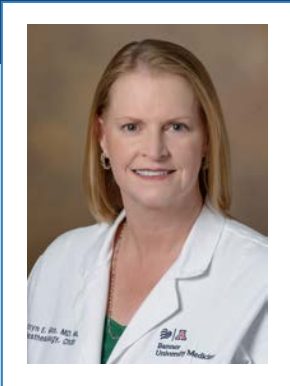




PRESIDENT'S MESSAGE



Kathryn E. Glas
MD, MBA, FASE

*President
Society of
Cardiovascular
Anesthesiologists*

**"Our updated
website includes
enhanced
content and
improved
functionality."**

All good things must come to an end **and be replaced with something way better!**

I am thrilled to announce the launch of our newly revamped website. This upgrade, with its focus on communication and user-friendliness, is set to impress. SCA partnered with Web to MD, a healthcare marketing and website design company, to help us achieve our goal. The result is a website that not only enhances functionality for our members, but also makes their experience more enjoyable and efficient, demonstrating our commitment to their needs and preferences.

Over the past five months, SCA members and staff, in collaboration with Web to MD, have dedicated significant energy and time to improving our website. This joint effort has led to the introduction of new design features, a modern look, and more resources. The website now offers a clean, uncluttered design, improved functionality, and enhanced content focused on research, education, current events, endowment, and membership.

Some exciting updates include the revamped Endowment page, which now makes it easier to donate, honor your mentor, plan giving, explore the Michael K. Calahan Legacy, research grants, the benefits of joining, renewing membership dues, meetings and events, education, and special interest groups. These are just a few areas that have been updated. We are committed to constantly updating our content with relevant information for our members.

I encourage everyone to visit and explore the site, and I look forward to hearing your feedback. Your input is invaluable in helping us continue to enhance the website for your benefit.

Best Regards,

Kathryn E. Glas MD

scahq.org

CHECK IT OUT!

Register for TAS 2024 Today!

April 26, 2024 – Toronto, Canada

Make plans to join us at the 12th Annual Thoracic Anesthesia Symposium and Workshops in Toronto, Canada, for an exchange of ideas, techniques, and the latest advances in the field of Thoracic Anesthesia!

The below workshops are available only in-person!
Please plan to join us Toronto, Canada for these exciting workshops!

Moderator: Amanda M. Kleiman, MD, UVA Health

Lung Isolation Workshop Caryl Bailey, MD, Medical College of Georgia; Ross Blank, MD, University of Michigan; Yasmin Maisonave, MD, Duke University Hospital; and Dionne Peacher, MD, University of Iowa

Thoracic Ultrasound: Diagnosis and Management Workshop Hyun Joo Ahn, MD, PhD, Samsung Medical Center, Sungkyunkwan University; Nazish K. Hashmi, MD, Duke University Hospital; Ingrid Moreno-Duarte, MD, UT Southwestern; and Elmari Neethling, MBChB, FCA, FRCPC, MMED, LMCC, University of Toronto

Regional Anesthesia Workshop Brett Elmore, MD, UVA Health; Jacob Jackson, MD, Memorial Sloan Kettering; and Luca La Colla, MD, MSHI, D.ABA, ABPM-CI, University of Pittsburgh Medical Center

Critical Procedure Workshop Andrea Corujo-Rodriguez, MD, Emory University; Paul Schipper, MD, FACS, FACCP, OHSU Healthcare



Join Us
at TAS
2024!

Problem Based Learning Discussions (PBLDs) Offered:

- **PBLD #1** Lung Transplantation in Kartagener's Syndrome - Mirror, Mirror, on the Wall
- **PBLD #2** Setting up a Regional Anesthetic Service for Thoracic Surgery
- **PBLD #3** Massive Hemoptysis in Interventional Pulmonology Suite
- **PBLD #4** It's Only a Simple Procedure – Segmentectomy in a Patient with Severe Pulmonary Hypertension and Right Ventricular Dysfunction
- **PBLD #5** Anesthetic Management for a Patient with an Anterior Mediastinal Mass – When Do You Need Backup?
- **PBLD #6** Challenges in Acute Pain Management: The Patient with Cancer Undergoing Minimally Invasive Esophageal Surgery

Thoracic Anesthesia Symposium & Workshops 2024



SESSION HIGHLIGHT

Panel 1: The Right Ventricle, Pulmonary Hypertension and Thoracic Surgery

Moderator: Archer Martin, MD

One Lung Ventilation and Hemodynamics

Julien Fessler, MD

Chronic Thromboembolic Pulmonary Hypertension – Options: Cath Lab to Pulmonary Endarterectomy

Amanda Kleiman, MD

Pulmonary Hypertension and Thoracic Surgery

Archer Martin, MD

[REGISTER NOW](#)

[VIEW AGENDA](#)

Don't Delay!
 Register
 Today!

Don't Miss the SCA 2024 Annual Meeting & Workshops in collaboration with AATS

Join your fellow members in Toronto, Canada for the latest cardiothoracic anesthesia information through fantastic plenary sessions, controversial panel discussions, pro-con debates, hands-on workshops, mentoring sessions, and problem-based learning sessions.

WORKSHOP HIGHLIGHT

Professional Development Workshop: Achieving Success in Cardiac Anesthesia: Skill-building Workshop for Professional Development and Career Advancement, and Leadership

Description: This unique, interactive workshop will integrate expertise from both the academic and business worlds to help SCA members navigate and succeed in both the academic and private practice landscape, with the goal of fostering future leaders. Specifically, attendees will work on skill development in networking, mentorship, negotiation, and presentation. Take-home lessons include how to perfect the "elevator pitch," cultivate healthy mentor and sponsor relationships, negotiate for time and compensation, and create and deliver an effective presentation.

PBLD HIGHLIGHT

PBLD 10 - VAD Emergencies

Christina Jelly, MD, Vanderbilt University Medical Center
 Jenny Kwak, MD, FASE, Loyola University Medical Center

SCA2024
 ANNUAL MEETING & WORKSHOPS



[REGISTER NOW](#)

[VIEW AGENDA](#)



REGISTER NOW

Register for the COR-PM Conference Today!

April 27-29, 2024 — Toronto, Canada

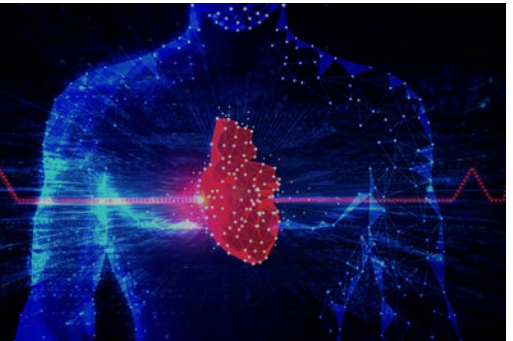
The Scientific Program Committee is thrilled to announce the third Cardiovascular Outcomes Research in Perioperative Medicine (COR-PM) conference will be held in person April 27-29, 2024, in conjunction with the SCA 46th Annual Meeting and Workshops in Toronto, Canada.

Session Highlight

How to Set-Up a Collaborative Multi-Disciplinary Clinical Trial

Moderator: Karsten Bartels, MD

- How to Set-up a Multi-disciplinary Clinical Trial from the Cardiac Anesthesiologist's Perspective — *Lisa Rong, MD*
- How to Set-up a Multi-disciplinary Clinical Trial from the Cardiothoracic Surgeon's Perspective — *Ibrahim Sultan, MD*
- Creating a Multidisciplinary, Multicenter, International Registry — *Gabriel Loor, MD*



Registration Is Now Open for the Virtual Echo Board Review Course — June 1-2

The Echo Board Exam Review Course is designed for Fellows who will be sitting the National Board of Echocardiography Advanced Perioperative Transesophageal Examination (Advanced PTEeXAM). A panel of experts will lead sessions designed to help prepare Echo Board candidates for the exam. **The Echo Board Review Course is scheduled for the following days:**

Saturday, June 1

10:00am – 5:30pm CST

Registration Fees

SCA Member Physician	\$400.00
Non-Member Physician	\$500.00
SCA Member Fellow/Resident	\$200.00
Non-Member Fellow/Resident	\$300.00

[Click Here](#) to View the Agenda

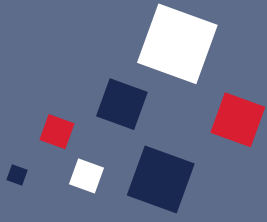
[Register Now](#) for the 2023 Echo Board Review

