery. LV function was categorized as good (ejection fraction [EF] > 50%); moderate (EF = 30–50%); poor (EF 20–30%); terrible (EF < 20%). Univariate predictors of in-hospital postoperative mortality were analyzed by Student’s T-test, Mann-Whitney-U test, and Chi-Square tests. All variables with p < 0.1 were entered into a multivariable logistic regression model to identify predictors of in-hospital postoperative mortality, and odds ratios were determined. Data on death from cardiac causes were obtained from UK Office of National Statistics. Univariate analysis of predictors of cardiac death was obtained by log-rank method. All variables with p < 0.1 were entered into multivariable Cox proportional hazards model to identify independent predictors of long-term survival, and hazard ratios were determined. p < 0.05 was considered statistically significant in multivariable analyses.
RESULTS: Cardiac surgery was performed on 3,890 consecutive patients (74.7% male, age 69 ± 8 years). Postoperative hospital mortality was 2.9% (n = 112). Older age was an important independent determinant and there was ≈50% reduction in mortality for every 10-year slab <80 years. Other adverse predictors included female sex (OR = 1.86), extracardiac arteriopathy (EA) (OR = 2.37), redo surgery (OR = 2.77), triple combined procedures (OR = 4.54), and advanced LV dysfunction (poor: OR = 4.76; terrible: OR = 7.3; reference good LV: OR = 1); all p < 0.05. Interestingly, moderate LV function did not adversely impact in-hospital mortality.

In total, there were 690 cardiac deaths (15.4%), with cardiac-mortality being 8.6%, 14.8%, 28.8%, and 38.2% in patients with good, moderate, poor and terrible LVs, respectively (p < 0.001). Coronary artery surgery (HR = 0.45) and double combined procedures (HR = 0.67) were protective from cardiac death. Independent predictors of cardiac mortality include older age; there was ≈40–50% reduction in mortality for every 10-year slab <80 years. Other adverse predictors of cardiac mortality included EA (HR = 1.35), diabetes (HR = 1.67), redo surgery (HR = 1.43), and LV dysfunction (moderate: HR = 1.9; poor: HR = 3.9; terrible: HR = 5.8; reference good LV: HR = 1), all p < 0.05.
Using survival data from SOLVD and COPERNICUS trials, time until treatment equipoise (TUTE) was 3 years in patients with poor LV and 4.5 years in patients with terrible LV, demonstrating long-term benefit from cardiac surgery even in these patients.

**CONCLUSIONS:** Cardiac surgery provides protection from cardiac death, and long-term survival benefit in patients of all subsets of LV function, including poor LV and terrible LV, and TUTE provides a valuable tool to define this benefit.
**21. Socioeconomic Factors Are Associated with Readmission Following Lobectomy for Early Stage Lung Cancer**

Rachel L. Medbery, Theresa W. Gillespie, Joseph Lipscomb, Yuan Liu, Dana Nickleach, Manu Sancheti, Allan Pickens, Seth D. Force, Felix G. Fernandez

*Emory University, Atlanta, GA*

**DISCUSSANT: SEAN C. GRONDIN**

**OBJECTIVES:** Postoperative readmissions have become not only an indicator of healthcare quality, but also a financial variable impacting hospital reimbursement. As a result, identification of patients at high risk for readmission is an essential part of the pre-operative evaluation. The data surrounding risk factors for readmissions following surgical resection for lung cancer are limited and largely focus on postoperative outcomes such as complications and hospital length of stay (LOS). The current study aims to identify preoperative risk factors for postoperative readmission in early stage lung cancer patients.

**METHODS:** The National Cancer Data Base was queried for all early stage lung cancer patients with clinical stage ≤T2N0M0 who underwent lobectomy in 2010 and 2011. Patients with unplanned readmission within 30 days of hospital discharge were identified; those who received preoperative radiation or died during their index hospitalization were excluded from analysis. Univariate analysis was utilized to identify pre-operative differences between the readmitted and non-readmitted cohorts; multivariable logistic regression was used to identify pre-operative risk factors resulting in unplanned 30-day readmission.

**RESULTS:** A total of 840/19,711 (4.3%) patients had an unplanned readmission within 30 days following lobectomy for early stage lung cancer. Male patients were more likely to be readmitted compared to female patients (4.9 vs. 3.8%; p < 0.001), as were those who received their surgery at a non-academic facility vs. an academic one (4.6 vs. 3.6%; p = 0.001) and had underlying medical comorbidities (Charlson/Deyo Score 1+ vs. 0; 4.8 vs. 3.7%; p < 0.001). Readmitted patients had a longer median hospital LOS; (6 vs. 5 days). In addition to these aforementioned variables, multivariable logistic regression analysis identified that median household income level, insurance status (government vs. private), and geographic residence (metro vs. urban vs. rural) had significant influence on unplanned 30-day readmission (*Table 1*). Race was not a significant risk factor in any analysis. Surprisingly, operative approach (VATS vs. Open) remained a significant variable in both univariate (5.1 vs. 3.9%; p < 0.001) and multivariable analysis (OR: 1.42; 95% CI [1.2–1.65]). Median LOS based on operative approach and readmission status is shown in *Table 2*. 
Table 1. Multivariable Association with Unplanned Readmission

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Level</th>
<th>Odds Ratio (95% CI)</th>
<th>OR P-Value</th>
<th>Type3 P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical approach</td>
<td>Minimally invasive</td>
<td>1.42 (1.21-1.65)</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Facility type</td>
<td>Academic/research program (includes NCI)</td>
<td>0.75 (0.56–1.01)</td>
<td>0.061</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>Comprehensive community cancer program</td>
<td>0.99 (0.75–1.30)</td>
<td>0.952</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community cancer program/other</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>1.23 (1.07–1.43)</td>
<td>0.004</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Race: White</td>
<td>Yes</td>
<td>1.23 (0.97–1.57)</td>
<td>0.091</td>
<td>0.091</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Insurance (derived from census tract)</td>
<td>Not insured</td>
<td>1.00 (0.62–1.60)</td>
<td>0.991</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>Private insurance</td>
<td>0.79 (0.67–0.93)</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government insurance</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Income (derived from census tract)</td>
<td>&lt;$30,000</td>
<td>1.51 (1.18–1.92)</td>
<td>&lt;.001</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>$30,000–$34,999</td>
<td>1.38 (1.12–1.71)</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$35,000–$45,999</td>
<td>1.23 (1.03–1.48)</td>
<td>0.025</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$46,000 +</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Urban/rural residence</td>
<td>Rural</td>
<td>0.47 (0.26–0.84)</td>
<td>0.011</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>0.71 (0.57–0.88)</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metro area</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Charlson/Deyo score</td>
<td>1+</td>
<td>1.23 (1.06–1.42)</td>
<td>0.006</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Number of observations in the original data set = 19,711. Number of observations used = 17,708. Backward selection with an alpha level of removal of 0.2 was used. The following variables were removed from the model: Patient Age, Education, Year of Diagnosis, Primary Site, and Size of Tumor (cm).
Table 2. Median Length of Stay (LOS) By Operative Approach and Readmission Status

<table>
<thead>
<tr>
<th>Unplanned Readmission</th>
<th>Operative Approach</th>
<th>Median LOS</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (N = 18,871)</td>
<td>Open</td>
<td>7 days (n = 536)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No (N = 840)</td>
<td>VATS</td>
<td>6 days (n = 536)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

CONCLUSIONS: Patient income level, insurance status, geographic residence and facility type all significantly impact the risk of unplanned 30-day hospital readmission following lobectomy for early stage lung cancer. In addition to clinical and procedure-related variables, the current study suggests that such socioeconomic factors need to be considered. Awareness of these risk factors is important for preoperative planning and allocation of limited resources to help prevent hospital readmissions in this patient population. Such disparities need to be the focus of preoperative discharge planning and resource utilization to help prevent unplanned readmissions.
22. Are Homografts Superior to Prosthetic Valves in the Setting of Infective Endocarditis?  
Joon Bum Kim¹, Julius I. Ejiofor², Maroun Yammine², Janice M. Camuso¹, Conor W. Walsh³, Serguei I. Melnitchouk¹, James D. Rawn², Marzia Leacche², *Thomas E. MacGillivray¹, *Lawrence H. Cohn¹,  
*John G. Byrne², *Thoralf M. Sundt, III¹ 
¹Massachusetts General Hospital, Harvard Medical School, Boston, MA; ²Brigham and Women’s Hospital, Harvard Medical School, Boston, MA; ³Tufts University School of Medicine, Boston, MA  
DISCUSSANT: TARA B. KARAMLOU

BACKGROUND: Fundamental surgical principles suggest that human tissue valves (homografts) should be preferable over conventional stented xenograft or mechanical prostheses in the setting of infective endocarditis (IE) because of a theoretical advantage of resistance to reinfection via avoidance of the Dacron sewing cuff, particularly in the setting of prosthetic valve endocarditis. There are, however, limited comparative data available to support this notion.

METHODS: From the prospective databases of two tertiary academic centers, we identified 304 consecutive adult patients (≥18 years) undergoing surgery for active IE involving the aortic valve (AV) from 2002 through 2014.

RESULTS: Homografts, xenograft prostheses and mechanical prostheses were used in 86 (28.3%), 139 (45.7%) and in 79 patients (26.0%), respectively (Table). Patients receiving homografts more often had prosthetic valve endocarditis (58.1% vs. 28.8%, P = 0.002) and methicillin-resistant staphylococcus (25.6% vs. 12.1%, P = 0.002) compared with those receiving conventional prostheses; however, multi-valve involvement (12.8% vs. 26.0%, P < 0.001) and severe valve dysfunction (57.0% vs. 76.3%, P = 0.006) were more common in the latter group (Table). Conversely, among patients with prosthetic endocarditis, 55.0% had homografts placed. Early mortality rates were 19.8% (n = 17) in the homograft group and 9.2% (n = 20) in the conventional prostheses group (P = 0.011). The mortality rate among those with prosthetic valve endocarditis specifically was 22.0% for homograft and 19.7% for conventional prostheses (P = 0.76). During follow-up (5.6 ± 3.7 years), 62 patients (20.4%) died and 23 patients (7.7%) experienced reinfection. There were no significant differences in survival (P = 0.18) or freedom from reinfection rates (P = 0.38) according to the types of prostheses implanted (Figure). After adjustments for significant risk factors, the use of homograft did not significantly affect risks of early death (OR: 1.61; 95% CI [0.73–3.40]; P = 0.23), overall death (HR: 1.22; 95% CI [0.69–2.14]; P = 0.49) or

* WTSA Member
reinfection (HR: 0.98; 95% CI [0.44–2.18]; P = 0.96) among the total group or for those with prosthetic endocarditis (OR for early death = 1.88; 95% CI [0.69–5.24]; P = 0.22; HR for overall death = 1.24; 95% CI [0.59–2.61]; P = 0.57; HR for reinfection = 0.62; 95% CI [0.10–3.88]; P = 0.62).

