

SPECIAL ARTICLE

Basic Cardiovascular Sciences Scientific Sessions 2020

Emerging Opportunities in Cardiovascular Diseases

Sakthivel Sadayappan¹, Jil C. Tardiff¹, Loren E. Wold¹

Following the successful 2019 Basic Cardiovascular Sciences (BCVS) Scientific Sessions in Boston, MA,¹ we began the planning process for the 2020 BCVS Scientific Sessions (#BCVS20) to be held in Chicago, IL, with excitement and a goal to be bigger and better than ever. Similar to Boston, Chicago is a vibrant city with several institutions of higher education in and around Chicago, which would likely draw even more participants than the record set in Boston. The objectives of #BCVS20 Emerging Opportunities in Cardiovascular Diseases were (1) to showcase the frontiers of basic and translational cardiovascular science and envision the next best thing to drive cardiovascular therapeutics forward; (2) to enhance exchange of ideas and collaboration among investigators of diverse geographic locations, disciplines, and career stages; (3) to catalyze new ideas/directions; and (4) to inspire the next generation of researchers in the cardiovascular sciences. The following selection criteria were used to achieve our overarching scientific planning goals: (1) to invite international senior investigators at the cutting edge of cardiovascular research, the most promising up-and-coming investigators from early, mid and established investigator levels, experts in emerging innovative methods, including those who had not presented within the last 2 years at the meeting; (2) to design a highly organized, yet interactive, program; (3) to provide an appealing, accessible, and affordable venue; (4) to include a minimum of one talk per session by young investigators who submitted the best abstracts; (5) to devote 4 sessions exclusively to early career trainees to present their research, including

the Young Investigator Award competition; (6) to expand travel grants and outreach awards to increase junior scientist and underrepresented minority attendance and participation; and (7) to provide support and mentorship to women and underrepresented scientists through an informal breakfast gathering. These last 2 objectives continue to be our efforts to promote the attendance of minorities and women, which has been a primary goal over the last several years.

FACE-TO-FACE TO VIRTUAL

Early in 2020, the coronavirus 2019 (COVID-19) pandemic disrupted personal and professional lives around the world. With the increase in COVID-19 cases in the United States, state and institutional policies including social distancing and new hygiene procedures were introduced, travel restrictions, and funding to attend scientific meetings was limited. As a result, the American Heart Association (AHA) announced on April 7, 2020, that the BCVS meeting would be converted to an all-virtual format. While this was initially a disappointing decision for the planning committee given the late stage of the programing, (invitations were queued to be emailed to invited speakers and moderators); however, the AHA staff and the program committee immediately began the process of re-envisioning the program for a virtual format. As a result, sessions were limited to 3 main speakers and one moderator, the number of workshops was reduced from 4 to 2, pre-early career sessions and boot camps were eliminated, and the Asian Cardiovascular

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Correspondence to: Loren E. Wold, PhD, Davis Heart and Lung Research Institute, The Ohio State University, 473 W 12th Ave, Columbus, OH 43210. Email lwold@osumc.edu

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Nonstandard Abbreviations and Acronyms

AHA	American Heart Association
BCVS	Basic Cardiovascular Sciences
COVID-19	coronavirus 2019
HFpEF	heart failure with preserved ejection fraction

Symposium was fully merged with the main #BCVS20 program. Despite the attendant need to rescind some invitations and completely re-organize the program, our collegial and supportive scientific community came together to rebuild our meeting. At the end of May 2020, we were able to complete the restructuring and programming of #BCVS20 and began to look forward to this important event.

While many investigators were already using virtual formats to conduct meetings during the pandemic, the prerecording of presentations was a necessary step to correct any technical difficulties before the meeting. In June 2020, the prerecording step was completed, and all of the sessions were ready for virtual presentation. #BCVS20 was held in this new virtual format on July 27 to 30, 2020, offering the dissemination of science in a new, innovative format, with 1070 registrations, 365 e-posters, 84 speakers, and 35 moderators. Overall, the enthusiasm to present and participate at #BCVS20 was high, irrespective of the pandemic crisis, compared with 650 and 1064 registrations in 2018² and 2019,¹ respectively (Figure 1). The sessions began with a preconference featuring the CEO of the AHA, Nancy Brown, opening remarks by the President of the American Heart Association, Mitch Elkind, MD, and welcoming remarks by the BCVS Council Chair, Elizabeth McNally, MD, PhD (Figure 2).