Sunday, June 2

10:00am – 6:30pm CST

ECHO BOARD REVIEW COURSE

VIRTUAL | JUNE 1-2, 2024



SCA 2024 ELECTION Results

SCA is pleased to announce the following individuals who have been elected to Society leadership positions:



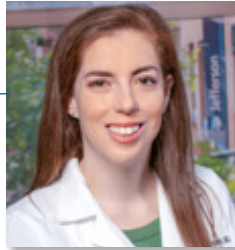
Director-at-Large

Abimbola (Bola) Faloye, MD, FASA, FASE
Emory University School of Medicine



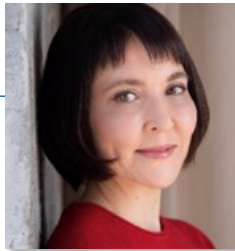
Director-at-Large

Alina Nicoara, MD, FASE
Duke University Medical Center



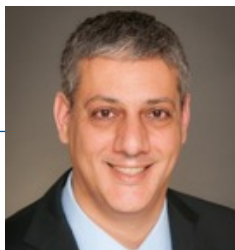
Early Career Director

Regina (Gina) Linganna, MD
University of Pennsylvania Health System



Early Career Director

Jessica Spence, MD, PhD
McMaster University



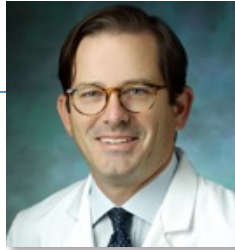
Continuing Medical Education (CME) Committee Member

Christos A. Koutentis, MB, ChB, MS
SUNY Downstate Medical Center



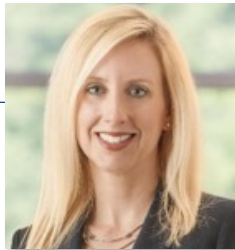
SCA's Outgoing Leaders – *Thank You for Your Service*

SCA would like to recognize the elected leaders whose terms of office have concluded. We greatly appreciate all their hard work towards improving our society, and we thank them for their involvement.



Board Director, 2021-2024

James (Jake) H. Abernathy III, MD, MPH, FAHA, FASE
Johns Hopkins University



Board Director, 2021-2024

Tara R. Brakke, MD, FASE
University of Nebraska Medical Center



Early Career Director, 2022-2024

Jessica Brodt, MBBS, FASA
Stanford University School of Medicine



Early Career Director, 2022-2024

Stephanie Ibekwe, MD, MPH, MS
Baylor College of Medicine



CME Committee, 2020-2024

Elvera L. Baron, MD, PhD
Louis Stokes Cleveland VA Medical Center

2025 SF Match Fellowship Match Program

In-order to provide more consistency and predictability to the ACTA fellowship application process, the ACTA programs participate in a common application and match process provided by SF Match for recruitment. The schedule for the 2025 training year is as follows:

November 6, 2023	Applicant Registration Began
March 6, 2024	Central Application Service Target / Deadline Date
June 5, 2024	Program Rank List Submission Deadline (12 PM PT)
June 5, 2024	Application Rank List Submission Deadline (12 PM PT)
June 19, 2024	Match Results
June 20, 2024	Post-Match Vacancies Posted
July 2025	Training Position Starts



Applicants and programs participate by registering with SF Match and applicants applying to the programs of their choice. Both programs and applicants submit a rank list based on their preferences. Notably, only programs where an applicant has interviewed can be ranked in the match.

Critical to the match process, programs and applicants can make an Exception Agreement prior to submitting their rank list to SF Match. Exception Agreements allow an applicant and program to agree to match each other prior to submitting their respective rank lists. Importantly, all ACTA positions must be included in the match, including all Exception Agreement positions.

Exceptions to the standard match process have been agreed upon by the ACTA Fellowship Program Directors Council in the following situations:

1. Applicants who are in active military service at the time of application.
2. Internal candidates, i.e., applicants who are currently in the anesthesiology residency program at the same institution as the ACTA fellowship.
3. Applicants who are making a commitment to come to the institution of the ACTA fellowship for more than one year.
4. Applicants who are enrolled in an anesthesiology residency outside of the USA at the time of application.
5. Applicants who reside outside the USA at the time of application or who are not eligible for ABA certification due to non-US training.
6. Applicants whose spouse or partner is applying for a GME-approved post graduate training program in a medical specialty in the same region as the ACTA fellowship.

Please Note: Eligible applicants and programs who wish to take advantage of an exception rule are still required to participate in the match ranking process and must complete an exception agreement found on the SCA website via the link below. This year exception agreements will be posted on the SCA website for transparency to programs and applicants. Any match irregularities will be referred to the ACTA Fellowship Program Directors Council of the SCA.

Program directors complete the first part of the match exception process. **To begin, [CLICK HERE](#).** Please note, you will need to log in with your SCA username and password. Once the program director completes this portion of the process, the applicant will receive an email with a link to the form they must complete. Any match irregularities will be referred to the ACTA Fellowship Program Directors Council of SCA.

For questions or assistance, please contact Mary Lunn at mary@veritasamc.com.



Check Out the Featured Courses!

Incredible Educational Content - View an ever-growing library of courses across an incredible range of topics from leading experts in cardiovascular anesthesiology!

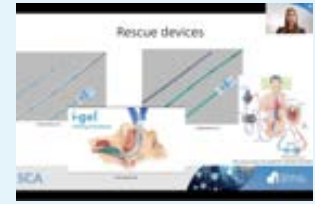
Earn CME Anywhere - Earn CME credit for all the courses you take with online quizzes and receive your certificate via email instantly!



SCA Clinical Update: Imaging for Mechanical Circulatory Support Devices—ECMO and Beyond

2.75 Credit Hours

[ACCESS COURSES](#)



SCA Clinical Update: Thoracic Anesthesia Essentials

2.25 Credit Hours

ERACS/ERATS Enhanced Recovery Survey for the SCA Membership

The ERACS and ERATS Sub-Committees of the Society of Cardiovascular Anesthesiologists are requesting your participation in a survey on your personal/institutional enhanced recovery practices for cardiac and thoracic surgery. Responses will be used to inform the SCA on the status of enhanced recovery in these two subspecialties, as well as identifying priorities for future clinical, educational, and research initiatives.

Participation is voluntary, and responses will be kept confidential. This online survey should take about 15-20 minutes to complete.

Please note, the survey has also been emailed to members of the American Society of Anesthesiologists. If you have already completed the survey, thank you for your help with our project and you do not need to complete it a second time.

Start the Survey

[CLICK HERE](#)

New Member Spotlight on the SCA Website

Agnieszka Trzcinka, MD

Tufts Medical Center

Director, Cardiovascular Center Procedural Anesthesia



Q Where is your current place of practice?

A I currently work at Tufts Medical Center in Boston.

Q What do you like most about being a member of the SCA?

A I am grateful for the opportunities through the SCA to further our amazing specialty. Working within the Scientific Program Committee has led to new conference content for our diverse membership. While collaborating with amazing colleagues within WICTA (Women in Cardiothoracic Anesthesia) special interest group, we created new webinar content designed specifically for our fellows to successfully navigate professional challenges within academic and private practice. Being part of the SCA offers tremendous opportunity for this productive collaboration.

Q What do you most look forward to at the SCA Annual Meetings?

A I feel inspired by colleagues and friends I meet during the SCA meetings. Our profession is very demanding of our time and energy. Drawing from experience and camaraderie of other SCA members inspires professional and personal development.

Q Name one member of the SCA who has been an impactful mentor to you and why.

A Dr. Stan Shernan has been a mentor since my training days at the Brigham and Women's Hospital. I continue to be inspired by his unwavering commitment to professional excellence while maintaining a perspective of gratitude for support of family and friends.

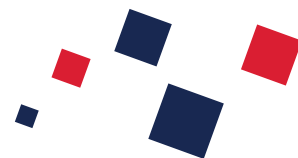
You can find the Member Spotlight by [Click Here](#)



AWEsome Woman Interview

Anne Cherry, MD, FASE

Associate Professor
Duke University



I am an Associate Professor in the Department of Anesthesiology at Duke University. I am a native Iowan, and studied physics at the University of Iowa, before coming to Duke for medical school. In our department, I serve as the Assistant Director of the Anesthesiology Clinical Research Unit and direct research mentorship for our ACTA fellows. I have worked in both basic and clinical research, investigating mitochondrial dysfunction after heart transplant (including mouse strain echocardiography), and evaluating the prognostic utility of echocardiographic RV dysfunction in STS adult cardiac surgical database patients (with a PUF award from the SCA), respectively.