Table. Baseline Profiles of Patients

<table>
<thead>
<tr>
<th></th>
<th>Homograft (n = 86)</th>
<th>Bioprostheses (n = 139)</th>
<th>Mechanical (n = 79)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, year</td>
<td>55.6 ± 16.6</td>
<td>59.8 ± 14.6</td>
<td>47.2 ± 14.5</td>
<td>0.001</td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>63 (73.3)</td>
<td>105 (75.5)</td>
<td>60 (75.9)</td>
<td>0.91</td>
</tr>
<tr>
<td>Preoperative embolic events, n (%)</td>
<td>26 (30.2)</td>
<td>47 (33.8)</td>
<td>15 (19.0)</td>
<td>0.065</td>
</tr>
<tr>
<td>Methicillin-resistant Staphylococcus, n (%)</td>
<td>22 (25.6)</td>
<td>16 (11.5)</td>
<td>10 (12.7)</td>
<td>0.002</td>
</tr>
<tr>
<td>Multiple valves affected, n (%)</td>
<td>14 (16.3)</td>
<td>29 (20.9)</td>
<td>33 (41.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prosthetic endocarditis, n (%)</td>
<td>50 (58.1)</td>
<td>30 (21.6)</td>
<td>31 (39.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Severe dysfunction of affected valves, n (%)</td>
<td>49 (57.0)</td>
<td>107 (77.0)</td>
<td>57 (72.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Left ventricular ejection fraction, %</td>
<td>57.8 ± 11.9</td>
<td>60.0 ± 11.6</td>
<td>60.1 ± 9.5</td>
<td>0.17</td>
</tr>
<tr>
<td>Emergency surgery, n (%)</td>
<td>86 (28.3)</td>
<td>139 (45.7)</td>
<td>18 (22.8)</td>
<td>0.91</td>
</tr>
</tbody>
</table>
CONCLUSION: No significant benefits of homograft over standard prosthetic valves were demonstrated in the setting of IE. Standard prosthetic valves may be preferable over homografts because of their ready availability and ease of implant unless technical considerations dictate homograft use.
11:10 am – 12:00 pm C. WALTON LILLEHEI POINT/COUNTERPOINT SESSION

MacDonald A-B
Supported by: White Memorial Medical Center and Foundation’s – Lyman A. Brewer, III, Fund and Thomas J. Fogarty

Is the Proliferation of Portable ECMO Devices Beneficial to Society?

Moderator: Michael S. Mulligan
Pro: Craig H. Selzman
Con: David M. McMullan

12:00 pm – 12:30 pm ANNUAL BUSINESS MEETING (Members Only), MacDonald A-B

12:30 pm – 2:00 pm FAMILY LUNCHEON, Woodlands Terrace

7:00 pm – 11:00 pm PRESIDENT’S RECESSION AND BANQUET, MacDonald A-C
(Black Tie Preferred)
CONSTITUTION AND BYLAWS

THE WESTERN THORACIC SURGICAL ASSOCIATION
Founded as The Samson Thoracic Surgical Society

CONSTITUTION

ARTICLE I. NAME
The name of this Corporation is The Western Thoracic Surgical Association (hereinafter “the Association”).

ARTICLE II. CORE VALUES
The core values of the Association shall be:

• Scientific Endeavor in a Collegial Environment;
• Education and Progress;
• The Development of Young Surgeons;
• Professionalism; and
• Family and Friendship.

ARTICLE III. PURPOSES
The purposes of the Association shall be:

To succeed to, and to continue to carry on, the activities formerly conducted by The Samson Thoracic Surgical Society, a corporation.

To associate persons residing in the western United States and Canada who desire to advance the quality and practice of thoracic and cardiovascular surgery as a specialty.

To encourage research and study of thoracic and cardiovascular functions and disorders so as to increase knowledge and improve treatment.

To hold scientific meetings for the presentation and discussion of topics of interest to thoracic and cardiovascular surgeons and to encourage publication to these proceedings.
ARTICLE IV. MEMBERSHIP

Section 1.
The membership of this Association shall consist of surgeons whose principal professional activities are devoted to the practice of thoracic and cardiovascular surgery, and who either fulfill the qualifications specified in Section 4 below or both fulfill the qualifications specified in Section 3 below and who are admitted to membership pursuant to the procedure specified in the By-Laws.

Section 2.
There shall be five types of membership: Active, Senior, Honorary, Charter, and Candidate, as defined in the By-Laws.

Section 3.
A candidate for active membership must:

a. Be a Diplomat of the American Board of Thoracic Surgery of the United States, a Fellow in the Cardiovascular and Thoracic Surgery in the Royal College of Surgeons of Canada, or possess such educational credentials as judged equivalent by the Council.

b. Reside within or have completed a cardiothoracic residency training program within the geographic limits of the Association, which are the states of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, and the provinces of Alberta, British Columbia, Manitoba, and Saskatchewan.

c. Have been engaged in the practice of thoracic and cardiovascular surgery either outside of or within the geographic limits of the Association for at least three years following completion of postgraduate training. One year of this three-years-in-practice requirement may be fulfilled by completion of either a thoracic surgical residency in an institution within the geographic limits of the Association or a one-year clinical fellowship in an institution within the geographic limits of the Association.

d. Have demonstrated interest in advancing the practice of thoracic and cardiovascular surgery through continuing professional contributions and scientific publications.

e. Have obtained the sponsorship of members of the Association as provided in the By-Laws.
Section 4.
All members in good standing of The Samson Thoracic Surgical Society in June, 1983 shall become members of the Association.

Section 5.
Charter members. Charter membership in the Association shall be accorded to those members who were charter members in good standing of The Samson Thoracic Surgical Society in June, 1983.

Section 6.
The privilege of continuing membership shall be subject to adherence to the provisions of the Constitution and By-Laws of the Association.

ARTICLE V. OFFICERS
Section 1.
The officers of the Association shall be a President, a Vice President, a Secretary, a Treasurer, an Editor, and an Historian.

Section 2.
The term of office of the President, Vice President, Secretary and Treasurer shall be one year. The President and Vice President shall not be eligible for re-election. The Secretary and Treasurer shall be eligible for re-election but may serve for no more than four (4) consecutive years. The term of Editor and Historian shall be defined in the By-Laws.

Section 3.
Neither the Secretary nor the Treasurer may serve concurrently as the President.

Section 4.
The Officers shall be elected at the Annual Meeting of the Association in accordance with the procedures set forth in the By-Laws.

ARTICLE VI. COUNCIL
Section 1.
The governing body of the Association shall be the Council and its composition shall be as provided in the By-Laws.
ARTICLE VII. MEETINGS

Section 1.
The Association shall hold Annual Business and regular Scientific Meetings, the time and place to be determined by the Council. Only members of the Association may attend the Business Meetings.

Section 2.
Special meetings of the Council or of the members may be called as provided in the By-Laws.

ARTICLE VIII. AMENDMENTS

Proposed amendments to the Constitution shall be submitted in writing to the members at least 30 days prior to a regular business meeting at which the proposed amendments shall be presented to the membership. Notice of such proposed amendments shall be mailed to each member at least thirty days prior to the next regular meeting at which the vote shall be taken. An affirmative vote of two-thirds of the members present is required to adopt an amendment to the Constitution.
ARTICLE I. APPLICATION FOR ACTIVE MEMBERSHIP

Section 1. Applicant.

a. An applicant for Active membership shall obtain a sponsor who is a member of the Association and who, attesting to the applicant’s professional competence and ethical behavior, shall obtain for him from the Chairman of the Membership Committee the application form and a list of the qualifications for Active membership.

b. An applicant for Active Membership shall (1) have a full and unrestricted license to practice medicine in his or her respective state or province, and (2) have a current appointment on the surgical staff of a hospital with no reportable action pending which could adversely affect such applicant’s staff privileges at any hospital.

c. Any applicant for Active Membership must possess ethical and moral fitness, as well as professional proficiency, as determined, in part, on the basis of reports from members consulted as references, reports from other references and other information.

Section 2. Candidate for Membership.

An applicant shall become a candidate for membership upon receipt by the Chairman of the Membership Committee of a properly executed application form and the written recommendation of three members, including his sponsor, attesting to his professional competence and ethical behavior. The names of all candidates shall be included in the notice of the regular meeting.

Section 3. Election to Membership.

Candidates recommended by the Membership Committee and approved by the Council shall be submitted to a vote at the Annual Business Meeting. Election to Active membership shall require an affirmative vote of the majority of members present.
Section 4. Notice of Election.
Every newly elected member shall be furnished by the Secretary with an official notice of election, accompanied by a copy of the Constitution and By-Laws. A Certificate of Membership signed by the President, the Secretary, and the Chairman of the Membership Committee bearing the Seal of the Association shall be presented to the newly elected members at the first session of the next regular meeting immediately following their election.

Section 5. Candidates Not Elected.
The Secretary shall notify the primary sponsor of candidates not recommended for election and separately notify the candidate.

Section 6. Re-application.
An unsuccessful candidate may reapply for membership by submitting a written request and obtaining new sponsor letters, which may be obtained from the same persons who previously submitted sponsor letters. Re-application shall not be permitted more than two times.