FIRST EXPERIENCES IN ESTABLISHING VIRTUAL SESSIONS

Several key advantages came out of this virtual format, compared with the typical face-to-face meeting. With a registration fee of only \$99, no travel or booking complications, registrants were able to focus on the science and interacting with speakers and attendees via the Zoom-like format. One long-term issue commonly faced at prior AHA meetings has been the rush to attend as many sessions as possible, some located far apart from each other, and having to miss some presentations owing to the overlapping times. With the virtual format, it was not necessary to rush as all presentations were made available for 90 days following the meeting. Another key advantage, along with the extended availability of the presentations, was the ability to watch/switch concurrent

sessions in a fraction of a second. Participants were able to ask questions without any hesitation by posting them via the online chat and interact in real time with other attendees and both speakers and moderators. This also allowed the attendees to ask questions during the presentations, as opposed to waiting until the speaker had finished presenting. Overall, the first experiences of science in the virtual format were a success, and many attendees later commented on how surprised they were by the interactive nature of the meeting and how they actually felt that they gained more from #BCVS20 than any other BCVS meeting!

BCVS 2020 MAIN PROGRAMMING: EMERGING OPPORTUNITIES IN CARDIOVASCULAR DISEASES

As noted above, the focus of the meeting was on new and innovative areas of cardiovascular sciences with many emerging themes. Although heart failure and stem cell biology have dominated many of the previous conferences, the #BCVS20 sessions were designed to offer presentations of unpublished data from a broader range of topics in an open and supportive environment. Pathogenic cardiac remodeling, together with its associated systemic effects, was the focus of the first session, offered concurrently with a session on new approaches to target complex cardiomyopathies. These sessions were well attended with significant discussion in the online chat. The following sessions discussed the use of nicotine, lack of exercise, and poor diet in the progression of cardiovascular disease, as well as the association between COVID-19 and CVD (see below). Another central theme was the involvement of inflammation in CVD with several sessions and poster presentations discussing the newest data on this important association. Other sessions included updates on signaling mechanisms of heart failure and the role of oxidative stress and autophagy in various CVDs. Another exciting new theme of this year's meeting was the cardiotoxicity associated with cancer therapeutics, which is a rapidly expanding area of study. While all sessions provided updates on these exciting themes of CVD research performed internationally, much excitement was also present in the virtual poster sessions, which offered many early career scientists the opportunity to interact with renowned experts in a relaxed environment.

SIGNATURE SESSIONS

COVID-19 and Keynote Lecture

The AHA responded to the COVID-19 pandemic by offering a rapid call for grants to investigate the potential implications of the virus on cardiovascular disease progression, which resulted in over 750 applications. The #BCVS20