1. What led you to become a Cardiovascular/Thoracic Anesthesiologist?

In medical school, my research mentor (Dr. Richard Moon) was an anesthesiologist. Although I knew next to nothing about anesthesiology at the time, our research involved placing PA catheters and arterial lines in subjects exercising underwater in a pool inside a (compressed) hyperbaric chamber. On days when we did not have research subjects, we did lung lavages for patients with pulmonary alveolar proteinosis in the hyperbaric chamber. Needless to say, I was completely hooked by the physiology I saw that year and really, there was never any other possible path after that experience.

2. How did you hear about the SCA?

I became a member as a fellow, and a mentor (Dr. Mark Stafford-Smith) suggested I apply to be on a committee for the following year.

3. What roles have you held for the society?

I was fortunate enough to be invited to join that committee (the Research Committee) just after fellowship (thank you, Mark!) and have been a member of that committee, the Kaplan Award Committee, and the SCA/STS Database Sub-Committee over the years. Last year, I became the chair of the Research Committee, and am now also involved in the Scientific Programming Committee and the Endowment Council.

4. What is one of your greatest achievements as a Cardiovascular/Thoracic Anesthesiologist?

Being a part of creating and awarding the Multi-Institutional Collaborative Clinical/Translational Research (MICoR) funding opportunity a few years ago was a highlight. There are so many difficult-to-answer questions in our field; doing something to really propel research forward was a great experience.

5. Do you have any advice for fellows and residents?

You can learn something from anyone you meet if you keep your eyes and mind open. It took me too long to learn this!

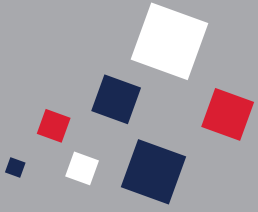
6. Have you experienced any difficulties as a woman in the field?

I have learned SO MUCH from hearing others' perspectives and experiences in this; first, I want to say that I KNOW my experience is not shared by many. I've always loved science, and in the small town where I grew up, I was often the only girl with these interests; but I don't remember anyone telling me that wasn't ok. In college, all the other physics majors were men (there were two other women astronomy majors). There were also very few other women in my first few committee meetings at the SCA. Fast-forwarding a bit, now I am blessed to work with a wonderful team of men and women at Duke. Not infrequently,

MEMBER CORNER



SOCIETY OF
CARDIOVASCULAR
ANESTHESIOLOGISTS
Knowledge • Care • Investigation



everyone in a given OR, and/or every anesthesiologist on the schedule, is a woman. All that said, I do not feel like my current nor prior experiences have been markedly difficult because I am a woman. Of course, it is possible that I am supremely unperceptive and have not been good about reflecting on my experiences. But as or more likely, I may not have had many difficult experiences because many excellent, strong women - and supportive men - have preceded me in all the places I have mentioned. I think those people (THANK YOU!) have buffered me from having many of those difficult experiences myself.

7. Do you have any advice for other women in the field?

- 1) When possible, outsource the things you do not enjoy, and make time (and do not apologize) for the things you do. This applies to work and personal life all the same.
- 2) If you are not clear (to others) about your goals, priorities, and values, other people will make assumptions about those things for you (often with best intentions, but still...). Have those deeper conversations whenever you can.

8. How do you balance work and personal life?

I try to recognize that those things are unlikely to be, and do not have to be, balanced at any given time. Then I am intentional about swaying the scale back and forth enough to average out.

9. What is something you enjoy doing outside of work?

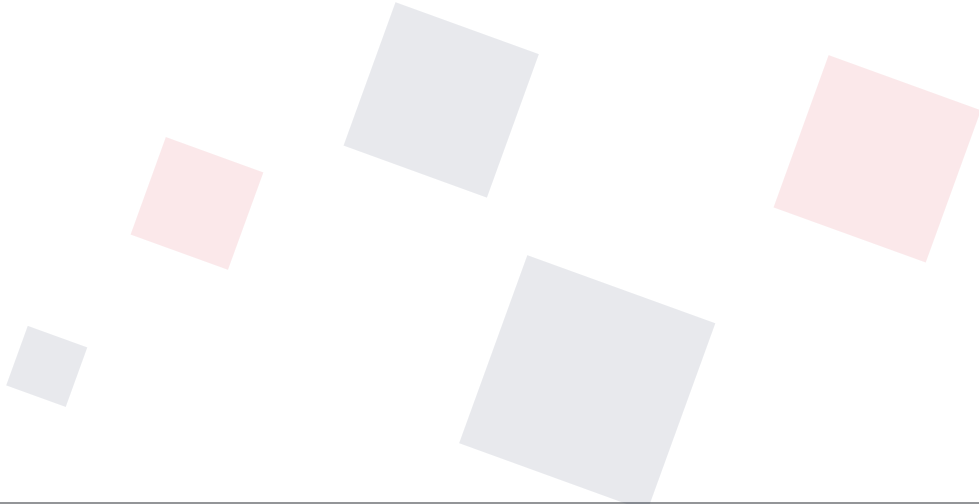
Anything self-propelled and outdoors. I run on the trails near our house several times a week; I also love to canoe/kayak and swim (I played water polo in college but finding an adult recreational team is a challenge, so lap swimming is the best I can do).

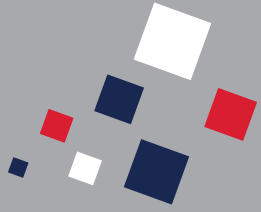
10. Would you change anything about the path you took to get to where you are now?

I think we all have things we wish we had spent less time on, like (seemingly) dead end projects, etc. But I learned a lot from those things too and they have all shaped who I am now. Since I am pretty happy with "now", it's hard to say that I'd really want to change anything about what led me to this point.

11. What was the best piece of advice you received?

Sometimes opportunities are disguised as hard work.





Get Involved

We have a New Look!

scahq.org

SCA is pleased to announce the launch of our newly redesigned website. We encourage everyone to visit and explore the site!

After many months of hard work and dedication, we are thrilled to offer our members a website that is easier to navigate and a more user-friendly experience.

The new design features a modern look, more resources, and information to help you discover what you are looking for quickly and efficiently.

We would like to thank our amazing staff at SCA and Veritas Association Management, who dedicated a lot of time and energy to making this site what it is, and our web partners, Web to Med, who have been fantastic partners for us.

We will constantly update our content with relevant information for our members. We encourage you to come back to check for the latest research, announcements, events, and articles.

We hope you enjoy the new website!

**SAVE
THE
DATE!**

WICTA Professional Development Meeting

**Navigating Organizational Politics:
Power, Political Savvy, and Why These Matter**

**Tuesday, May 28, 2024
7:00 pm EST/ 4:00 pm PST**

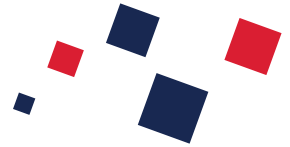
Moderators:

- Kiran Belani, MD, FASE, FACC - Northwestern
- Emily Methangkool, MD, MPH - Olive View - UCLA Medical Center
- Ragini G. Gupta, MD - Temple University

Speaker: Daryl Oakes, MD, Stanford University

The Importance of Identity in Perioperative Cardiovascular Medicine – An Opinion Piece

Trevor S. Sutton, MD, MBA, CPE; Mary E. Arthur, MD;
Bantayehu Sileshi, MD



The United States (US) Supreme Court decision in June 2023 on considering race in college admissions coupled with concerted efforts by high-profile individuals, political groups, and entities to halt continuation of diversity, equity, and inclusion (DEI) work have raised national debate and concerns regarding the future of DEI. This evolution in the US sociopolitical climate has forced colleges and universities, corporations, and academic societies to re-evaluate their approach to DEI initiatives and confirm sound legal footing while ensuring sustained delivery of the mission.¹⁻³

There is strong evidence that a diverse and representative healthcare workforce improves patient's access to care,⁴ their perceptions of the care they receive,⁵ and their health outcomes.⁶ Given the global burden of cardiovascular diseases, embracing diversity, equity, and inclusion in higher education is relevant to the future of cardiovascular medicine. Life-threatening and debilitating cardiovascular disorders reflect an interaction between an individual's metabolic profiles, environmental conditions, structural design of the healthcare system, bias, racism, and behavioral risk factors.^{7,8} To effectively address these cardiovascular disorders, mitigate rising costs in health care in the US, and attract the best and brightest healthcare professionals to pursue careers in cardiovascular medicine, cardiovascular specialists must embrace holistic approaches to research, professional development, patient care, and interdisciplinary collaboration.⁹ Moreover, leadership in medicine requires expertise in talent management as well as the vision and capabilities to address institutional accountability for the social mission of equity in access and quality improvement in health care.^{10,11} Competencies in DEI are critical in meeting these leadership and societal objectives as these skill sets are components of executive and administrative leadership in medicine, yet they are not structural requirements of the current learning environment for many medical school and post-graduate medical trainees.¹² Below we address concepts that may be important to consider while we continue to work collectively to ensure that appropriate DEI work is performed at our institutions and in society.