ARTICLE II. MEMBERS
Section 1. Active Members.

a. **Duties and Rights.** It shall be the duty of each Active member to attend regularly the meetings of the Association, to participate in the Scientific Programs, and to uphold the ideals and objectives of the Association. Each Active member shall be entitled to one vote and may hold any office in the Association.

b. **Dues.** All Active members shall pay dues. The amount of dues may be changed upon the recommendation of the Council and approval of the majority of the members present at the Annual Business Meeting. Dues shall be payable on April 16th of each year. Members may not attend a meeting unless their dues are current.

c. **Number of Members.** The number of Active members residing within the geographic limits of the Association shall be limited to two hundred and fifty (250).

d. **Moving Outside Geographic Limits.** Active members who move outside the geographic limits of the Association may maintain their status and shall not be limited in number. They shall be exempt from the Annual Meeting attendance requirement under Section 1(f) below.
e. **Delinquency.** The Treasurer shall submit to the Council a list of the members who have failed to pay their dues by March 31st of each year, and notice of such delinquency shall be mailed to each such member at the address recorded in the records of the Association. If the delinquency is not made good within three (3) months of the mailing of such notice, or excused for adequate cause by the Council, the membership of each delinquent member shall be subject to termination pursuant to Section 1(g) below.

f. **Nonattendance.** The membership of any member who fails to attend three (3) consecutive meetings of the Association, unless such nonattendance is excused by the Council for adequate cause, shall be subject to termination pursuant to Section 1(g) below.

g. **Termination Procedure.** Any member whose membership has become subject to termination for delinquency or nonattendance shall be given written notice of such prospective termination not less than forty (40) days before the effective date of the termination. Any member who is subject to termination may apply for reconsideration by filing a written request with the Council, addressed to the Secretary, within thirty (30) days following the mailing of notice of such termination, which request shall state the reasons why such membership should not be terminated. If such a request is received within the requisite period, termination will be delayed until after the next Council meeting. If the Council finds the reasons given in the request to be adequate, membership shall not be terminated, conditioned upon payment of any arrears, where applicable. If the Council finds the reasons given in the request not to be adequate, the termination shall become effective on the sixth day after the Council meeting.

h. **Disability.** A member who becomes disabled may petition the Council for senior membership status and the Council may grant such request for a period of time until the member can return to practice.

i. **Resignation.** A member may resign from the Association at any time by tendering a resignation in writing and paying in full any dues or obligations owing the Association at the time.
Section 2. Senior Members.
Senior membership shall be obtained by written request and Council approval for members retired from active practice at age 60 or shall be automatic at age 70 provided that continuing active membership without respect to age shall be granted on written request. Senior members shall have the same duties, rights and privileges as active members except that they shall be exempt from dues and meeting attendance requirements and shall not hold office, except the office of the Historian. Their numbers shall not be limited.

Section 3. Honorary Members.
Honorary membership shall be granted to persons deemed suitable by reason of special contributions in the field of thoracic and cardiovascular surgery or professional accomplishments. Such persons need not be certified thoracic surgeons. Persons deemed suitable as Honorary members may become such when proposed by two members, endorsed by the Membership Committee and the Council, and approved by a majority of the members present at the next meeting. Honorary members shall be exempt from dues and meeting attendance requirements and shall have no rights to vote or hold office except as provided below. The Editor of THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY shall be an honorary member of the Association and ex-officio member of the Council without vote.

Section 4. Candidate Members.
Candidate membership is available to:

- Residents who are matched or enrolled in either a cardiothoracic surgery education program accredited by the Residency Review Committee for Thoracic Surgery under the authority of the Accreditation Council for Graduate Medical Education or a program approved for cardiothoracic surgery education by the Royal College of Surgeons of Canada—or their equivalency—from the Association’s geographic limits as defined by the Constitution of the Association;
- individuals who have completed their education in one of the above programs and are in the process of acquiring certification in cardiothoracic surgery by either the American Board of Thoracic Surgery or the Royal College of Surgeons of Canada; and
- individuals who trained outside the Association’s geographic limits who are now residing within the Association’s boundaries but do not yet have three years in practice.
Candidate members shall have no rights to vote or hold office. Candidate membership shall end when the Candidate becomes eligible for Active membership, at which time s/he is invited to apply for Active membership.

Section 5. Conduct & Discipline.

a. **Conduct.** A member of the Association shall conduct his relationship with patients, fellow physicians, and the public at large in a manner consistent with the Principles of Medical Ethics of the Society of Thoracic Surgeons, and with the purposes of this Association.

b. **Discipline.** Upon the recommendation of the Ethics Committee, the Council may take disciplinary action against a member for conduct inconsistent with the provisions of this Section or with the purposes of the Association. Any question concerning the conduct or discipline of a member shall be directed to the Chairman of the Ethics Committee. In the event that the Ethics Committee determines that disciplinary action should be considered in a particular case, the Committee shall submit to the Council a written recommendation of the disciplinary action which the Committee proposes be taken. Such determination by the Ethics Committee shall be made only after the member has been given not less than thirty (30) days written notice of the date, time and place of the Committee’s meeting, and of the nature of the complaint regarding the conduct of the member or charges against the member which are considered by the Committee, and informing the member that he may appear in person and/or by a representative and may submit whatever information he deems proper to refute the charges under consideration.

In the event that the Ethics Committee recommends to the Council that disciplinary action be taken against a member, such member shall be given thirty (30) days written notice of the time and place of the Council meeting at which such recommendation is to be considered, and of his right to appear in person or by representative to submit whatever information he deems appropriate to refute the recommendation of the Committee. Disciplinary action may consist of censure, probation, suspension, or expulsion from membership, as deemed appropriate by a majority of the Council following hearing and consideration as set forth above. No such disciplinary action shall become effective less than five (5) days after the scheduled date of the Council meeting at which the member had the opportunity to refute the Committee’s recommendation.
ARTICLE III. OFFICERS
Section 1. Nomination and Election.
Candidates for election as Vice President, Secretary, Treasurer and Councilor-at-Large shall be placed in nomination by the Nominating Committee. Nominations for any of these offices may also be made from the floor. An affirmative vote by the majority of the members present at an Annual Meeting shall be required for election to office. The Vice President, Secretary and Treasurer shall be elected annually, and will hold office from the termination of the meeting at which elected until the termination of the next regular meeting when their successor will be elected. The Vice President shall become the President upon completion of his term as Vice President.

Section 2. Duties of the President.
The President shall be the chief executive officer of the Association and shall have general supervision over the business of the Association, subject to the control of the Council. He shall preside at all meetings and generally shall perform all duties incident to the office of President, together with such other duties as may from time to time be delegated to him by the Council.

Section 3. Duties of the Vice President.
The Vice President shall perform the duties of the President in the absence or inability to act of the President, and such other duties as set forth in these By-Laws or as may from time to time be delegated to him by the Council.

Section 4. Duties of the Secretary.
The Secretary shall certify and maintain the records of the Association, including a copy of the Constitution and By-Laws, together with any amendment thereto, and a record of the names, classifications, and addresses of the members. The Secretary shall keep minutes of the meetings of the Association, shall file all non-financial reports required by law and shall send all notices required by law, by these By-Laws, or by direction of the Council, and shall perform such other duties as may be assigned by the Council.

Section 5. Duties of the Treasurer.
The Treasurer shall receive and have charge of all funds of the Association, subject to the direction of the Council. He shall perform the usual duties incident to the office of the Treasurer, including the collection of dues, the payment of the Association’s bills and obligations as approved by the Council, and the preparation, submission to the Council and presentation to the members of an annual financial report, including any that may be required by statute, together
with such additional duties as may from time to time be assigned to him by the Council. The financial affairs and the financial statements of the Association shall be audited by an Audit Committee of members, or by an outside auditor as determined from year to year by the Council.

Section 6. Duties of the Editor.
The Editor of THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY shall be the Editor of the Association and shall be an ex-officio member without vote of the Program Committee and the Council. The Editor shall be appointed annually by the Council. The Editor shall serve as advisor to the Association on standards for editing and review for publication of manuscripts and proceedings of the Association.

Section 7. Duties of the Historian.
The Historian shall be the Parliamentarian and Historian of the Association and shall act as its public relations and press representative, and perform such other duties as may from time to time be delegated to him by the Council. The Historian shall be appointed annually by the Council.

Section 8. Duties of the Representative to the American College of Surgeons Board of Governors.
The representative to the Board of Governors of the American College of Surgeons shall represent the membership of the Association to the American College of Surgeons’ Board of Governors in accordance with the duties of a specialty society Governor. Such Governor shall be appointed by the American College of Surgeons from nominees submitted by the Council of the Association and shall serve on the Council as an ex-officio member without vote.

Section 9. Compensation of Officers.
No Officer of the Association shall receive any compensation for his services, but may be reimbursed for expenses when authorized by the Council.

ARTICLE IV. COUNCIL
Section 1. Composition of the Council.
The Council shall be composed of the President, Vice President, Secretary, Treasurer, Immediate Past President, (3) Councilors-at-Large, up to (2) Councilors/Founders and ex-officio, without vote, the Historian, Editor, and Representative to the Board of Governors of the American College of Surgeons.
Section 2. Councilors-at-Large.
One Councilor-at-Large may be elected at each Annual Business Meeting by majority vote and serve three years.

Section 3. Duties of the Council.
The Council shall exercise all corporate powers, excepting as otherwise provided in the By-Laws. The Council shall appoint the Historian and the Editor, and may in its discretion appoint an Assistant Secretary or Assistant Treasurer.

Section 4. Liability of Councilors.
A Councilor shall have no liability based upon any alleged failure to discharge his obligations as a Councilor, except for any self-dealing transaction prohibited by law.

Section 5. Compensation of the Council.
No Councilor shall receive any compensation for serving as a Councilor of the Association, but may be reimbursed for expenses when authorized by the Council.

Section 6. Council Meetings.

a. Regular and Special Meetings. The Council shall hold regular meetings just before the beginning of the Annual Meeting of members, and shall hold such additional meetings as shall be called from time to time by the President or by any two voting members of the Council.

b. Notice. Meetings of the Council shall be held upon four days’ notice by first class mail or 48 hours’ notice delivered personally by telephone or telegraph. Notice of regular meetings need not be given if the time and place of such meeting has been set previously by the Council. Notice of a meeting need not be given to any Councilor who signs a waiver of notice or a written consent to holding the meeting or an approval of the minutes thereof, whether before or after the meeting, who attends the meeting without protesting, prior thereto or at its commencement, the lack of such notice to such Councilor. All such waivers, consents and approvals shall be filed with the corporate records or made a part of the minutes of the meetings.

c. Quorum. The presence of five (5) voting members of the Council shall constitute a quorum for a Council meeting.
d. **Telephone Conference.** Council members may participate in a meeting through the use of a conference telephone or similar communications equipment, so long as all members participating in such meeting can hear one another. Participation in a meeting pursuant to this section constitutes presence in person at such meeting.

e. **Manner of Acting.** Every act or decision done or made by a majority of the Councilors present at a meeting duly held at which a quorum is present is an act of the Council. A meeting at which a quorum is initially present may continue to transact business, notwithstanding the withdrawal of Councilors, if any action taken is approved by at least a majority of the required quorum for such meeting.

f. **Adjournment.** A majority of the Councilors present, whether or not a quorum is present, may adjourn any meeting to another time and place. If the meeting is adjourned for more than 24 hours, notice of such adjournment shall be given prior to the time of the adjourned meeting to the Councilors who were not present at the time of the adjournment.

**ARTICLE V. EXECUTIVE DIRECTOR**
The Council may appoint an Executive Director, who shall be responsible for the operational management of the affairs of the Association, under the executive direction of the Officers in their respective areas of responsibility. The Executive Director shall be bonded in an amount sufficient to safeguard the financial assets of the Association.