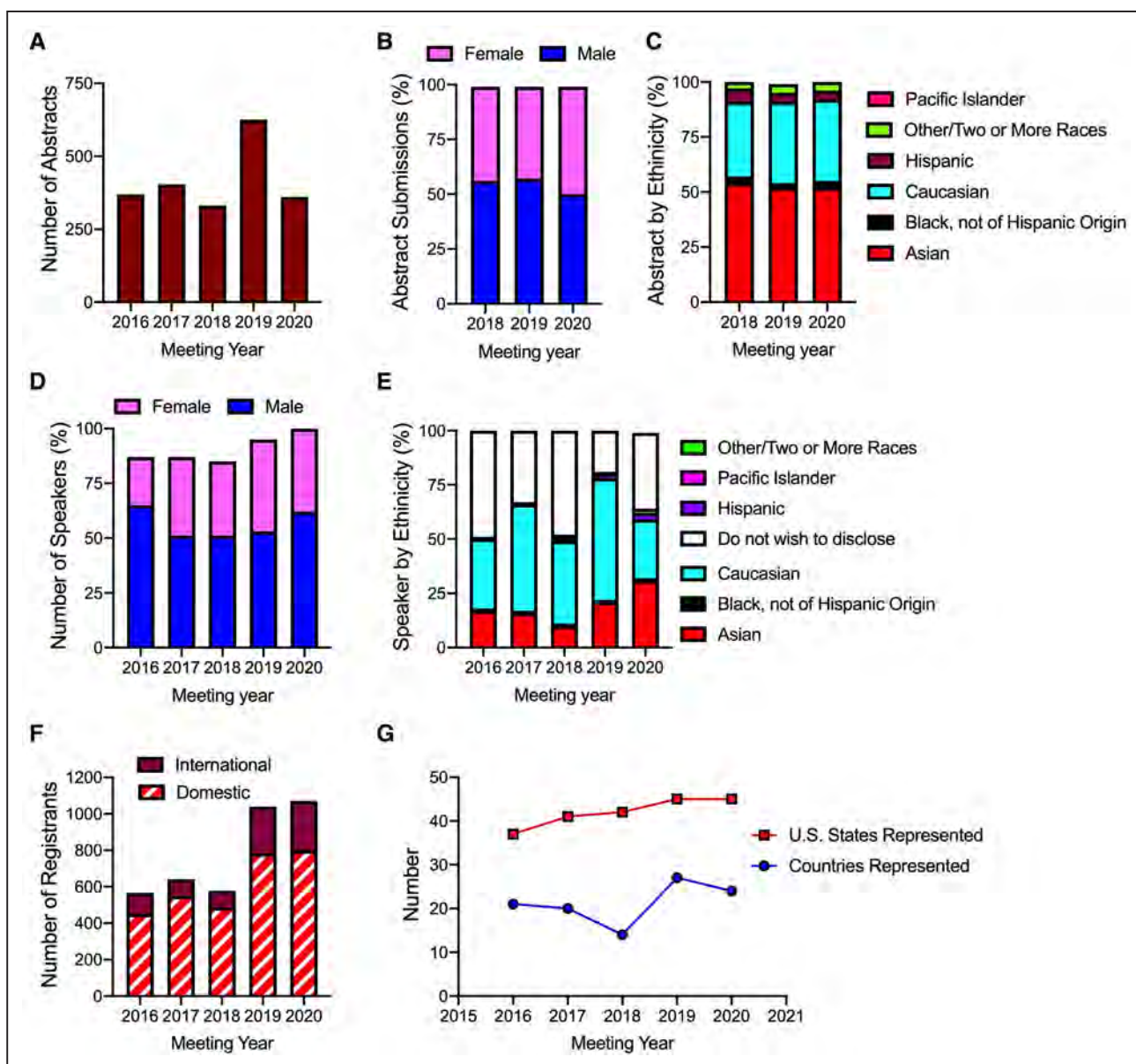


Figure 1. #BCVS20 statistical summary: 2016 to 2020.

A, Total number of abstracts presented at the Basic Cardiovascular Sciences (BCVS) meeting over the past 5 meetings. **B**, Sex and **(C)** ethnic representation of abstract submissions in percentage. **D**, Sex and **(E)** ethnic representation of speakers in percentage. **F**, Total number of BCVS meeting registrants (Domestic; United States and International) from 2016 to 2019. **G**, Number of US states and foreign countries represented at the past 5 BCVS Scientific Sessions.

session entitled COVID-19 and Cardiovascular Disease was moderated by Mina Chung, MD, Cleveland, OH, who was a recipient of one of these prestigious rapid awards. A panel discussion was held with participants, including Eduardo Marban, MD, Los Angeles, CA, and Sanjum Sethi, MD, New York, NY, who discussed the potential implications of the virus on cardiovascular health. An exciting discussion about deep learning using chest radiographs to potentially predict COVID-19 outcomes was also offered by Michael Lu, MD, Boston, MA. These discussions highlighted the importance of understanding and investigating novel triggers of CVD, including COVID-19.