1. EQUALITY VERSUS EQUITY

Physicians embrace a fiduciary responsibility to promote optimum health care for patients.¹³ This consideration recognizes the distinction between equality and equity. Equality refers to treating everyone the same, regardless of their needs or circumstances. Equity, conversely, refers to ensuring everyone has access to the same level of care and resources, irrespective of their background or circumstances. Equity recognizes the need for distinct treatment and resources for different groups. This recognition, in part, reflects intentional examination of existing processes that determine access to resources and opportunities that may create disproportionate barriers for numerous and sizeable groups in society. DEI initiatives intentionally focus on continuous improvement in medicine with recognition of broad societal missions for healthcare delivery and the importance that all healthcare professionals' benefit from expanded collaborations, new insights, and novel platforms for scholarship.

Population groups at increased risk for reduced access to care and worse outcomes of treatment in cardiovascular medicine can be defined by socioeconomic level, medical insurance status, race and ethnicity, gender, health literacy, and English language proficiency.¹⁴⁻¹⁶ Research from well-designed studies in contemporary medical practice suggest that patient-physician concordance is associated with positive patient outcomes.⁶ The causes of persistent treatment and outcome disparities in cardiovascular medicine include but are not limited to, social determinants of health, structural racism (e.g., race coefficients), implicit bias, and lack of trust in the healthcare system.^{15,17}



Multi-disciplinary care coordination and clinical care pathways could address healthcare disparities in cardiovascular medicine.¹⁸ Implementation science, precision medicine, artificial intelligence, clinical decision support, and community-based participatory research are approaches to quality improvement and innovation in medicine that may shed light on ways to advance equity in cardiovascular medicine.¹⁹⁻²¹ These strategies rely on stratifying populations with demographic identifiers. The concept that “one size does not fit all” in cardiovascular medicine recognizes the limitations of treating everyone equally.²² Embracing quality improvement methodologies designed to promote equity, when achievable, in health care treatment and outcomes is critical to future advances in cardiovascular medicine.

2. INCLUSION VERSUS BELONGING

Inclusion is, indeed, not the same as diversity. Diversity requires inclusion and belonging. Inclusion alone can be achieved with invitations, solicitations, advertisements, or statements acknowledging an interest in recruiting all individuals. These efforts, alone, are not likely to advance diversity for the benefit of cardiovascular patients or for the benefit of physicians entering the cardiovascular medicine workforce. Conversely, belonging goes further by fostering a sense of acceptance, connection, and identity within the environment, whether at a hospital, teaching institution, or entity such as SCA. When appropriate efforts are implemented to foster belonging, individuals feel valued and respected. Inclusion without belonging can be associated with low fulfillment and intention to leave one’s career in medicine. Wellness and burnout are relevant to all physicians, and specialists in cardiovascular medicine may be at increased risk for professional challenges in these areas.²³ Minority physicians are commonly relied upon to support the recruitment or mentoring of other minority physicians. This can paradoxically impact perceptions of inclusion and belonging if this work is not recognized or credited for professional advancement (i.e., Minority Tax).²⁴

A recent study regarding perceptions of professionalism among academic faculty showed that women and other minority groups perceived tension between inclusion and assimilation.²⁵ Acceptance and belonging might address tensions between inclusion and assimilation.

The fulcrum for promoting diversity in cardiovascular medicine has been holistic application review and admission to training programs. Program directors in specialties in cardiovascular medicine acknowledge that “fit” is the leading criterion for ranking candidates, and a small, qualified applicant pool is frequently cited as an important barrier to diversity recruitment.²⁶ Holistic application review addresses inclusion but does not address the prospective applicant’s perception of belonging in cardiovascular medicine. A focus on creating an environment of belonging in training programs, medical societies, and departments in the specialties of cardiovascular medicine may be an important approach for promoting inclusion, belonging, and diversity in cardiovascular medicine.

3. MERIT, SELECTION, AND FUTURE POTENTIAL

The concept of holistic application review is to search for the best candidate while accounting for hurdles and challenges that all applicants overcome and to consider the institutional social mission and needs of the professional community. We support this approach when considering candidates for training in cardiovascular medicine. Grades, board scores, references, and institutional background are extremely important for discerning entry into any profession. Yet, these criteria are neither completely objective nor are they predictive of who will have a positive impact on patients, society, or professions within cardiovascular medicine.²⁷

Studies have demonstrated that underrepresented racial and ethnic minorities in medicine are more likely to be interested in providing care to medically underserved communities.²⁸ Studies of primary care physicians have shown that physicians from racial and ethnic groups underrepresented in medicine are more likely to have practices where a significant percentage of their patients are racial and ethnic minorities.⁴ There is evidence that physician identity may be associated with patient care expertise²⁹ and may also be associated with physician interest in serving underserved communities.^{5,28} Embracing the concept of ensuring equitable cardiovascular care means we must do the hard but important work of recruiting, mentoring,



and sponsoring candidates from underrepresented racial, ethnic, and gender minorities who will play an integral role in helping to achieve this goal.

4. INCREMENTALISM AND A COLOR-BLIND APPROACH

Examination of the impact of identity in cardiovascular medicine is not equivalent to defining individuals by demographic identifiers. Identity is complex and multi-faceted due to identity intersectionality and the evolution of people's lived experiences.³⁰ The role of identity in influencing patient-physician interactions and influencing cardiovascular medicine physicians' career development are important areas of study.^{31,32}

Bias, prejudice, and racism reflect human attitudes and beliefs. These attitudes and beliefs are perceived by individuals even in environments where these subjects are not openly discussed, and failure to address these concerns with opportunities for shared clarification and understanding may exacerbate feelings of tension and non-belonging.³³

Prejudice and racism are uncomfortable subjects for many. Subconscious bias is likely more relevant to daily decision-making and interpersonal experiences in medicine than explicit bias or prejudice. Subconscious bias, prejudice, and racism may exist on a continuum that is influenced by individual experiences as well as by stress. Understanding how to mitigate stress and recognize subconscious biases are important opportunities in medicine and for healthcare leaders.³⁴⁻³⁶

5. DOING GOOD

It has been suggested that the best metric for advancing the future of cardiac surgery is "doing good."³⁷ Technical proficiency, compassion, empathy, advocacy, mentoring, sponsorship, reliability, accountability, honesty, collaborative leadership, impactful discovery, and visionary innovation are ways that cardiovascular physicians can do good. The signs of doing good may exist early in one's career, but the opportunities to do good exist throughout one's career. In addition to selecting individuals who have done good by any measure, we hope to encourage and develop physicians whom we can support and influence to do good in cardiovascular medicine through heightened awareness of and engagement in addressing the needs of all communities, particularly those that have a high burden of cardiovascular diseases.

A PATH FORWARD

Embracing identity is important to the future of cardiovascular medicine. There are barriers to recruiting women and underrepresented minorities to pursue careers in cardiovascular medicine (cardiac anesthesiology, cardiac surgery, cardiology, and vascular surgery) and be selected for leadership positions in these specialties.^{26,38-40} Aptitude, talent, and desire are not the solutions to these barriers. Pipeline development has been a component of recent strategies to increase diversity in cardiovascular medicine.⁴¹ The 2023 court decision regarding affirmative action should not undermine continued efforts in pipeline development. However, additional strategies should be pursued to address structural barriers for recruitment and promotion as well as pipeline attrition.

Population health and mitigation of health care disparities is an important mission in all specialties of medicine, including cardiovascular medicine.^{42,43} The development of more structured scholarship in systems-based practice in cardiovascular medicine training programs and potential multi-disciplinary collaboration in education, patient care, and research focused on population health may be an important approach for attracting and retaining a diverse and qualified pool of future leaders in cardiovascular medicine.