**ARTICLE VI. COMMITTEES**
**Section 1. Standing Committees.**
The Standing Committees of the Association shall be:

a. **Membership.** The Membership Committee shall consist of a Chairman and five members, each to serve for a term of three years provided that the terms are initially arranged such that two members retire each year. The Committee shall formulate and recommend to the Council, rules governing the qualifications and procedure with respect to elections of new members and, when appropriate, a recommendation as to the numerical limitations upon each type of membership. The Committee shall consider all applications for membership and report their recommendations to the Council for review and for presentation to the meetings of the members.
b. **Program.** The Program Committee shall consist of a Chairman and five members, each to serve for a term of three years, provided that the terms are initially arranged so that two members retire each year. The President, Secretary, and Editor shall also serve as members ex-officio without vote. It shall be the responsibility of the Program Committee to make all arrangements necessary to provide scientific sessions of high quality. The Program Committee shall submit a budget of expenses for the program, and the names of persons to be invited as guest speakers, to the Council for approval before making any final commitments regarding the expenses and guest speakers. The Program Committee shall have the additional responsibility of the initial editorial review of all manuscripts presented at the regular meeting before they are submitted to the Editor.

c. **Local Arrangements.** The Local Arrangements Committee shall consist of a Chairman and as many members as are deemed appropriate by the Council. The Committee shall serve for a term of one year. The responsibility of the Committee shall be to make the general arrangements for the Annual Meeting and to submit a report and budget for such arrangements to the Council at least thirty days before such Annual Meeting.

d. **Nominating.** The Nominating Committee shall consist of the five most recent surviving Past Presidents of the Association. The most senior Past President shall serve as Chairman. The Committee shall prepare a slate of nominees to fill any vacancies among the Officers and Council which exist or will occur at the time of the Annual Meeting. The Committee shall submit its proposed slate to the Council before presentation to the members at the Annual Meeting.

e. **Ethics.** The Ethics Committee shall consist of the three most recent surviving Past Presidents of the Association. The most recent Past President shall serve as Chairman. The Committee shall consider questions of conduct of members and make recommendations to the Council pursuant to Article II, Section 4 of these By-Laws.

**Section 2. Appointment.**
Appointment to vacant chairmanships or memberships of each Standing Committee, except the Nominating and Ethics Committees, shall be made by the Vice President for the year during which he will be President. The Vice President shall make known to the Nominating Committee and the Council for review and
approval his selection of members for the Committee appointments. Vacancies on Committees occurring between regular meetings shall be filled by the President.

Section 3. Special Committees.
The Council from time to time may create such Special Committees and appoint the Chairman and members thereof as it deems appropriate for carrying out the purposes and activities of the Association.

ARTICLE VII. MEETINGS OF MEMBERS
Section 1. Special Meetings.
Special meetings of the members may be called by the President or by 5 percent or more of the members. Any special business meeting of the members called by the President to act on an amendment to the By-Laws shall be approved by the Council.

Section 2. Notice of Meetings.
Notice of each Annual or Special Meeting shall be given appropriately as determined by the President or by the Council to members of record at the close of business on the business day preceding the day on which notice is given, provided that such notice of the Annual Meeting or Special Meeting of the members shall be given to each member by the Secretary in writing at least thirty (30) and not more than ninety (90) days prior to the date thereof.

Section 3. Quorum.
No fewer than fifty (50) member shall constitute a quorum for the transaction of the business of the Association at any meeting. However, if fewer than one-third (1/3) of the members are present at the meeting, the only matters which may be voted upon are those matters as to which proper notice was given.

Section 4. Proposals to the Members.
Proposals concerning the operation or policies of the Association may be brought before meetings of the members upon majority vote of the Council or written request of a majority of the voting members delivered to the Secretary not less than thirty (30) days prior to such meeting. A decision reached at the meeting regarding such a proposal shall be a two-thirds (2/3) vote of the members, assuming a quorum, shall be binding on the Council and the Association.

Section 5. Proxies.
Attendance or voting at a meeting of members by proxy is prohibited and shall be invalid and of no effect.
Section 6. Reports and Papers.
All reports and papers read before the Association at the Annual Meeting shall be deposited with the Secretary at the time of their presentation.

ARTICLE VIII. GENERAL
Section 1. Operation of the Association.
The Association shall operate as set forth in its Articles of Incorporation, Constitution and By-Laws, and its funds, both income and principal, shall be used solely for the purposes therein set forth, no part of the same being available for the benefit of any member or other person, firm or society.

The Treasurer’s financial report referred to in Article III, Section 5, shall be considered the Annual Financial Report of the Association and the Council shall have no duty to cause any other financial report to be prepared. The financial report shall be distributed in writing to the members at the Annual Meeting or mailed to the members as the Council determines.

Section 3. Fiscal Year.
The fiscal year of the Association shall be from January 1 through December 31 of the next calendar year.

Section 4. Parliamentary Procedure.
The meetings of the members and Council, excepting as otherwise provided in the By-Laws shall be conducted pursuant to Sturgis Standard Code of Parliamentary Procedure, as set forth in the then current edition of said work.

Section 5. Reserve and Endowment Funds.
The Council may establish a reserve fund and from time to time direct that funds of the Association not required for current operations be transferred to such fund to provide long term financial stability to the Association and to be a means for accumulating funds for future projects. The reserve fund shall be deposited in an insured account or accounts in a savings bank and/or savings and loan association or invested in whole or in part in investments which legally may be made by trustees under the laws of the State of California. The Council may create a Reserve Fund Committee to make recommendations concerning the investment and deposit of the fund. The Council may in its discretion withdraw and use in the current operations of the Association the income of the fund, but withdrawals of principal shall be made only with the approval of the proposed withdrawal and use of the funds by a majority of the Council members present at a meeting.
The Council shall establish a Paul C. Samson Endowment Fund to perpetuate the educational activities of the Association and to underwrite in whole or in part the Paul C. Samson Resident Prize Award.

ARTICLE IX. ASSESSMENTS
If in the judgment of the Council special needs of the Association so require, it may propose an assessment of a specified amount to be charged to each member. Notice of such proposal shall be mailed to the members at least thirty (30) days in advance of the meeting at which the vote is to be taken, and shall be effective if approved by two-thirds (2/3) of the members present at such meeting.

ARTICLE X. GUESTS
Section 1. Guests of the Members.
Each member may invite one guest and accompanying person to meetings of the Association. Members shall notify the Secretary in advance of the names of their guests. The Council shall determine the charge to be made for guests and the expenses relating to the guests’ attendance shall be the responsibility of the member who has issued the invitation.

Section 2. Guests of the Program Committee.
The Program Committee may invite guests to participate in the scientific programs. Such guests shall be expected to bear the expenses related to their participation and attendance at meetings except as provided in Article X, Section 3.

The Council may invite guests to attend the meetings of the Association without charge when deemed appropriate and in the interest of carrying out the purposes of the Association.

Section 4. Participation of Guests.
Guests shall be expected to withdraw when the business of the Association is to be conducted, as an announcement by the President.
ARTICLE XI. INDEMNIFICATION
The Association shall indemnify any person, who is or was a Councilor, officer, employee or other agent of the Association, to the extent allowed by law, so long as such person acted in good faith, in a manner such person believed to be in the best interests of the Association and with such care, including reasonable inquiry, as an ordinary prudent person in a like position would use under similar circumstances.

ARTICLE XII. DISSOLUTION
Section 1. Voting.
The Association shall not be dissolved except by the affirmative vote of two-thirds (2/3) of the members entitled to vote.

Section 2. Conditions.
In the event of dissolution of the Association in any manner and for any cause, after the payment or adequate provision being made for payment of all of its debts, and liabilities, all of the remaining funds and assets of the Association shall be transferred to a nonprofit fund, foundation or corporation which is organized and operated exclusively for educational or scientific purposes related to the purpose of the Association, and which has established its tax exempt status under Section 501 (c) (3) of the Internal Revenue Code and Section 23701 (d) of the Revenue and Taxation Code of California, or equivalent statutes then in effect.

ARTICLE XIII. AMENDMENTS
Proposed amendments to these By-Laws shall be submitted in writing to the members at a business meeting called for that purpose immediately preceding the one at which the vote is taken. An affirmative vote of two-thirds (2/3) of the members present is required to adopt an amendment to the By-Laws.
GUIDELINES FOR EXPERT WITNESS TESTIMONY

The Western Thoracic Surgical Association joins with other specialty organizations in emphasizing the obligation of objectivity when its members respond to requests to serve as expert witnesses in the judicial system. The perceived need for a guideline outlining policies and standards for expert testimony was recognized by the Council following a report by the Association’s Ethics Committee of a complaint against a member. Within the legal system the definition of an “expert” is far less stringent than what the medical profession might acknowledge. In a trial the attorneys introduce the qualifications of their experts and their testimony generally embodies relevant facts, the expert’s knowledge and experience, and the expert’s best judgment. Attacks on the credibility of an expert witness are termed impeachments and tactics can be employed during cross-examination to question the expert’s qualifications. It is this issue that the Association wishes to specifically address, the qualifications of an expert. An expert witness should have current experience and ongoing knowledge about the areas of clinical medicine in which they are testifying as well as familiarity with practices during the time and place of the episode being considered as well as the circumstances surrounding the occurrence. The expert witness should be an impartial practicing physician. He or she must not become an advocate or a partisan in a legal proceeding. Truthfulness is essential and misrepresentation or exaggeration of facts or opinions in an attempt to establish an absolute right or wrong may be harmful both to the individual parties involved and to the profession as a whole. The expert’s views must not narrowly reflect applicable standards to the exclusion of the other acceptable choices. The ultimate test for accuracy and impartiality is a willingness to prepare testimony that could be presented unchanged for use by either the plaintiff or the defendant. The solicitation of physicians to serve as expert witnesses by plaintiff’s attorneys who offer large fees may result in highly biased and inaccurate testimony. The expert witness should possess excellent special knowledge but be cognizant of the limitations of his competence in his own special field, and recognize the possibility of multiple accepted avenues of therapy. The expert witness gives testimony that educates the court and the jury rather than obfuscates and distorts for personal gain.
IMPORTANT NOTICE: The previous member listing is proprietary information of the Western Thoracic Surgical Association (“WTSA”) and may not be distributed or duplicated, in whole or in part, for any purpose without the prior written consent of the WTSA. Use of the information for telemarketing or any other solicitation of any persons on this list is strictly prohibited.