The highlight for many participants was the keynote lecture by Heinrich Taegtmeier, MD, Houston, TX. Dr Taegtmeier discussed his many years of research on cardiac metabolism. Listening to Dr Taegtmeier discuss his scientific pursuits over the years was a humbling experience, but, at the same time, it was exciting to learn about the number of outstanding scientists he has trained over the years. The chat box was very active with comments from well wishers, most noting how Dr Taegtmeier and his career have encouraged them to be better scientists and mentors. Thank you, Dr Taegtmeier, for your outstanding

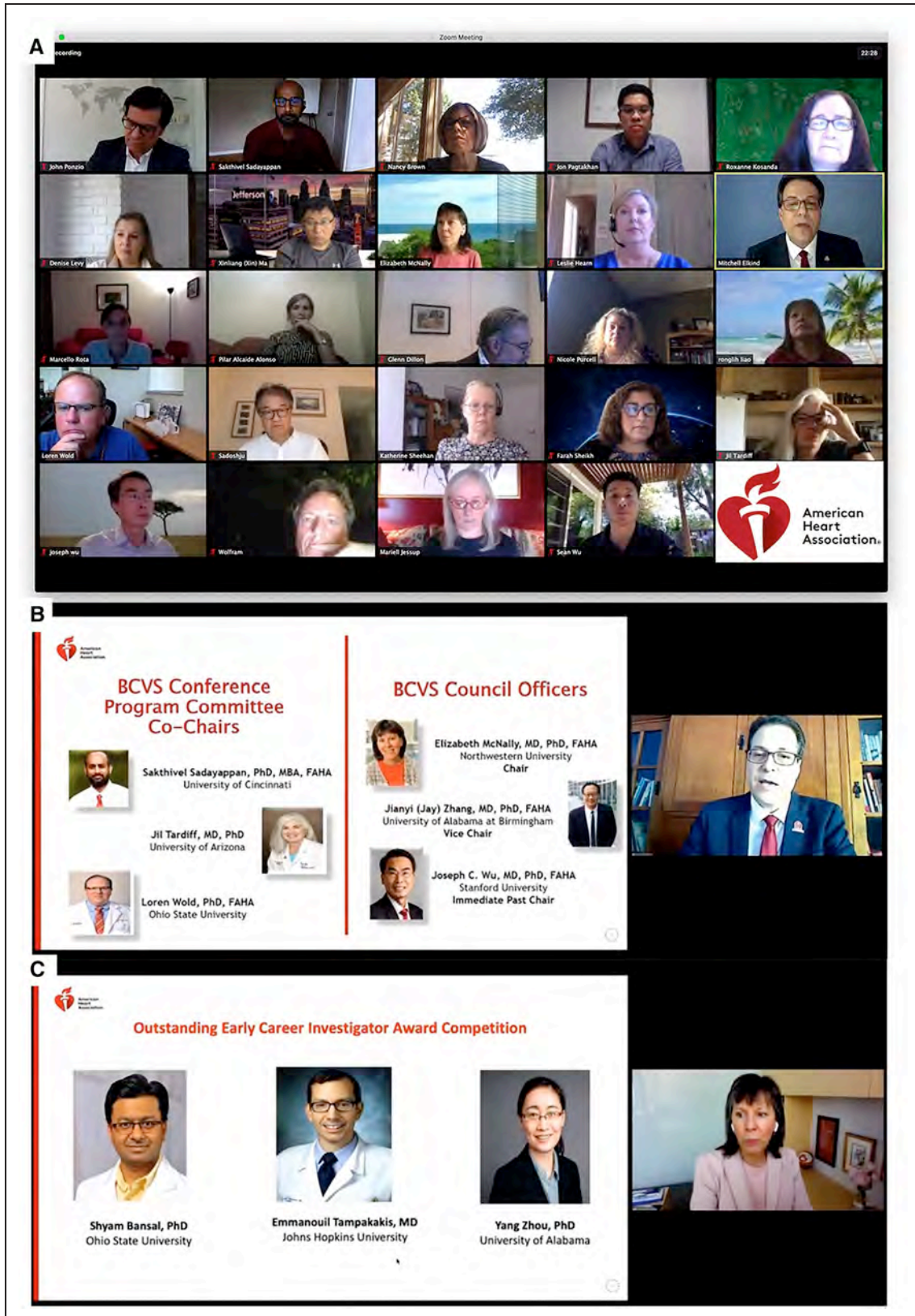


Figure 2. Preconference session and opening remarks at #BCVS20.

A, Preconference session with the American Heart Association (AHA) CEO, Nancy Brown, and the Basic Cardiovascular Sciences (BCVS) Executive Committee, before the #BCVS20 opening remarks of **(B)** AHA President, Mitch Elkind, MD, and **(C)** Chair of the #BCVS20 Council.