Barriers to systems-based practice in medicine include the perception of lack of time and relevance. Priorities are more likely to be placed on developing technical skills during post-graduate training.¹² The expertise to support trainee exposure to population health may not exist or it may be nascent in development within many departments with training programs in cardiovascular medicine. This may be a call to action for specialties such as cardiac anesthesiology, cardiology, cardiac surgery, and vascular surgery to collaborate in education and research with a focus on holistic approaches to clinical care coordination, quality improvement, and leadership development in cardiovascular medicine.



References

- 1 Yancy CW, Barabino G, Bright C, Laurencin CT, Rice M. The Supreme Court and the Importance of Diversity in Medicine. *NEJM* 2023; 389(8): 677-679. DOI: 10.1056/NEJMp2306195
- 2 Saha S. After Affirmative Action - Working toward Equitable Representation in Medicine. *NEJM* 2023; 389(19): 1817-1821. DOI: 10.1056/NEJMms2308319
- 3 Venkataramani AS. Affirmative Action, Population Health, and the Importance of Opportunity and Hope. *NEJM* 2023;389 (13):1157-1159. DOI: 10.1056/NEJMp2307766
- 4 Komaromy M, Grumbach K, Drake M, Vranizan K, Lurie N, Keane D, Bindman AB. The role of black and Hispanic physicians in providing health care for underserved populations. *N Engl J Med*. 1996 May 16;334(20):1305-10. doi: 10.1056/NEJM199605163342006. PMID: 8609949.
- 5 Saha S, Shipman SA. The rationale for diversity in the health professions: A review of the evidence. 2007 <https://api.semanticscholar.org/CorpusID:6205009>
- 6 Greenwood BN, Carnahan S, Huang L. Patient-physician gender concordance and increased mortality among female heart attack patients. *Proc Natl Acad Sci U S A*. 2018 Aug 21;115(34):8569-8574. doi: 10.1073/pnas.1800097115. Epub 2018 Aug 6. PMID: 30082406; PMCID: PMC6112736.
- 7 Mensah GA, Fuster V, Murray CJL, Roth GA on behalf of the Global Burden of Cardiovascular Diseases and Risks Collaborators *J Am Coll Cardiol*. 2023 Dec, 82 (25) 2350-2473.
- 8 Vervoort, D, Lee, G, Lin, Y. et al. 6 Billion People Have No Access to Safe, Timely, and Affordable Cardiac Surgical Care. *JACC Adv*. 2022 Aug, 1 (3). <https://doi.org/10.1016/j.jacadv.2022.100061>
- 9 LaVeist TA, Pérez-Stable EJ, Richard P, Anderson A, Isaac LA, Santiago R, et al. The Economic Burden of Racial, Ethnic, and Educational Health Inequities in the US. *JAMA* 2023; 329(19): 1682-1692. doi: 10.1001/jama.2023.5965. Erratum in: *JAMA*. 2023 Jun 6;329(21):1886. PMID: 37191700.
- 10 Shanafelt TD, Noseworthy JH. Executive leadership and physician well-being. Nine organizational strategies to promote engagement and reduce burnout. *Mayo Clinic Proc* 2017; 92: 129-46.
- 11 Wyatt R, Tucker L, Mate K, Cerise F, Fernandez A, Jain S, Bau I, Wolfson D. A matter of trust: Commitment to act for health equity. *Healthc (Amst)*. 2023 Mar;11(1):100675. doi: 10.1016/j.hjdsi.2023.100675. Epub 2023 Jan 22. PMID: 36693301.
- 12 Bhate TD, Sukhera J, Litwin S, Chan TM, Wong BM, Smeraglio A. Systems-Based Practice in Graduate Medical Education: Evolving Toward an Ideal Future State. *Acad Med*. 2024 Apr 1;99(4):357-362. doi: 10.1097/ACM.0000000000005612. Epub 2023 Dec 19. PMID: 38113412.
- 13 Marcotte LM, Moriates C, Wolfson DB, Frankel RM. Professionalism as the Bedrock of High-Value Care. *Acad Med*. 2020 Jun;95(6):864-867. doi: 10.1097/ACM.0000000000002858. PMID: 31274519.
- 14 Schultz WM, Kelli HM, Lisko JC, Varghese T, Shen J, Sandesara P, et al. Socioeconomic Status and Cardiovascular Outcomes: Challenges and Interventions. *Circulation*. 2018 May 15;137(20):2166-2178. doi: 10.1161/CIRCULATIONAHA.117.029652. PMID: 29760227; PMCID: PMC5958918.
- 15 Milam, A, Ogunniyi, M, Faloye, A. et al. Racial and Ethnic Disparities in Perioperative Health Care Among Patients Undergoing Cardiac Surgery: JACC State-of-the-Art Review. *J Am Coll Cardiol*. 2024 Jan, 83 (4) 530-545. <https://doi.org/10.1016/j.jacc.2023.11.015>
- 16 Wu JR, Moser DK, DeWalt DA, Rayens MK, Dracup K. Health literacy mediates the relationship between age and health outcomes in patients with heart failure. *Circ Heart Fail*. 2016;9:e002250.
- 17 Vyas DA, Eisenstein LG, Jones DS. Hidden in Plain Sight - Reconsidering the Use of Race Correction in Clinical Algorithms. *N Engl J Med*. 2020 Aug 27;383(9):874-882. doi: 10.1056/NEJMms2004740. Epub 2020 Jun 17. PMID: 32853499.



DEI COMMITTEE

- 18 Sutton TS, McKay RG, Mather J, Takata E, Eschert J, Cox M, et al. Enhanced Recovery After Surgery Is Associated with Improved Outcomes and Reduced Racial and Ethnic Disparities After Isolated Coronary Artery Bypass Surgery: A Retrospective Analysis with Propensity-Score Matching. *JCVA* 2022;36(8 Pt A):2418-2431. doi: 10.1053/j.jvca.2022.02.027. Epub 2022 Feb 25. PMID: 35397958.
- 19 Lane-Fall MB. What Anesthesiology Has to Learn from Implementation Science and Quality Improvement. *Anesthesiology*. 2022 Jun 1;136(6):875-876. doi:10.1097/ALN.0000000000004206. PMID: 35405007.
- 20 Nirvik P, Kertai MD. Future of Perioperative Precision Medicine: Integration of Molecular Science, Dynamic Health Care Informatics, and Implementation of Predictive Pathways in Real Time. *Anesthesia & Analgesia* 134(5): 900-908, May 2022. DOI: 10.1213/ANE.0000000000005966.
- 21 Haynes N, Kaur A, Swain J, Joseph JJ, Brewer LC. Community-Based Participatory Research to Improve Cardiovascular Health Among US Racial and Ethnic Minority Groups. *Curr Epidemiol Rep*. 2022;9(3):212-221. doi: 10.1007/s40471-022-00298-5. Epub 2022 Jul 11. PMID: 36003088; PMCID: PMC9392701.
- 22 <https://www.acc.org/latest-in-cardiology/articles/2018/10/14/12/42/cover-story-one-size-does-not-fit-all-sex-gender-race-and-ethnicity-in-cardiovascular-medicine> - accessed April 1, 2024.
- 23 Ligibel JA, Goularte N, Berliner JI, Bird SB, Brazeau CMLR, Rowe SG, Stewart MT, Trockel MT. Well-Being Parameters and Intention to Leave Current Institution Among Academic Physicians. *JAMA Netw Open*. 2023 Dec 1;6(12): e2347894. doi: 10.1001/jamanetworkopen.2023.47894. PMID: 38100103; PMCID: PMC10724765.
- 24 Rodríguez, J.E., Campbell, K.M. & Pololi, L.H. Addressing disparities in academic medicine: what of the minority tax? *BMC Med Educ* 15, 6 (2015). <https://doi.org/10.1186/s12909-015-0290-9>.
- 25 Alexis DA, Kearney MD, Williams JC, Xu C, Higginbotham EJ, Aysola J. Assessment of Perceptions of Professionalism Among Faculty, Trainees, Staff, and Students in a Large University-Based Health System. *JAMA Netw Open*. 2020 Nov 2;3(11): e2021452. doi: 10.1001/jamanetworkopen.2020.21452. PMID: 33226428; PMCID: PMC7684446.
- 26 Crowley AL, Damp J, Sulistio MS, Berlacher K, Polk DM, Hong RA, et al. Perceptions on Diversity in Cardiology: A Survey of Cardiology Fellowship Training Program Directors. *J Am Heart Assoc*. 2020 Sep;9(17): e017196. doi: 10.1161/JAHA.120.017196.
- 27 Aibana O, Swails JL, Flores RJ, et al. Bridging the gap: Holistic review to increase diversity in graduate medical education. *Acad Med* 2019;94: 1137-41.
- 28 Dyrbye LN, Brushaber DE, West CP. US Medical Student Plans to Practice in Underserved Areas. *JAMA*. 2023 Nov 14;330(18):1797-1799. doi: 10.1001/jama.2023.19521. PMID: 37856116; PMCID: PMC10587820.
- 29 Tsugawa Y, Jena AB, Figueroa JF, Orav JE, Blumenthal DM, Jha AK. Comparison of hospital mortality and readmission rates for medicare patients treated by male vs female physicians. *JAMA Intern Med*. 2017;177(2): 206-213.
- 30 Brown CE, Marshall AR, Snyder CR, et al. Perspectives about racism and patient-clinician communication among black adults with serious illness. *JAMA Netw Open*. 2023;6(7): e2321746. doi:10.1001/jamanetworkopen.2023.21746.
- 31 Cooper LA, Roter DL, Carson KA, Beach MC, Sabin JA, Greenwald AG, Inui TS. The associations of clinicians' implicit attitudes about race with medical visit communication and patient ratings of interpersonal care. *Am J Public Health*. 2012 May;102(5):979-87. doi: 10.2105/AJPH.2011.300558. Epub 2012 Mar 15. PMID: 22420787; PMCID: PMC3483913.
- 32 Winkel AF, Telzak B, Shaw J, Hollond C, Magro J, Nicholson J, Quinn G. The Role of Gender in Careers in Medicine: a Systematic Review and Thematic Synthesis of Qualitative Literature. *J Gen Intern Med*. 2021 Aug;36(8):2392-2399. doi: 10.1007/s11606-021-06836-z. Epub 2021 May 4. PMID: 33948802; PMCID: PMC8342686.