**NECROLOGY**

Harry S. Dvorsky, MD, San Leandro, CA  
James P. Geiger, MD, San Rafael, CA  
R. Thomas McLaughlin, MD, Fullerton, CA  
J. Judson McNamara, MD, Honolulu, HI  
Clifford J. Straehley, MD, Golden, CO
PAST PRESIDENTS

David J. Dugan 1974–1977
John C. Callaghan 1984–1985
John E. Connolly 1977–1978
Paul A. Ebert 1981–1982
John R. Benfield 1989–1990
Norman E. Shumway 1978–1979
Robert W. Jamplis 1982–1983
Ivan A. May 1986–1987
Richard P. Anderson 1990–1991
Harold V. Liddle 1979–1980
Lucius D. Hill 1987–1988
ROSTER

David A. Fullerton  
2008–2009

J. Scott Millikan  
2009–2010

Robbin G. Cohen  
2010–2011

Robert C. Robbins  
2011–2012

John C. Chen  
2012–2013

Thomas A. Burdon  
2013–2014
In 1984, on the tenth anniversary of its founding, the Samson Thoracic Surgical Society changed its name to the Western Thoracic Surgical Association in order to better describe its scope and to gain professional recognition as the major surgical specialty organization it had become. Thereafter, the Council sought a means to perpetuate the name of Paul C. Samson, the patron and inspiration of the society during its early years. Mindful of Paul’s legendary warmth and generosity to young surgeons and his lifelong dedication to both graduate and postgraduate surgical education, it was decided to link his name with the activities of the Association that pertained to these interests and in 1985 the Samson Endowment Fund was created.

The Fund is managed as an endowment and the interest accruing to the principal is used exclusively for specific educational purposes. One such purpose is the funding of the Samson Resident Prize Essay which each year brings to the scientific program the best work of residents from thoracic surgical education programs throughout North America and from abroad.

The Samson Endowment Fund has reached its goal and has now been capped. A new, unrestricted Samson WTSA Fund has been opened, the purpose of which is to help the WTSA achieve its ongoing mission of: associating persons who desire to advance the quality and practice of thoracic and cardiovascular surgery as a specialty; encouraging research and study of thoracic and cardiovascular functions and disorders so as to increase knowledge and improve treatment; and holding scientific meetings for the presentation and discussion of topics of interest to thoracic and cardiovascular surgeons and to encourage publication to these proceedings. It is suggested that each member make a contribution of $500 to the Samson Endowment and WTSA Funds. This may be viewed as a lifetime obligation to be discharged in any manner over any time period the Member chooses. Previous contributions to the now capped Samson Endowment Fund are totaled with any new donations to the Samson WTSA Fund when calculating whether a member has fulfilled his/her suggested lifetime contribution of $500. Contribution is entirely voluntary and failure to contribute is not penalized or singled out in any way. A line item for optional contribution is included on the annual dues statement only as a reminder.
The David J. Dugan Distinguished Service Award of the Western Thoracic Surgical Association is presented to members of the Association in recognition of distinguished achievement and outstanding contributions to the field of thoracic surgery in the areas of science or leadership over a sustained period of time. Nominations for this award are made by the Nominating Committee and are presented to the Council for consideration & approval.

1994 George E. Miller, Jr
Pebble Beach, California

1997 Edward A. Smeloff
Sacramento, California

1999 Jack M. Matloff
Los Angeles, California

2002 Albert Starr
Portland, Oregon

2004 Leonard L. Bailey
Loma Linda, California

2005 Bruce A. Reitz
Stanford, California

2007 W. Gerald Rainer
Denver, Colorado

2009 Richard P. Anderson
Seattle, Washington

2010 John A. Hawkins
Salt Lake City, Utah
2013  Edward D. Verrier  
        Seattle, Washington

2014  Harold C. Urschel, Jr.  
        Dallas, Texas
The Donald B. Doty Educational Award is a $10,000 educational grant with a twofold purpose: 1) to foster innovative educational initiatives in cardiothoracic surgery by WTSA members, and 2) to provide an opportunity for the dissemination of this information to other training centers and academic institutions.

<table>
<thead>
<tr>
<th>Year</th>
<th>Recipient</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>LDS Hospital</td>
<td>Salt Lake City</td>
</tr>
<tr>
<td>2006</td>
<td>James I. Fann</td>
<td>Stanford, California</td>
</tr>
<tr>
<td>2008</td>
<td>John D. Mitchell</td>
<td>Aurora, Colorado</td>
</tr>
<tr>
<td>2009</td>
<td>Robbin G. Cohen</td>
<td>Los Angeles, California</td>
</tr>
<tr>
<td>2010</td>
<td>Michael S. Mulligan</td>
<td>Seattle, Washington</td>
</tr>
<tr>
<td>2011</td>
<td>Gordon A. Cohen</td>
<td>Seattle, Washington</td>
</tr>
<tr>
<td>2012</td>
<td>James I. Fann</td>
<td>Stanford, California</td>
</tr>
<tr>
<td>2013</td>
<td>Winfield J. Wells</td>
<td>Los Angeles, California</td>
</tr>
<tr>
<td>2014</td>
<td>Nahush A. Mokadam</td>
<td>Seattle, Washington</td>
</tr>
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PAST MEETING HIGHLIGHTS

1975 The Santa Barbara Biltmore Hotel, Santa Barbara, California
President David J. Dugan
    Oakland, California
Secretary Arthur N. Thomas
    San Francisco, California
Local Arrangements Chairman John F. Higginson
    Santa Barbara, California
Samson Resident Prize Essay Award William R. Brody
    Bethesda, Maryland

1976 The Banff Springs Hotel, Banff, Alberta, Canada
President David J. Dugan
    Oakland, California
Secretary Arthur N. Thomas
    San Francisco, California
Local Arrangements Chairman John C. Callaghan
    Edmonton, Alberta, Canada
Samson Resident Prize Essay Award Joe W. Ramsdell
    San Diego, California

1977 The Broadmoor Hotel, Colorado Springs, Colorado
President David J. Dugan
    Oakland, California
Secretary Arthur N. Thomas
    San Francisco, California
Local Arrangements Chairman Richard G. Sanderson
    Tucson, Arizona
Samson Resident Prize Essay Award J. Nilas Young
    Oakland, California

1978 Hotel Del Coronado, Coronado, California
President John E. Connolly
    Irvine, California
Secretary Arthur N. Thomas
    San Francisco, California
Local Arrangements Chairman Richard G. Fosburg
    San Diego, California
Samson Resident Prize Essay Award James M. Wilson
    San Francisco, California
# PAST MEETING HIGHLIGHTS

## 1979  
**Sun Valley Lodge, Sun Valley, Idaho**

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>City, State</th>
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<tbody>
<tr>
<td>President</td>
<td>Norman E. Shumway</td>
<td>Stanford, California</td>
</tr>
<tr>
<td>Secretary</td>
<td>Arthur N. Thomas</td>
<td>San Francisco, California</td>
</tr>
<tr>
<td>Local Arrangements Chairman</td>
<td>Harold V. Liddle</td>
<td>Salt Lake City, Utah</td>
</tr>
<tr>
<td>Samson Resident Prize Essay Award</td>
<td>Thomas H. Hoffmann</td>
<td>San Antonio, Texas</td>
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## 1980  
**Tamarron Lodge, Durango, Colorado**

<table>
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<th>Position</th>
<th>Name</th>
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<tbody>
<tr>
<td>President</td>
<td>Harold V. Liddle</td>
<td>Salt Lake City, Utah</td>
</tr>
<tr>
<td>Secretary</td>
<td>Arthur N. Thomas</td>
<td>San Francisco, California</td>
</tr>
<tr>
<td>Local Arrangements Chairman</td>
<td>W. Gerald Rainer</td>
<td>Denver, Colorado</td>
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<tr>
<td>Samson Resident Prize Essay Award</td>
<td>Robert H. Breyer</td>
<td>Chicago, Illinois</td>
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## 1981  
**Hyatt Regency Hotel, Maui, Hawaii**

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<th>Position</th>
<th>Name</th>
<th>City, State</th>
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<tbody>
<tr>
<td>President</td>
<td>Bertrand W. Meyer</td>
<td>Los Angeles, California</td>
</tr>
<tr>
<td>Secretary</td>
<td>Lucius D. Hill</td>
<td>Seattle, Washington</td>
</tr>
<tr>
<td>Local Arrangements Chairman</td>
<td>Quentin R. Stiles</td>
<td>Los Angeles, California</td>
</tr>
<tr>
<td>Samson Resident Prize Essay Award</td>
<td>Clifford M. Kitten</td>
<td>San Antonio, Texas</td>
</tr>
</tbody>
</table>

## 1982  
**Hotel del Coronado, Coronado, California**

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>City, State</th>
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<tbody>
<tr>
<td>President</td>
<td>Paul A. Ebert</td>
<td>San Francisco, California</td>
</tr>
<tr>
<td>Secretary</td>
<td>Lucius D. Hill</td>
<td>Seattle, Washington</td>
</tr>
<tr>
<td>Local Arrangements Chairman</td>
<td>Richard G. Fosburg</td>
<td>La Jolla, California</td>
</tr>
<tr>
<td>Samson Resident Prize Essay Award</td>
<td>Douglas A. Murphy</td>
<td>Atlanta, Georgia</td>
</tr>
</tbody>
</table>
PAST MEETING HIGHLIGHTS

1983 The Broadmoor, Colorado Springs, Colorado
President Robert W. Jamplis
Palo Alto, California
Secretary Lucius D. Hill
Seattle, Washington
Local Arrangements Co-Chairmen James B.D. Mark
Stanford, California
W. Gerald Rainer
Denver, Colorado
Samson Resident Prize Essay Award Michael L. Dewar
Montreal, Quebec, Canada

1984 Hyatt Regency Hotel, Maui, Hawaii
President Arthur N. Thomas
San Francisco, California
Secretary Lucius D. Hill
Seattle, Washington
Local Arrangements Chairman David J. Dugan
Oakland, California
Samson Resident Prize Essay Award Keith D. Dawkins
Stanford, California

1985 Hyatt Lake Tahoe, Incline Village, Nevada
President John C. Callaghan
Edmonton, Alberta, Canada
Secretary Lucius D. Hill
Seattle, Washington
Local Arrangements Chairman Edward A. Smeloff
Sacramento, California
Samson Resident Prize Essay Award George T. Christakis
Toronto, Ontario, Canada

1986 Silverado Country Club, Napa, California
President Richard M. Peters
San Diego, California
Secretary Richard G. Fosburg
Del Mar, California
Local Arrangements Chairman John R. Benfield
Duarte, California
Samson Resident Prize Essay Award David E. Hansen
Stanford, California
PAST MEETING HIGHLIGHTS

1987  **The Broadmoor, Colorado Springs, Colorado**
President   Ivan A. May  
**Oakland, California**
Secretary   Richard G. Fosburg  
**Del Mar, California**
Local Arrangements Chairman   Leigh I.G. Iverson  
**Oakland, California**
Samson Resident Prize Essay Award   Louis A. Brunsting  
**Durham, North Carolina**