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contributions to cardiac metabolism and to science in general (Figure 3).

EARLY CAREER SESSIONS

Early career scientists are the driving force and innovators of cardiovascular research in our society.³ The AHA is continuously promoting early career scientists through various mechanisms, including funding opportunities and training, as well as skill-building at BCVS Scientific Sessions. At the #BCVS20 on July 28, 2020, an early career panel session entitled Amplify the Signal, Not the Noise was moderated by David Barefield, PhD, and Priscila Sato, PhD, with 2 panel members, Gary N. Keller, Xomix, Ltd, Chicago, IL, with expertise in startup companies, and Michael Kennedy, PhD, who is the founder of the Science Club. On the same evening, an early career virtual networking social event for established researchers in the cardiovascular field was held with an open forum in a speed-dating format (Figure 3). The outstanding early career investigator award competition was also held virtually with 3 truly promising finalists, including Drs Shyam S. Bansal, Emmanouil Tampakakis, and Yang Zhou. The session was moderated by Hesham Sadek, MD, PhD, and the Chair of the Selection Committee was John W. Calvert, PhD. The winner this year was Dr Tampakakis of Johns Hopkins University, who gave an exciting talk on how sympathetic innervation negatively regulates post-natal cardiomyocyte proliferation through circadian genes

(Figure 4). Congratulations to all of the finalists and to Dr Tampakakis; the future of CVD research is bright!

Women in Science Breakfast

The Women in Science Breakfast is always an exciting event at the BCVS meeting, with kudos to Rongliu Liao, PhD, Stanford, CA, for starting this outstanding initiative to highlight the important work of all women scientists (Figures 3 and 4). In the virtual world, having a breakfast was difficult with attendees logging in from all over the world, so it was decided that we would host a special session to discuss issues related to women in science. This session was moderated by Rong Tian, MD, Seattle, WA, with a presentation by Ms Lee Ann Piano, who is a leadership and empowerment speaker from Chicago, IL. The session was outstanding with discussions on career progression and how to overcome obstacles in science and mentorship. Breakout rooms were used to take a deeper dive into many of these areas. Attendance was over 150 in this session, so it is clear that Dr Liao was forward-thinking in organizing this meaningful group many years ago.

Collaborative Sessions With Asian Cardiovascular Organizations and Heart Failure Association

The BCVS is continuously expanding its activities by working with several international organizations to foster