DEI COMMITTEE

- 33 FitzGerald C, Hurst S. Implicit bias in healthcare professionals: a systematic review. *BMC Med Ethics*. 2017 Mar 1;18(1):19. doi: 10.1186/s12910-017-0179-8. PMID: 28249596; PMCID: PMC5333436.
- 34 Gopal DP, Chetty U, O'Donnell P, Gajria C, Blackadder-Weinstein J. Implicit bias in healthcare: clinical practice, research and decision making. *Future Healthc J*. 2021 Mar;8(1):40-48. doi: 10.7861/fhj.2020-0233. PMID: 33791459; PMCID: PMC8004354.
- 35 Vela MB, Erondy AI, Smith NA, Peek ME, Woodruff JN, Chin MH. Eliminating Explicit and Implicit Biases in Health Care: Evidence and Research Needs. *Annu Rev Public Health*. 2022 Apr 5; 43: 477-501. doi: 10.1146/annurev-publhealth-052620-103528. Epub 2022 Jan 12. PMID: 35020445; PMCID: PMC9172268.
- 36 Edgoose J, Quiogue M, Sidhar K. How to Identify, Understand, and Unlearn Implicit Bias in Patient Care. *Family Practice Medicine* 2019 July/August 29-33.
- 37 <https://www.tctmd.com/news/sts-2023-outgoing-presidents-address-spurs-shock-and-anger> - accessed April 1, 2024.
- 38 Sumler ML, Capdeville M, Ngai J, Cormican D, Oakes D. A Call for Diversity: Underrepresented Minorities and Cardiothoracic Anesthesiology Fellowship Education. *JCVA* 2022. 36(1): 58-65. doi.org/10.1053/j.jvca.2021.09.028.
- 39 Aulivola B, Mitchell EL, Rowe VL et al. Ensuring equity, diversity, and inclusion in the Society for Vascular Surgery: A report of the Society of Vascular surgery Task Force on Equity, Diversity, and inclusion. *JVS* 2021; 73(3): 745-756. DOI: <https://doi.org/10.1016/j.jvs.2020.11.049>.
- 40 Erkmen CP, Ortmeyer KA, Pelletier GJ, Preventza O, Cooke DT; Society of Thoracic Surgeons Workforce on Diversity and Inclusion. An Approach to Diversity and Inclusion in Cardiothoracic Surgery. *Ann Thorac Surg*. 2021 Mar;111(3):747-752. doi: 10.1016/j.athoracsur.2020.10.056. Epub 2020 Dec 17. PMID: 33345789; PMCID: PMC8240968.
- 41 Bravo-Jaimes K, Velarde GP. Diversity in Cardiovascular Medicine: The Fingerprint of International Medical School Exchange Programs. *JACC Case Rep*. 2023 Mar 15; 10:101749. doi: 10.1016/j.jaccas.2023.101749. PMID: 36974050; PMCID: PMC10039375.
- 42 Olayiwola JN, Rastetter M. Aiming for health equity: the bullseye of the quadruple aim. *Journal of Health management and Policy* 2020 <https://api.semanticscholar.org/CorpusID:230630201>.
- (1) Dzau VJ, Mate K, O'Kane M. Equity and Quality—Improving Health Care Delivery Requires Both. *JAMA*. 2022;327(6):519-520. doi:10.1001/jama.2022.0283.



Platelet Transfusion in Cardiac Surgery: An Entropy-Balanced, Weighted, Multicenter Analysis

Calvin M. Fletcher, MD, Jake V. Hinton, MD, Zhongyue Xing, BBiomedSc, Luke A. Perry, MBBS (Hons), Noah Greifer, PhD, Alexandra Karamesinis, MD, Jenny Shi, MPH, Jahan C. Penny-Dimri, MBBS (Hons), Dhruvesh Ramson, MBBS (Hons), Zhengyang Liu, MD,† Jenni Williams-Spence, PhD, Reny Segal, FANZCA, Julian A. Smith, MBMS, MSurgEd, FRACS, Tim G. Coulson, PhD, FANZCA, and Rinaldo Bellomo, PhD, MD

Reviewers:

Sonali Nayak, MD
Resident Physician
Department of Anesthesiology & Perioperative Medicine
University of California, Los Angeles

Sophia P. Poorsattar, MD
Assistant Clinical Professor
Department of Anesthesiology & Perioperative Medicine
University of California, Los Angeles

Background

Patients undergoing cardiac surgery are at a high risk of bleeding due to risk factors including but not limited to the use of anti-platelet agents pre-operatively and impaired platelet function and thrombocytopenia associated with cardiopulmonary bypass.¹ The current guidelines state platelet transfusion is indicated in patients on anti-platelet agents who are actively bleeding or those with platelet counts less than 50×10^9 (Class IIa, level of evidence C₂).² Transfusion of platelets is common during cardiac surgery, though clinical practice is quite variable given the paucity of evidence to support it. Specifically, the outcomes associated with platelet transfusion are quite mixed with some studies associating platelet transfusion with infection, higher vasopressor use, stroke, and death, while other studies show no association between platelet transfusion and these adverse outcomes.³⁻⁶ The wide variability in evidence can in part be attributed to the small nature of these studies or the inability to remove important confounders such as simultaneous transfusion of other blood products. As such, Fletcher et al. looked at the morbidity and mortality associated with perioperative platelet transfusion to elucidate the safety, efficacy, and value of platelet transfusion in cardiac surgery.

Methods

The authors conducted a retrospective, multicenter, inverse probability of treatment weighting via entropy balance study of patients 18 years and older who underwent cardiac surgery between 2005 and 2018 across 40 Australian centers and who received at least 1 unit of platelets intraoperatively or within 30 days postoperatively. The two primary outcomes were operative mortality, which included in-hospital mortality or death within 30 days, and 90-day mortality. Secondary outcomes were numerous and included return to the OR, complications involving anticoagulation (bleeding, hemorrhage, embolic events, pulmonary embolism), chest drain output, inotrope use, cardiogenic shock, new arrhythmia, acute kidney injury (AKI), post-operative renal replacement therapy, gastrointestinal complications, infection (sepsis, deep sternal/parasternal wound infection, pneumonia), acute myocardial infarction, transient ischemic attack, stroke, acute limb ischemia, intensive care unit (ICU) length of stay, mechanical ventilation time, readmission to ICU, and readmission to hospital.