1988  **Royal Waikoloa, Waikoloa, Hawaii**
President   Lucius D.Hill  
**Seattle, Washington**
Secretary   Richard G. Fosburg  
**Del Mar, California**
Local Arrangements Chairman   Richard P. Anderson  
**Seattle, Washington**
Samson Resident Prize Essay Award   George E. Sarris  
**Stanford, California**

1989  **Hyatt Regency Resort, Monterey, California**
President   Quentin R. Stiles  
**Los Angeles, California**
Secretary   Richard G. Fosburg  
**Del Mar, California**
Local Arrangements Co-Chairmen   Richard L. Murtland  
**Monterey, California**
Winfield J. Wells  
**Los Angeles, California**
Samson Resident Prize Essay Award   Michael A. Breda  
**Los Angeles, California**

1990  **Hotel Del Coronado, San Diego, California**
President   John R. Benfield  
**Sacramento, California**
Secretary   D. Craig Miller  
**Stanford, California**
Local Arrangements Chairman   Richard G. Fosburg  
**La Jolla, California**
Samson Resident Prize Essay Award   David Fullerton  
**Denver, Colorado**
### PAST MEETING HIGHLIGHTS

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>President</th>
<th>Secretary</th>
<th>Local Arrangements Chairman</th>
<th>Samson Resident Prize Essay Award</th>
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</thead>
<tbody>
<tr>
<td>1992</td>
<td>Hyatt Regency Hotel, Kauai, Hawaii</td>
<td>Richard G. Fosburg La Jolla, California</td>
<td>D. Craig Miller Stanford, California</td>
<td>Edward L. Hurley Sacramento, California Philip W. Wright Honolulu, Hawaii</td>
<td>Luis J. Castro Stanford, California</td>
</tr>
<tr>
<td>1994</td>
<td>Resort at Squaw Creek, Olympic Valley, California</td>
<td>Marvin Pomerantz Denver, Colorado</td>
<td>Kent W. Jones Salt Lake City, Utah</td>
<td>Daniel L. Smith Denver, Colorado</td>
<td>Barbara L. Robinson Rochester, Minnesota</td>
</tr>
</tbody>
</table>
PAST MEETING HIGHLIGHTS

1995  The Coeur d’Alene Resort, Coeur d’Alene, Idaho
President   D. Craig Miller  
            Stanford, California
Secretary   Kent W. Jones  
            Salt Lake City, Utah
Local Arrangements Chairman   Ronald P. Grunwald  
            Spokane, Washington
Samson Resident Prize Essay Award   Michael J. Moulton  
            St. Louis, Missouri

1996  The Grand Wailea Resort, Wailea, Maui, Hawaii
President   Richard G. Sanderson  
            Tucson, Arizona
Secretary   Kent W. Jones  
            Salt Lake City, Utah
Local Arrangements Chairman   Edward A. Smeloff  
            Sacramento, California
Samson Resident Prize Essay Award   Daniel S. Schwartz  
            New York, New York

1997  The Silverado Country Club & Resort, Napa, California
President   Daniel J. Ullyot  
            Burlingame, California
Secretary   Kent W. Jones  
            Salt Lake City, Utah
Local Arrangements Chairman   Michael K. Wood  
            Hillsborough, California
Samson Resident Prize Essay Award   Edward M. Boyle, Jr.  
            Seattle, Washington

1998  The Chateau Whistler Resort, Whistler, B.C., Canada
President   Winfield J. Wells  
            Los Angeles, California
Secretary   Vaughn A. Starnes  
            Los Angeles, California
Local Arrangements Co-Chair   W.R. Eric Jamieson  
            Vancouver, B.C., Canada
            Patricia A. Penkoske  
            Edmonton, Alberta, Canada
Samson Resident Prize Essay Award   Vivek Rao  
            Toronto, Ontario, Canada
PAST MEETING HIGHLIGHTS

1999  The Resort at Squaw Creek, Olympic Valley, California
President               Kent W. Jones
                        Salt Lake City, Utah
Secretary               Vaughn A. Starnes
                        Los Angeles, California
Local Arrangements Chairman J. Edward Okies
                        Portland, Oregon
Samson Resident Prize Essay Award Leonard Y. Lee
                        New York, New York

2000  The Orchid at Mauna Lani, The Big Island, Hawaii
President               Bradley J. Harlan
                        Sacramento, California
Secretary               Vaughn A. Starnes
                        Los Angeles, California
Local Arrangements Co-Chairs Paul B. Kelly and Linda M. Kelly
                        Fair Oaks, California
Samson Resident Prize Essay Award Murray H. Kown
                        Stanford, California

2001  Rancho Bernardo Inn, San Diego, California
President               David R. Clarke
                        Denver, Colorado
Secretary               Vaughn A. Starnes
                        Los Angeles, California
Local Arrangements Co-Chairs Myles S. Guber and Debbie Bishop
                        Denver, Colorado
Samson Resident Prize Essay Award Baiya Krishnasasan
                        Seattle, Washington

2002  Big Sky Resort, Big Sky, Montana
President               Donald B. Doty
                        Salt Lake City, Utah
Secretary               R. Scott Mitchell
                        Stanford, California
Local Arrangements Chairman John A. Hawkins
                        Salt Lake City, Utah
Samson Resident Prize Essay Award Susan D. Moffatt-Bruce
                        Stanford, California
PAST MEETING HIGHLIGHTS

2003  La Costa Resort, Carlsbad, California
President       Edward D. Verrier
                Seattle, Washington
Secretary       R. Scott Mitchell
                Stanford, California
Local Arrangements Chairman Douglas E. Wood
                Seattle, Washington
Samson Resident Prize Essay Award Albert J. Chong
                Seattle, Washington

2004  Wailea Marriott, Wailea, Maui, Hawaii
President       Vaughn A. Starnes
                Los Angeles, California
Secretary       R. Scott Mitchell
                Stanford, California
Local Arrangements Chairman Winfield J. Wells
                Los Angeles, California
Samson Resident Prize Essay Award Frederick A. Tibayan
                Stanford, California

2005  Fairmont Empress Hotel, Victoria, BC, Canada
President       Steven W. Guyton
                Seattle, Washington
Secretary       John A. Hawkins
                Salt Lake City, Utah
Local Arrangements Chairman W. R. Eric Jamieson
                Vancouver, BC, Canada
Samson Resident Prize Essay Award Matthew G. Whitten
                Salt Lake City, Utah
Donald B. Doty Award LDS Hospital
                Salt Lake City, Utah

2006  Sun Valley Resort, Sun Valley, Idaho
President       R. Scott Mitchell
                Stanford, California
Secretary       John A. Hawkins
                Salt Lake City, Utah
Local Arrangements Chairman Thomas A. Burdon
                Stanford, California
Samson Resident Prize Essay Award T. Brett Reece
                Charlottesville, VA
Donald B. Doty Award James I. Fann
                Stanford, California
Norman E. Shumway Award John A. Hawkins
                Salt Lake City, Utah
PAST MEETING HIGHLIGHTS

2007  Hyatt Regency Tamaya Resort & Spa, Santa Ana Pueblo, New Mexico
President  Elliot T. Gelfand
Edmonton, AB, Canada
Secretary  John A. Hawkins
Salt Lake City, Utah
Local Arrangements Chairman  Jorge A. Wernly
Albuquerque, New Mexico
Samson Resident Prize Essay Award  Jayan Nagendran
Edmonton, Canada
Donald B. Doty Award  Gordon A. Cohen
Seattle, Washington
Norman E. Shumway Award  Michael J. Weyant
Aurora, Colorado

2008  Sheraton Keauhou Bay Resort and Spa, Kona, Hawaii
President  Douglas E. Wood
Seattle, Washington
Secretary  John A. Hawkins
Salt Lake City, Utah
Local Arrangements Chairman  Michael S. Mulligan
Seattle, Washington
Samson Resident Prize Essay Award  John Keech
Seattle, Washington
Donald B. Doty Award  John D. Mitchell
Denver, Colorado
Norman E. Shumway Award  Joseph S. Carey
Torrance, California

2009  The Fairmont Banff Springs, Banff, Canada
President  David A. Fullerton
Aurora, Colorado
Secretary  Thomas A. Burdon
Palo Alto, California
Local Arrangements Chairman  Michael J. Weyant
Aurora, Colorado
Samson Resident Prize Essay Award  David C. Mauchley
Denver, Colorado
Donald B. Doty Award  Robbin G. Cohen
Los Angeles, California
Norman E. Shumway Award  Anthony D. Caffarelli
Stanford, California
PAST MEETING HIGHLIGHTS

2010  Ojai Valley Inn, Ojai, California
President  J. Scott Millikan  Billings, Montana
Secretary  Thomas A. Burdon  Palo Alto, California
Local Arrangements Co-Chairs  Dominic and Carolyn Tedesco  Ventura, California
Samson Resident Prize Essay Award  Phillip D. Smith  Aurora, Colorado
Donald B. Doty Award  Michael S. Mulligan  Seattle, Washington
Norman E. Shumway Award  Phillip D. Smith  Aurora, Colorado

2011  The Broadmoor, Colorado Springs, Colorado
President  Robbin G. Cohen  Los Angeles, California
Secretary  Thomas A. Burdon  Palo Alto, California
Local Arrangements Co-Chairs  David and Christine Fullerton  Aurora, Colorado
Samson Resident Prize Essay Award  Jessica A. Yu  Denver, Colorado
Donald B. Doty Award  Gordon A. Cohen  Seattle, Washington
Norman E. Shumway Award  Agustin E. Rubio  Seattle, Washington

2012  The Grand Wailea, Maui, Hawaii
President  Robert C. Robbins  Stanford, California
Secretary  Thomas A. Burdon  Stanford, California
Local Arrangements Co-Chairs  James and Andrea Fann  Stanford, California
Samson Resident Prize Essay Award  Ryan Kim  Saginaw, Michigan
Donald B. Doty Award  James I. Fann  Stanford, California
Norman E. Shumway Award  Sarah Geisbuesch  New York, New York
## PAST MEETING HIGHLIGHTS

### 2013  The Coeur d’Alene, Coeur d’Alene, Idaho

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
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<tr>
<td>President</td>
<td>John C. Chen</td>
<td>Honolulu, Hawaii</td>
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<td>Secretary</td>
<td>Patricia A. Thistlethwaite</td>
<td>La Jolla, California</td>
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<td>Local Arrangements Chair</td>
<td>Yong Shin</td>
<td>Clackamas, Oregon</td>
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<td>Samson Resident Prize Essay Award</td>
<td>Janet Edwards</td>
<td>Calgary, Alberta</td>
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<tr>
<td>Donald B. Doty Award</td>
<td>Winfield J. Wells</td>
<td>Los Angeles, California</td>
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<td>Norman E. Shumway Award</td>
<td>Ahmad Y. Sheikh</td>
<td>Stanford, California</td>
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### 2014  The St. Regis Monarch Beach, Dana Point, California