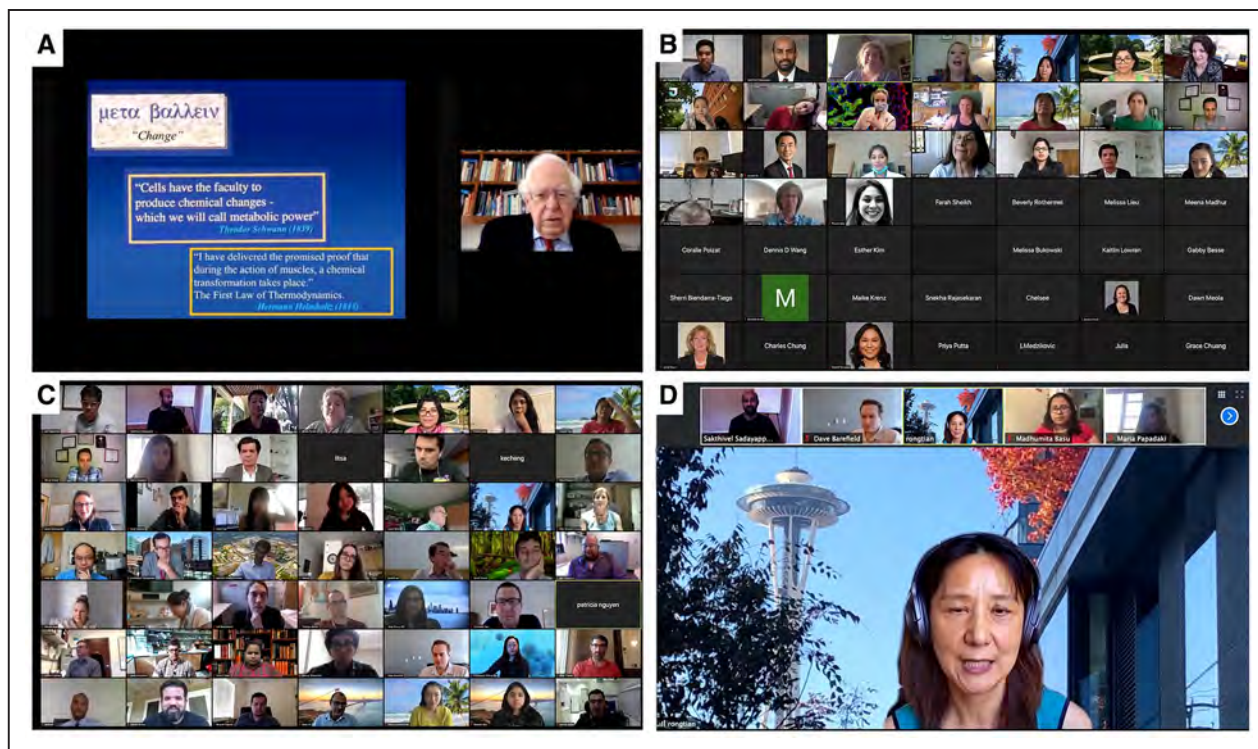


Figure 3. Signature sessions and speakers at #BCVS20.

A, The keynote lecture by Heinrich Taegtmeyer, MD; Zoom call for **(B)** Women in Science and **(C)** Early Career Virtual Networking Social Event with Dr Rong Tian, PhD **(D)**, discussing how to establish collaborative science.