Inverse probability weighting using entropy balancing was used to account for 72 unique confounding variables and compensated for the differences in patient demographics, cardiac risk factors, comorbidities, and perioperative interventions. The study also utilized sensitivity analysis for patients who receive maximum of 2 units of platelets and for those who underwent exclusively coronary artery bypass graft and/or valvular surgery. E-value analysis was also conducted to account for unmeasured confounders. Logistic and linear regression was used for analysis of categorical and continuous outcomes, respectively. Statistical significance was associated with P-values <0.01 .



Results

Of the 119,132 patients who met inclusion criteria from the ANZSCTS Cardiac Surgery Database, 25,373 (21.3%) received platelets. For patients who were transfused versus controls, the odds ratio of operative mortality was 0.63 (99% CI, 0.47–0.84; $P < .0001$) and that of 90-day mortality was 0.66 (99% CI, 0.51–0.85; $P < .0001$). Of the secondary outcomes, patients who received platelets had decreased odds of developing deep sternal wound infection, AKI, and postoperative renal replacement therapy. However, an increased association with return to the operating room, inotrope use, pneumonia, prolonged intubation, readmission to hospital within 30 days of surgery, and greater drain volumes was seen in patients who underwent transfusion. The remainder of the secondary outcomes had no correlation with platelet transfusion.

The sensitivity analyses were similarly consistent—in both the cohort who received two or fewer units of platelets and the group that underwent CABG and/or valvular surgery, transfusion was shown to have decreased association with both operative and 90-day mortality versus controls. The E-values for operative mortality was 2.55 and 2.40 for 90-day mortality. This is notable since smaller E-values suggest a minimal unmeasured confounder can more easily explain away an effect.⁷

Discussion

In this large, multicenter, weighted retrospective analysis, Fletcher et al. describes an independent relationship between platelet transfusion and decreased operative and 90-day mortality. This is significant given the opposing outcomes that have previously been described regarding morbidity and mortality with perioperative platelet transfusion in cardiac surgery. Of note, a prior, small systematic review in 2021 also found no worsening of adverse outcomes with platelet transfusion, and an observational, single center analysis noted an association between transfusion of non-red blood cell products (i.e., platelets, cryoprecipitate, and fresh frozen plasma) and reduced long-term mortality.^{8,9}

What sets this study apart, aside from its size and power, however, is their use of entropy balancing to minimize the confounding effects of the administration of other blood products, including red blood cells. This is of value because current transfusion practice avoids administration of blood products given the risks associated with red blood cell transfusion. The data in this study suggests these risks may not confer to platelet transfusion. Another strength is the various and clinically relevant secondary outcomes that were investigated which help detail the morbidity associated with platelet transfusion. Future randomized controlled trials will be important to stratify risk per blood product and to elaborate on the findings of this cohort study.

The study also had several limitations that should be noted. Despite entropy balancing, a cohort study is inferior to a randomized controlled study when accounting for unmeasured confounders. In the same vein, this study did not include certain known confounders, such as platelet count, hemoglobin, and coagulation testing. As previously mentioned, there is significant variability in transfusion practice and no way to confirm platelet transfusion was indicated for the patients included in this analysis.

As such, this study did not examine provider-level variation in outcomes, though the significance of this is likely to be small compared to patient factors. Next, patients who underwent multiple procedures in the follow-up period could not be excluded due to the deidentified nature of patient information in the database. Lastly, the database did not differentiate between intraoperative and postoperative transfusion so it is difficult to ascertain a correlation between early platelet transfusion and short-term outcomes that may in fact be unrelated.

In conclusion, the findings of this study are promising — perioperative platelet transfusion correlates with reduced in-hospital, 30-day, and 90-day mortality. Platelet transfusion should certainly be considered when clinically appropriate for cardiac surgery patients and until further randomized controlled trials can better characterize the safety profile of platelet transfusion.



References

- 1 Pearse BL, Keogh S, Rickard CM, et al. Bleeding management practices of Australian cardiac surgeons, anesthesiologists and perfusionists: a cross-sectional National Survey Incorporating the theoretical domains framework (TDF) and COM-B model. *J Multidiscip Healthc.* 2020;13:27–41.
- 2 Pagano D, Milojevic M, Meesters MI, et al. 2017 EACTS/ EACTA guidelines on patient blood management for adult cardiac surgery. *Eur J Cardiothorac Surg.* 2018;53:79–111.
- 3 Spiess BD, Royston D, Levy JH, et al. Platelet transfusions during coronary artery bypass graft surgery are associated with serious adverse outcomes. *Transfusion.* 2004;44:1143–1148.
- 4 Bilgin YM, van de Watering LM, Versteegh MI, van Oers MH, Vamvakas EC, Brand A. Postoperative complications associated with transfusion of platelets and plasma in cardiac surgery. *Transfusion.* 2011;51:2603–2610.
- 5 van Hout FM, Hogervorst EK, Rosseel PM, et al. Does a platelet transfusion independently affect bleeding and adverse outcomes in cardiac surgery? *Anesthesiology.* 2017;126:441–449.
- 6 Ninkovic S, McQuilten Z, Gotmaker R, Newcomb AE, Cole Sinclair MF. Platelet transfusion is not associated with increased mortality or morbidity in patients undergoing cardiac surgery. *Transfusion.* 2018;58:1218–1227.
- 7 VanderWeele TJ, Ding P. Sensitivity Analysis in Observational Research: Introducing the E-Value. *Ann Intern Med.* 2017 Aug 15;167(4):268–274. doi: 10.7326/M16-2607. Epub 2017 Jul 11. PMID: 28693043.
- 8 Yanagawa B, Ribeiro R, Lee J, et al; Canadian Cardiovascular Surgery Meta-Analysis Working Group. Platelet transfusion in cardiac surgery: a systematic review and meta-analysis. *Ann Thorac Surg.* 2021;111:607–614.
- 9 Bianco V, Aranda-Michel E, Serna-Gallegos D, et al. Transfusion of non-red blood cell blood products does not reduce survival following cardiac surgery. *J Thorac Cardiovasc Surg.* Published online February 23, 2022. <https://doi.org/10.1016/j.jtcvs.2022.02.032>.



Long-Term Clinical and Echocardiographic Outcomes Following the Ross Procedure

A Post Hoc Analysis of Randomized Clinical Trials

Maximiliaan L. Notenboom, BSc; Giovanni Melina, MD, PhD; Kevin M. Veen, MD, PhD; Fabio DeRobertis, MD; Giuditta Coppola, MD; Paolo De Siena, MD; Emiliano M. Navarra, MD; Jullien Gaer, MS; Michael E. K. Ibrahim, MA, MD, PhD; Ismail El-Hamamsy, MD, PhD; Johanna J. M. Takkenberg, MD, PhD; Magdi H. Yacoub, OM

JAMA Cardiol. 2024;9(1):6-14. doi:10.1001/jamacardio.2023.4090

Published online November 8, 2023

Reviewers:

Stavroula Nikolaidis M.D.
Baylor Scott and White Health

Background

Aortic valve pathology is a common valvular abnormality and accounts for most deaths from severe valvular heart.¹ Most patients with severe aortic valve disease (AVD), will require aortic valve replacement (AVR). For patients older than 65 years a transcatheter AVR (TAVR) is considered and recommended if life expectancy is less than 20 years. Compared with the general population, patients younger than 65 years old, after prosthetic AVR have loss in life expectancy.²⁻⁵ The ideal replacement for the aortic valve should be a durable apparatus that does not require re-intervention, has favorable hemodynamics, does not require long term anticoagulation, and does not shorten life expectancy. As the search for the best option continues, there has recently been increased interest in the Ross procedure, introduced by Dr Ross in 1967. In the Ross procedure, the aortic valve and root are replaced with the patient's pulmonary autograft which is the only available living autograft, and a homograft is placed in the pulmonic position. Dr Ross performed this procedure successfully in the pediatric population, with no need for reoperation or long-term anticoagulation. After success in the pediatric population, the Ross procedure was performed successfully in young adults but, in the early 2000s, reports of autograft dilation and homograft degeneration requiring reintervention caused hesitation. However, recently several studies have shown improved long-term outcomes of the Ross procedure compared to any other prosthesis in younger adults^{7,8} and survival benefit compared to "matched" general population.^{7,9-11}

Authors from this study, in 2010 reported the 10-year results of a prospective randomized clinical trial comparing the Ross procedure to aortic homograft performed in a single center by a single surgeon between 1994 and 2001. The superiority of the Ross procedure in overall quality of life, survival, and freedom from reoperation at 10 years was reported then. In this study, a post hoc analysis of the patients that received the Ross procedure, in the study mentioned above, was performed and the long-term results (29 years or 2488 patient-years) were reported.