<table>
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<tr>
<td>President</td>
<td>Thomas A. Burdon</td>
<td>Stanford, California</td>
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<tr>
<td>Secretary</td>
<td>Patricia A. Thistlethwaite</td>
<td>La Jolla, California</td>
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<td>Local Arrangements Co-Chairs</td>
<td>Anthony and Jennifer Caffarelli</td>
<td>Newport Beach, California</td>
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<td>Jatin Anand</td>
<td>Houston, TX</td>
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<td>Donald B. Doty Award</td>
<td>Nahush A. Mokadam</td>
<td>Seattle, Washington</td>
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<td>Norman E. Shumway Award</td>
<td>Stephanie G. Worrell</td>
<td>Los Angeles, California</td>
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POSTGRADUATE COURSES AND SPEAKERS

1979
Management of the (Re-Do) Coronary Artery Patient
Edward B. Stinson, MD, Stanford, CA
The Infected Artificial Heart Valve
Edward J. Hurley, MD, Sacramento, CA
Changing Concepts in the Interpretation of Ventricular Filling Pressures
Gregory A. Misbach, MD, San Francisco, CA
Are Randomized Trials Possible for Devices or Surgical Procedures
Lawrence I. Bonchek, MD, Milwaukee, WI

1980
Preoperative Assessment of the Patient with Marginal Pulmonary Function
Richard M. Peters, MD, San Diego, CA
Airway Management
G. Hugh Lawrence, MD, Portland, OR
Postoperative Care of the Patient With Marginal Pulmonary Function
Alan Hilgenberg, MD, Denver, CO

1981
Historical Perspective
John C. Callaghan, MD, Edmonton, Alberta, Canada
Dyoxia of Cells
Eugene Robin, MD, Palo Alto, CA
Crystalloid Solution for Myocardial Protection
R. Leighton Fisk, MD, Phoenix, AZ
Blood Cardioplegia for Myocardial Protection
Gerald D. Buckberg, MD, Los Angeles, CA
Before and After – Myocardial Preservation
Shahbudin Rahimtoola, MD, Los Angeles, CA

1982
Current Diagnostics and Drug Therapy For Thoracic Infections
Arnold Weinberg, MD, Boston, MA
Surgical Therapy of Pleural Space Infections
G. Hugh Lawrence, MD, Portland, OR
Post-Operative Mediastinal Wound Infections
E.A. Rittenhouse, MD, Seattle, WA
Current Therapy of Esophageal Perforations
Arthur N. Thomas, MD, San Francisco, CA
POSTGRADUATE COURSES AND SPEAKERS

1983

The Thymus: Master Gland of the Immune System
Robert A. Good, MD, PhD, New York, NY

The Mediastinal Imaging Techniques
James B.D. Mark, MD, Stanford, CA

Surgical Approaches to the Mediastinum
Philip C. Jolly, MD, Seattle, WA

Surgical Oncology of Mediastinal Tumors
John R. Benfield, MD, Los Angeles, CA

1984

The Surgical Management of Aortic Dissection
Paul A. Ebert, MD, San Francisco, CA

Routine Use of the Internal Mammary Artery Conduit for Coronary Bypass:
Late Clinical and Angiographic Follow-Up Studies
U. Scott Page, MD, Portland, OR

Cardiac Trauma
F. William Blaisdell, MD, Sacramento, CA

Physiologic Principles of Coronary Blood Flow as Applied to the Cardiac
Surgical Patient
Julien J.E. Hoffman, MD, San Francisco, CA

1985

Cardiac Support Devices
J. Donald Hill, MD, San Francisco, CA

Cardiac Transplantation – Present Status and Future Prospects
Jack G. Copeland, III, MD, Tucson, AZ

Will the Real Cass Study Stand up?
Richard P. Anderson, MD, Seattle, WA

1986

Cell Membranes – Implications on Cancer Control
Jonathan Singer, MD, San Diego, CA

Pathophysiologic of Left Ventricular Dysfunction in a Surgical Perspective
Kirk Peterson, MD, San Diego, CA

1987

Anti-Platelet Therapy – Practical Clinical Strategies for Bypass Graft
Patients
Laurence A. Harker, MD, La Jolla, CA

Platelets, Vasospasm, and Aspirin – Thoughts on the Pathogenesis and
Prevention of Arteriosclerosis
Laurence A. Harker, MD, La Jolla, CA
POSTGRADUATE COURSES AND SPEAKERS

1988  Single Lung Transplantation
       F. Griffith Pearson, MD, Toronto, Ontario, Canada

1989  Challenges of the Heights: Limits For Survival
       Michael Wiedman, MD, Boston, MA

       The Western Thoracic Surgical Association Multi-Institutional Study of
       Results In Cardiac Surgery
       Forrest L. Junod, MD, Sacramento, CA
       Daniel J. Ullyot, MD, San Francisco, CA

1990  Cellular and Molecular Biology of Lung Cancer: Clinical Implications
       Martin F. McKneally, MD, Albany, NY
       John D. Minna, MD, Bethesda, MD

1991  Modern Statistical Analysis of Surgical Risks and Outcomes
       Gary L. Grunkemeier, PhD, Portland, OR
       Eugene Blackstone, MD, Birmingham, AL

1992  Growth Factors in the Injury Response: Developing Strategies To Promote
       (And Prevent) Cell Growth
       Andrew Baird, MD, PhD, La Jolla, CA
       Alain Carpentier, MD, Paris, France

1993  Doing Better, Feeling Worse
       Donald Kennedy, PhD, Stanford, CA

1994  Esophageal Carcinoma from Molecular Biology to Esophagectomy
       Mark Orringer, MD, Ann Arbor, MI
       David Beer, PhD, Ann Arbor, MI

1995  Molecular Genetics of the Marfan Syndrome and Related Connective
       Tissue Disorders
       Hal Dietz, MD, PhD, Baltimore, MD

       Practical Update on Biostatistics for Cardiothoracic Surgeons
       Gary Grunkemeier, PhD, Portland, OR

1996  Regulation of Intimal Thickening and Luminal Narrowing After Vascular
       Reconstruction: Molecular Mechanisms and Pharmacological Control
       Alexander W. Clowes, MD, Seattle, WA
POSTGRADUATE COURSES AND SPEAKERS

1997  What is Wrong with the Failing Heart  
      William W. Parmley, MD, San Francisco, CA

1998  The Surgical Treatment of End-Stage Heart Disease by Transplants and Mechanical Devices: Outcomes and Costs  
      Keith Reemtsma, MD, New York, New York

1999  The Surgical Profession at the Turn of the Century: Challenges and Opportunities  
      Samuel A. Wells, Jr., MD, Chicago, Illinois

2000  The Current Status of Therapy for Thoracic Aneurysms  
      Denton A. Cooley, MD, Houston, Texas

2001  Thinking Beyond the Third Dimension  
      Marc R. DeLeval, MD, FRCS, London, England

2002  Advances in Aortic Surgery  
      Nicholas T. Kouchoukos, MD, FACS, St. Louis, Missouri
      Advances in Congenital Heart Disease Surgery  
      Frank L. Hanley, MD, San Francisco, California
      Advances in Cardiac Valve Surgery  
      Robert Karp, MD, Snowmass, Colorado

2003  Cell Transplantation to Prevent Heart Failure  
      Richard D. Weisel, MD, Toronto, Ontario Canada

2004  Where, When and How it all Started  
      Norman E. Shumway, MD, Stanford California

2005  Progress Toward A Tissue Engineered Heart Valve  
      John E. Mayer, Jr., MD, Boston, MA

2006  Stem Cell Research  
      Irving Weissman, MD, Stanford, CA

2007  Frontiers in Disease Phenotyping: The Example of Organ Transplantation  
      Philip F. Halloran, MD, Edmonton, AB, Canada

2008  Allogeneic Stem Cell Transplantation for Malignant and Nonmalignant Hematologic Disorders  
      Rainer F. Storb, MD, Seattle, Washington
POSTGRADUATE COURSES AND SPEAKERS

2009  **Cardiac Surgery and Translational Research—A Critical Partnership in Critical Condition**  
      Francis G. Spinale, MD, Charleston, South Carolina

2010  **The Emerging Science of Healthcare Delivery**  
      Nicholas Wolter, MD, Billings, Montana

2011  **Why Would Anyone Want to Be on Your Surgical Team?**  
      Robert C. Myrtle, Los Angeles, California

2012  **Paging Dr. Moore, STAT**  
      Arnold Milstein, Stanford, California

2013  **Medical Miracles Cost Money**  
      Geoffrey Sewell, Honolulu, Hawaii

      **How to Be Successful in the Accountable Care Organization (ACO) Movement**  
      Francis J. Crosson, Alexandria, Virginia  
      J. Scott Millikan, Billings, Montana  
      Dominic J. Tedesco, Ventura, California

2014  **From Checklists to Culture: What Spacewalking Brings to Surgery**  
      David Williams, Toronto, Ontario
The Thoracic Surgery Foundation for Research and Education (TSFRE) was established in 1988 as a 501(c)(3) not-for-profit charitable organization. Representatives from the four leading thoracic surgery societies – the American Association for Thoracic Surgery (AATS), The Society of Thoracic Surgeons (STS), the Southern Thoracic Surgical Association (STSA), and the Western Thoracic Surgical Association (WTSA) serve on the TSFRE Board of Directors, and each organization provides financial support to TSFRE. The Foundation represents all of thoracic surgery in the United States and its research and educational initiatives support the broad spectrum of thoracic surgery.

The mission of TSFRE is to foster the development of surgeon scientists in cardiothoracic surgery; increasing knowledge and innovation to benefit patient care.

For over 25 years, TSFRE has supported over $11 million toward thoracic surgery research and education programs, and has supported over 250 Alley-Sheridan Scholarships.

Your donations to TSFRE have a direct impact on the future of cardiothoracic surgery and the welfare of our patients. Please consider making an annual donation to TSFRE via the following options:

- Donate in person at the TSFRE Booth #T20
- Donate online at http://tsfre.org/donation/
- Donate by mail: TSFRE, 633 North St. Clair Street, 23rd Floor, Chicago, IL 60611

To receive more information about giving opportunities or TSFRE Awards, please contact Priscilla S. Kennedy, TSFRE Executive Director, at (312) 202-5868, or by e-mail at pkennedy@tsfre.org.
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Robert S. D. Higgins, MD
Richard N. Pierson III, MD
Joseph F. Sabik III, MD

Thomas K. Waddell, MD, Chair, TSFRE Research Committee
Priscilla S. Kennedy, Executive Director
2015 TSFRE RESEARCH AND EDUCATION AWARD RECIPIENTS

TSFRE Research Grant: Operational support of original research efforts by cardiothoracic surgeons who have completed their formal training, and who are seeking initial support and recognition for their research program. Awards of up to $40,000 a year for up to two years are made each year to support the work of an early-career cardiothoracic surgeon (within five years of first faculty appointment).