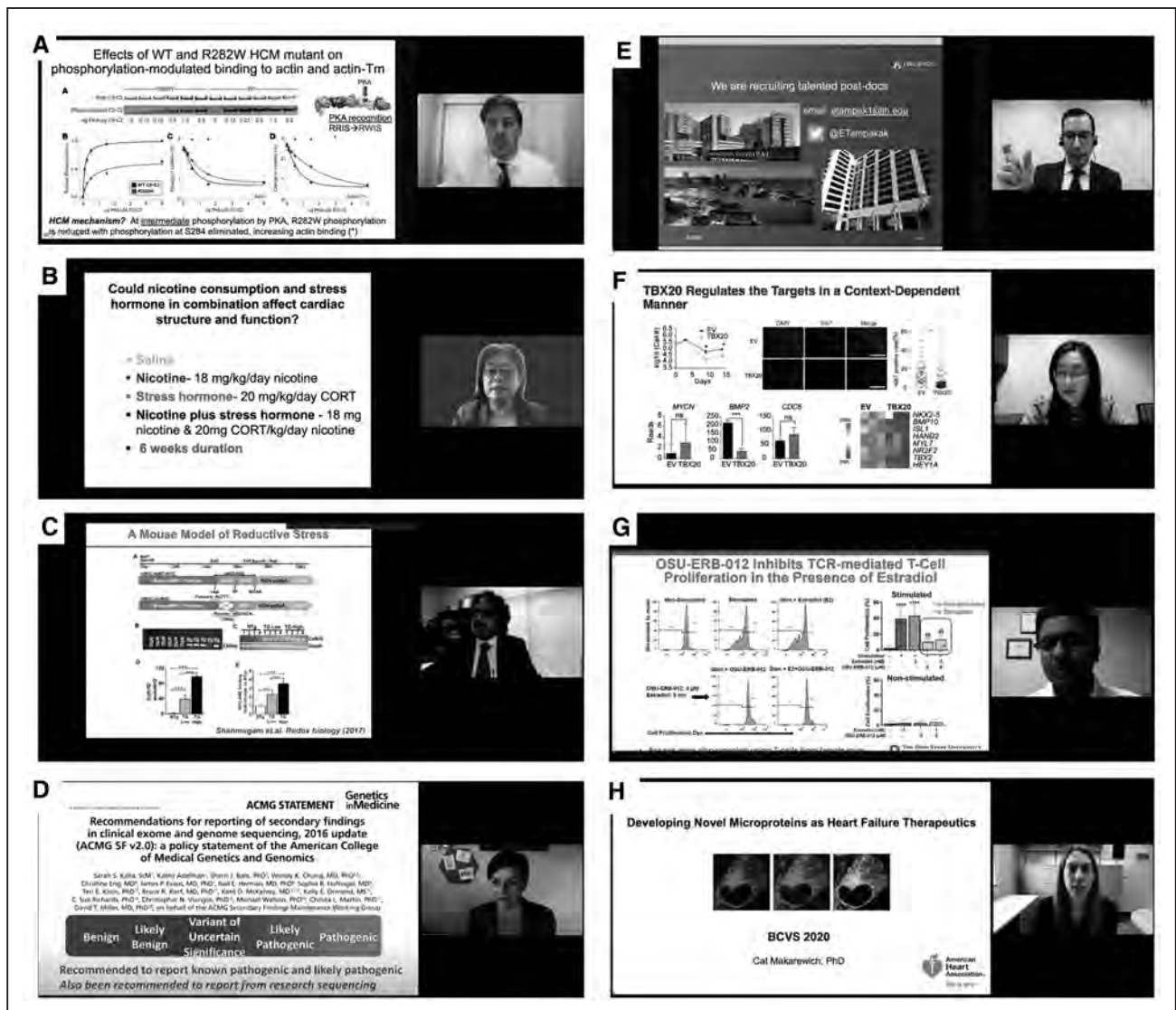


Figure 4. Signature sessions and speakers at #BCVS20.

Plenary Session speakers for #BCVS20: (A) Brett Colson, PhD, (B) Rongliu Liao, PhD, (C) Rajasekaran Namakkal Soorappan, PhD, and (D) Megan Puckelwartz, PhD. Outstanding early career investigator award competition by promising early career scientists, (E) Emmanouil Tampakakis, PhD (the winner), (F) Yang Zhou, PhD, and (G) Shyam S. Bansal, PhD. H, Plenary Session speaker, Catherine Makarewicz, PhD, presenting Systems Approaches to Cardiac Disease Concurrent Session 14B.

collaboration and networking across continents. Last year, for the first time, the Asian Cardiovascular Symposium was included on the Sunday before the 2019 BCVS Scientific Sessions in Boston. The symposium was sponsored and organized by 4 different Asian Research Groups: Academy of Cardiovascular Research Excellence, Japanese Cardiovascular Group, Korean Cardiovascular Society, and South Asian Heart Association. At #BCVS20, the Asian Cardiovascular Symposium was introduced as part of the BCVS Scientific Sessions and included 4 different sessions coordinated by Gangjian Qin, MD, Koichiro Kuwahara, MD, PhD, Rajasekaran Namakkal Soorappan, PhD, and Young-sup Yoon, MD, PhD. In addition, for the first time, #BCVS20 partnered with the Heart Failure Association/European Section

and had its own sponsored session on July 29, 2020, entitled Molecular Mechanisms of Cardiac Hypertrophy under the leadership of Dr Johannes Backs. Overall, these collaborative sessions strengthened ongoing international collaborations, provided innovative ideas and concepts, and created opportunities for researchers from around the world.

E-Poster Sessions

Poster sessions are always an exciting event at the BCVS Scientific Sessions as they provide face-to-face presentations and discussions with the trainees. #BCVS20 featured 356 abstracts; this year, the poster sessions were changed to e-poster sessions with 4 concurrent

sessions for a total of 8 total sessions. Each session had 6 e-poster presentations with a 5-minute presentation by each author. E-posters were selected based on the top scores through the abstract review process in each subject category. A moderator was assigned for each e-poster session for a Q&A with the presenting author. The accepted abstracts were published in *Circulation Research* as supplemental files.

Virtual Workshops

Workshops are a great opportunity to have focused discussions on topics that resonate throughout cardiovascular research but without emphasizing any one theme. This year, mirroring a growing focus on rigor and reproducibility in science, 2 new workshops were developed. The first workshop was held on Wednesday, July 29, 2020, and entitled Nailing Your Statistics: Rigorous Analysis for Grants and Papers. It was moderated by Jane Freedman, MD, Worcester, MA, and sponsored by *Circulation Research*. The panelists included Jennifer Below, PhD, Nashville, TN, Heather Highland, PhD, MS, Chapel Hill, NC, and Eric Gamazon, PhD, Nashville, TN. The second workshop was held Wednesday afternoon. It was entitled The Practice of Biomedical Research: Honesty, Transparency and Early Career Funding Opportunities and was moderated by Leslie Leinwand, PhD, Boulder, CO. This session included a presentation by Jane Freedman, MD, Worcester, MA, on the inclusion of honesty and transparency in journal submissions, followed by an exciting talk by Susan Garfinkel, PhD, Columbus, OH, on the handling of allegations of research misconduct within the federal government, as well as academic institutions. Joseph Hill, MD, Dallas, TX, rounded out the presentations in this workshop with a discussion about truth in publishing and his role as Editor-in-Chief of *Circulation* (Figure 5).