Methods

Patients younger than 69 years old with severe AVD were randomly assigned and underwent the Ross procedure at the Royal Brompton & Harefield NHS Foundation Trust, London, UK, between 9/1/1994 and 5/31/2001. Patients with bicuspid aortic valve, aortic root or ascending aortic dilatation, acute endocarditis, rheumatic heart disease, reduced ejection fraction, previous cardiac surgery or requiring emergent surgery, were included but patients with Marfan's or Reiter's syndrome, or rheumatoid arthritis were excluded.

All procedures were performed by the same surgeon, Dr Yacub, using the same technique: freestanding root technique without foreign material to support the proximal or distal anastomosis. In cases of aorto-pulmonary annulus mismatch, intertrigonal compression plication was performed with suture. Pulmonary homograft was placed in the pulmonic position. For the first 6 months, strict blood pressure control with systolic blood pressure less than 110 mmHg was implemented to allow for adaptive remodeling.

From 1994 to 2010 the data were collected prospectively, as per previous prospective randomized study.⁹ After 2010 data were collected retrospectively, in the Harefield hospital, in November and December of 2022.



Echocardiographic data included: autograft root diameter, grade of regurgitation,¹⁻⁴ pulmonary homograft regurgitation,¹⁻⁴ left ventricular ejection fraction, end-systolic and end-diastolic diameters. Structural valve deterioration (SVD) was defined as the autograft dilation with or without valvular regurgitation.

Hospital medical and death records were used and was investigated whether the patient had relocated. Follow-up phone calls were given to the patients still alive.

Events within 30 days of the operation or after 30 days were defined as early or late outcome events, respectively.

Statistical analysis: Performed in RStudio, version 2022.07.2

Primary outcome: long term survival among patients who underwent the Ross procedure compared with age, origin, and sex matched general population controls.

Secondary outcomes: freedom from any reintervention, autograft reintervention, homograft reintervention, autograft dilatation, homograft or autograft regurgitation and NYHA functional status.

Data were analyzed to measure freedom from reintervention after surgery, long term survival, and the survival was compared to the general population with a matching strategy. Reinterventions were considered competing risks with death. In order to investigate factors associated with reintervention or mortality, Cox proportional hazards regression analysis was done.

Results

Study group: 108 adults, male 92 (85%), female 16 (15%)

Age: mean 38 years (range 19-66)

Country of origin: UK 95, Italy 6, Greece 5, Egypt 1 and Turkey 1

Main indication: Aortic stenosis (AS): 30 (28%), aortic regurgitation (AR): 49 (45%), mixed AS/AR: 29 (27%) and thoracic aortic dilatation: 2 (2%)

Active endocarditis: 9 (8%)

Reoperation: 45 (42%)

Follow up duration: mean 24.1 years (range 22.6-26.1 years, 2488 patient-years), 98% follow up completeness.

Median Echocardiographic follow up was 21.7 years with 71% follow up completion.

Surviving patients were 91

Perioperative death 1 patient, death after discharge 16 patients (11 cardiac cause)

25-year survival was 83% (relative survival 99.1% when compared with matched general population, for age, country of origin, and sex).

Reintervention: 17 patients (15.7%) which included AVR, bioprosthetic or mechanical, and valve sparing root replacement.

Indication for reintervention: AR (17), with (7) or without root dilatation. Eighteen reinterventions were performed to 14 patients on the pulmonary homograft for PS (7), PR (2), endocarditis (5) and undocumented (4).

Freedom from Ross related reintervention: 71% at 25 years, autograft 80.3%, homograft 86.3%

30-day mortality of the first Ross related reintervention was 0 %, and first and second combined 3.8%. 10-year survival after reoperation was 96.2%. Homograft endocarditis happened in 9 cases vs autograft endocarditis that occurred only in 1 case.

Autograft dilatation did not occur in all patients. From the multivariate analysis, no predisposing factors were found. When it occurred, it was more pronounced the first 11 years

Discussion

The Ross procedure used to be performed mainly in young patients with aortic stenosis, because of concerns for early deterioration of the autograft in patients with dilated aorta and AR. Other reports have shown very good results in patients with prior AR^{10,14} who received the Ross procedure. In the present study patients with AR and root dilatation were not excluded and received the Ross procedure. Multivariate analysis did not find AR to be a predisposing factor of early deterioration. Intertrigonal plication was performed in cases of aortopulmonary mismatch.



The 25 years follow up of patients after the Ross procedure demonstrated no difference in survival compared to the general population. This demonstrates a survival benefit of the living aortic autograft.

Although autograft deterioration did occur in some patients, the incidence was low and the progression to AR not fast. Not all patients who developed autograft dilatation developed severe enough AI to require intervention.

Today the Ross procedure is one of the fastest growing surgical procedures. Because of its complexity, should it be performed only in certain centers of excellence?

More research is needed to address this question.

Strengths and Limitations

The biggest strength of the study is that it presents the longest reported follow-up after the Ross procedure. Recently several other studies have reported favorable outcomes.

The single center / single surgeon cohort certainly eliminated operator related or setting related confounding factors that could have changed the results but, are they reproducible in a different setting with different surgeons?

References

1. Coffey S, Cox B, Williams MJ. Lack of progress in valvular heart disease in the pre-transcatheter aortic valve replacement era: increasing deaths and minimal change in mortality rate over the past three decades. *AmHeartJ*.2014;167(4):562-567.e2.
2. Glaser N, Persson M, Jackson V, Holzmann MJ, Franco-Cereceda A, Sartipy U. Loss in life expectancy after surgical aortic valve replacement: SWEDHEARTstudy. *JAmCollCardiol*.2019;74(1): 26-33. doi:10.1016/j.jacc.2019.04.053
3. Etnel JRG, Huygens SA, Grashuis P, et al. Bioprosthetic aortic valve replacement in nonelderly adults: a systematic review, meta-analysis, microsimulation. *Circ Cardiovasc Qual Outcomes*.2019;12(2):e005481.
4. Korteland NM, Etnel JRG, Arabkhani B, et al. Mechanical aortic valve replacement in non-elderly adults: meta-analysis and microsimulation. *Eur Heart J*. 2017;38(45):3370-3377.
5. Kvidal P, Bergström R, Hörte LG, Ståhle E. Observed and relative survival after aortic valve replacement. *J Am Coll Cardiol*. 2000;35(3):747-756.
6. Ross DN. Replacement of aortic and mitral valves with a pulmonary autograft. *Lancet*. 1967;2 (7523):956-958.
7. Aboud A, Charitos EI, Fujita B, et al. Long-term outcomes of patients undergoing the Ross procedure. *J Am Coll Cardiol*. 2021;77(11):1412-1422.
8. Takkenberg JJ, Klieverik LM, Schoof PH, et al. The Ross procedure: a systematic review and meta-analysis. *Circulation*. 2009;119(2):222-228.
9. El-Hamamsyl, Toyoda N, Itagaki S, et al. Propensity-matched comparison of the Ross procedure and prosthetic aortic valve replacement in adults. *J Am Coll Cardiol*. 2022;79(8):805-815.
10. Mazine A, El-Hamamsyl, VermaS, et al. Ross procedure in adults for cardiologists and cardiac surgeons: JACC state-of-the-art review. *J Am Coll Cardiol*. 2018;72(22):2761-2777.
11. David TE, David C, Woo A, Manlhiot C. The Ross procedure: outcomes at 20 years. *J Thorac Cardiovasc Surg*. 2014;147(1):85-93.
12. Ryan WH, Prince SL, Culica D, Herbert MA. The Ross procedure performed for aortic insufficiency is associated with increased autograft reoperation. *Ann Thorac Surg*. 2011;91(1):64-69.
13. David TE, Woo A, Armstrong S, Maganti M. When is the Ross operation a good option to treat aortic valve disease? *J Thorac Cardiovasc Surg*. 2010;139(1):68-73.
14. Mazine A, El-Hamamsyl. The Ross procedure is an excellent operation in non-repairable aortic regurgitation: insights and techniques. *Ann Cardiothorac Surg*. 2021;10(4):463-475.