Bryan A. Whitson, MD, PhD
The Ohio State University
“MG53 Mitigation of Ischemia-Reperfusion Injury in Lung Transplantation: Mechanisms Action in Ex-Vivo Lung Perfusion”

Bo Yang, MD, PhD
Regents of the University of Michigan
“Determining the Effect of TGFBR Mutations on Myocardin-Dependent Smooth Muscle Differentiation Using Human iPS Cells”

TSFRE Nina Starr Braunwald Research Fellowship: Support of up to $30,000 per year for up to two years for a woman resident working in a cardiac surgical clinic or laboratory research program who has not yet completed cardiothoracic surgical training.

Heidi J. Reich, MD
Cedars-Sinai Medical Center
“Repeat Dosing of Allogenic Cardiosphere-Derived Cells After Myocardial Infarction in immunocompetent Rats”

Hanghang Wang, MD
Duke University Medical Center
“Metabolomic and MicroRNA Signatures in Peripheral Blood of Patients with Thoracic Aortic Aneurysm”
Carolyn E. Reed Traveling Fellowship: Support of $10,000 per fellowship will allow a clinically established woman thoracic surgeon to travel to another institution for the purpose of learning a new skill or technology.

Jessica S. Donington, MD
New York University School of Medicine
“Our Robotic Thoracic Surgery at the University of Alabama at Birmingham”

Melanie A. Edwards, MD
Saint Louis University
“Our Robotic Thoracic Surgery at the University of Alabama at Birmingham”

TSFRE/Edwards Lifesciences Foundation Every Heartbeat Matters Award: Support of up to $37,500 for qualified surgeons who conduct charity work in underserved regions/populations. This award is designed to provide support for programs that educate, screen and/or treat underserved populations to reduce the global burden of heart valve disease, or to support other programs that advance health care and address underserved populations.

Ralph M. Bolman, III, MD
Brigham and Women’s Hospital
“Increasing Access to Reduce the Burdens of Rheumatic Heart Disease in Rwanda”

Emily A. Farkas, MD
Cardiostart International
“Establishing a Not-For-Profit Cardiac Surgical Program at Kathmandu University Dhulikhel Hospital”

Frederick L. Grover, MD
University of Colorado School of Medicine
“Enhancing Access to Care and Treatment of Cardiovascular Disease in Nepal”

V. Mohan Reddy, MD
Stanford University
“Building Capacity for Pediatric Heart Valve Disease in Southeast Asia”
J. Nilas Young, MD
University of California Davis Medical Center
“Educating Cardiac Surgeons and Cardiologists on: (1) The Prevalence of Valvular Heart Disease, (2) The Consequences for Underserved Populations, and (3) Appropriate Medical, Surgical, and Interventional Treatment Options throughout the Russian Federation”

2015 TSFRE EDUCATION AWARD RECIPIENTS

TSFRE Alley-Sheridan Scholarship: TSFRE offers up to 10 partial scholarships of $2,500 toward the cost to attend the Leadership Program in Health Policy and Management at the Heller School of Public Policy and Management at Brandeis University, and the Surgeons as Educators Course, hosted by the American College of Surgeons.

Zane Atkins, MD
University of California, Davis
Leadership Program in Health Policy and Management

Subhasis Chatterjee, MD
Affinity Heart Lung Vascular Institute, St. Elizabeth Hospital
Leadership Program in Health Policy and Management

John F.L. Lazar, MD
PinnacleHealth Cardiovascular Institute
Leadership Program in Health Policy and Management

Glen Jeffrey Pelletier, MD
Nemours Cardiac Center, A.I. DuPont Hospital for Children
Leadership Program in Health Policy and Management

Jane L. Schwabe, MD
Heartland Cardiothoracic Surgery
Leadership Program in Health Policy and Management

Betty C. Tong, MD
Duke University
Surgeons as Educators Course
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<tr>
<td>David Zurakowski</td>
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</tbody>
</table>
IS YOUR WTSA MEMBERSHIP INFORMATION CURRENT?

DO YOU HAVE:
A new email address for either work or home?
A new address or phone number?

Please let us know so that your WTSA records stay current, and that all important updates and news reaches you.

(Please Print)

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<tr>
<th>First Name</th>
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<th>Last Name</th>
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**OFFICE ADDRESS**

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**HOME ADDRESS**

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| Home Phone | Home Fax |

I prefer to receive my mailings at: **HOME**  **OFFICE**

During the Annual Meeting, you may leave the completed form with the WTSA Registration Desk. You may also fax this form to (978) 524-0498 or mail to:

Western Thoracic Surgical Association
500 Cummings Center, Suite 4550
Beverly, MA 01915
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 pm - 6:00 pm</td>
<td>Registration</td>
<td>MacDonald Foyer</td>
</tr>
<tr>
<td>1:00 pm - 6:00 pm</td>
<td>Speaker Ready Room</td>
<td>Tremblant</td>
</tr>
<tr>
<td>7:00 pm - 9:00 pm</td>
<td>New Members/Welcome Reception</td>
<td>Woodlands Terrace</td>
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**THURSDAY, June 25, 2015**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>6:00 am</td>
<td>Samson Fun Run</td>
<td>Start at Hotel Front Entrance</td>
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<tr>
<td>7:00 am - 12:30 pm</td>
<td>Registration</td>
<td>MacDonald Foyer</td>
</tr>
<tr>
<td>7:00 am - 12:30 pm</td>
<td>Speaker Ready Room</td>
<td>Tremblant</td>
</tr>
<tr>
<td>7:00 am - 12:00 pm</td>
<td>Exhibits</td>
<td>MacDonald C-F</td>
</tr>
<tr>
<td>7:00 am - 8:00 am</td>
<td>Breakfast</td>
<td>MacDonald C-F</td>
</tr>
<tr>
<td>8:00 am - 9:00 am</td>
<td>Scientific Session I</td>
<td>MacDonald A-B</td>
</tr>
<tr>
<td>9:00 am - 9:10 am</td>
<td>New Member &amp; Samson Prize Finalist Introductions</td>
<td>MacDonald A-B</td>
</tr>
<tr>
<td>9:10 am - 9:55 am</td>
<td>Presidential Address</td>
<td>MacDonald A-B</td>
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<tr>
<td>9:55 am - 10:20 am</td>
<td>Coffee Break: Visit Exhibits &amp; Posters</td>
<td>MacDonald C-F</td>
</tr>
<tr>
<td>10:20 am - 11:40 am</td>
<td>Scientific Session II</td>
<td>MacDonald A-B</td>
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<tr>
<td>11:40 am - 12:25 pm</td>
<td>Controversies Debate</td>
<td>MacDonald A-B</td>
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<tr>
<td>1:30 pm</td>
<td>ATV Wilderness Adventure*</td>
<td>Depart from Hotel Front Entrance</td>
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<tr>
<td>1:30 pm</td>
<td>Ziptrek Bear Tour*</td>
<td>Depart from Hotel Front Entrance</td>
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<tr>
<td>6:00 pm - 10:00 pm</td>
<td>Mountain Sports Street Party Theme Dinner</td>
<td>Portobello Alley</td>
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**FRIDAY, June 26, 2015**

<table>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>6:00 am - 12:00 pm</td>
<td>Registration</td>
<td>MacDonald Foyer</td>
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<tr>
<td>6:00 am - 12:00 pm</td>
<td>Speaker Ready Room</td>
<td>Tremblant</td>
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<tr>
<td>6:30 am - 7:50 am</td>
<td>Simultaneous Breakfast Sessions I &amp; II*</td>
<td>Empress B &amp; C</td>
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<tr>
<td></td>
<td>I. Lung Cancer Screening in the Past - Approval Era</td>
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<td>II. Prosthetic Valve Selection in the Era of Transcatheter Valves</td>
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<td>7:00 am - 12:00 pm</td>
<td>Exhibits</td>
<td>MacDonald C-F</td>
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<tr>
<td>7:00 am - 8:00 am</td>
<td>Breakfast</td>
<td>MacDonald C-F</td>
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<tr>
<td>8:00 am - 8:50 am</td>
<td>Postgraduate Course</td>
<td>MacDonald A-B</td>
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<td>8:50 am - 10:30 am</td>
<td>Scientific Session III</td>
<td>MacDonald A-B</td>
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<td>10:30 am - 11:00 am</td>
<td>Coffee Break: Visit Exhibits &amp; Posters</td>
<td>MacDonald C-F</td>
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<td>11:00 am - 12:00 pm</td>
<td>Scientific Session IV</td>
<td>MacDonald A-B</td>
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<tr>
<td>1:20 pm</td>
<td>Golf Tournament*</td>
<td>Golf Club</td>
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<tr>
<td>2:00 pm</td>
<td>Tennis Tournament*</td>
<td>Tennis Club</td>
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<td>Free Evening</td>
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**SATURDAY, June 27, 2015**

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<td>6:30 am - 10:30 am</td>
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<td>MacDonald C-F</td>
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<td>Breakfast</td>
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<td>7:00 am - 8:15 am</td>
<td>Concurrent Forums</td>
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<td></td>
<td>A) Adult Cardiac</td>
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<td>B) General Thoracic</td>
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<td>C) Congenital Heart Disease</td>
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<td>8:30 am - 9:50 am</td>
<td>Scientific Session V</td>
<td>MacDonald A-B</td>
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<td>9:50 am - 10:10 am</td>
<td>Coffee Break: Visit Exhibits &amp; Posters</td>
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<td>10:10 am - 11:10 am</td>
<td>Scientific Session VI</td>
<td>MacDonald A-B</td>
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<td>11:10 am - 12:00 pm</td>
<td>C. Walton Lillehei Point/Counterpoint Session</td>
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<td>12:00 pm - 12:30 pm</td>
<td>Annual Business Meeting (Members Only)</td>
<td>MacDonald A-B</td>
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<td>12:30 pm - 2:00 pm</td>
<td>Family Luncheon</td>
<td>Woodlands Terrace</td>
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<tr>
<td>7:00 pm - 11:00 pm</td>
<td>President’s Reception &amp; Banquet (Black Tie Preferred)</td>
<td>MacDonald A-C</td>
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*Separate Subscription Required*