Bridging the Clinical/Translational Divide

BCVS will continue to bridge basic, translational, and clinical research by including speakers from diverse backgrounds and disciplines—physicians, physician-scientists, and basic scientists—who address topics relevant to identifying therapeutic targets, drug discovery, and performing preclinical studies. At #BCVS20, several sessions were devoted to these themes. For example, Session 6B entitled Novel Animal Models and Translational Insights was moderated by Maria Kontaridis, PhD, with 3 speakers, including Meena Madhur, MD, Edward Thorp, PhD, and Rabea Hinkel, DVM. Session 7B entitled Cardiotoxicity of Cancer Therapeutics: Mechanisms and Potential Therapies was moderated by Richard Becker, MD, and included Bonnie Ky, MD, Loren Field, PhD, and Carrie Geisberg Lenneman, MD, as speakers. In addition, e-poster session 4A highlighted 6 poster presentations covering various topics reflective of bridging the clinical/

translational divide. Hunter Hidalgo, BS, presented work illustrating that bilateral radiofrequency renal sympathetic denervation is a viable treatment option for cardiometabolic heart failure with preserved ejection fraction. Dr Bonnie Ky highlighted the role of pertuzumab, doxorubicin, and trastuzumab in cardiotoxicity. Dr Lenneman presented the use of dexrazoxane to prevent cardiotoxicity. Thus, translational sessions provided the latest updates on clinical and preclinical studies on various cardiovascular diseases.

Novel Approaches and Methodologies

To advance studies of the cardiovascular system, novel approaches and methodologies are essential and are always a central focus of the BCVS meeting. At #BCVS20, several sessions highlighted novel techniques. Session 1B entitled Cutting-edge Approaches to Targeting Complex Cardiomyopathies was moderated by Jil Tardiff, MD, PhD and was presented by Brett Colson, PhD, Sharlene Day, MD, and Andrew Carley, PhD. Of note, Dr Colson presented a high-throughput fluorescence lifetime-based assay using labeled F-actin in the 384-well format for screening small molecules to treat hypertrophic cardiomyopathy. Concurrent Session 3A entitled Molecular Predictors and Markers of Heart Failure Progression was moderated by Kristine DeLeon-Pennell, PhD, with presentations by Seitaro Nomura, MD, Ying Ge, MD, and Motohiro Nishida, PhD. Some key discoveries in these sessions included the use of single-cell analysis and top-down proteomics. In Concurrent Session 11A entitled Molecular and Cellular Therapy for Heart Failure, several other topics were covered, such as Injectable Biomaterials for Treating Myocardial Infarction and Heart Failure by Karen Christman, PhD. Novel approaches in studying cardiovascular diseases were the subject of other presentations: AAV9 Gene Transfer of MyBP-C N-terminal Domains Ameliorates Cardiomyopathy in MyBP-C-deficient Mice by Julian Stelzer, PhD; Drug Delivery for Heart Repair by Ke Cheng, MD; Fibroblast-controlled Contractile Performance in (Tissue-engineered) Heart Muscle by Wolfram Zimmerman, MD; and Gene Editing Reverses Arrhythmia Susceptibility in Humanized PLN-R14del Mice by Francesca Stillitano, PhD. Together, these presentations introduced novel approaches and the latest techniques for diagnosing and treating cardiovascular diseases.

Heart Failure With Preserved Ejection Fraction: More Than Diastolic Dysfunction

The symptoms of heart failure with preserved ejection fraction (HFpEF) include exercise intolerance, impaired quality of life, and normal systolic but depressed diastolic function; HFpEF accounts for ≈50% of patients with heart failure. As no effective treatments for HFpEF exist,

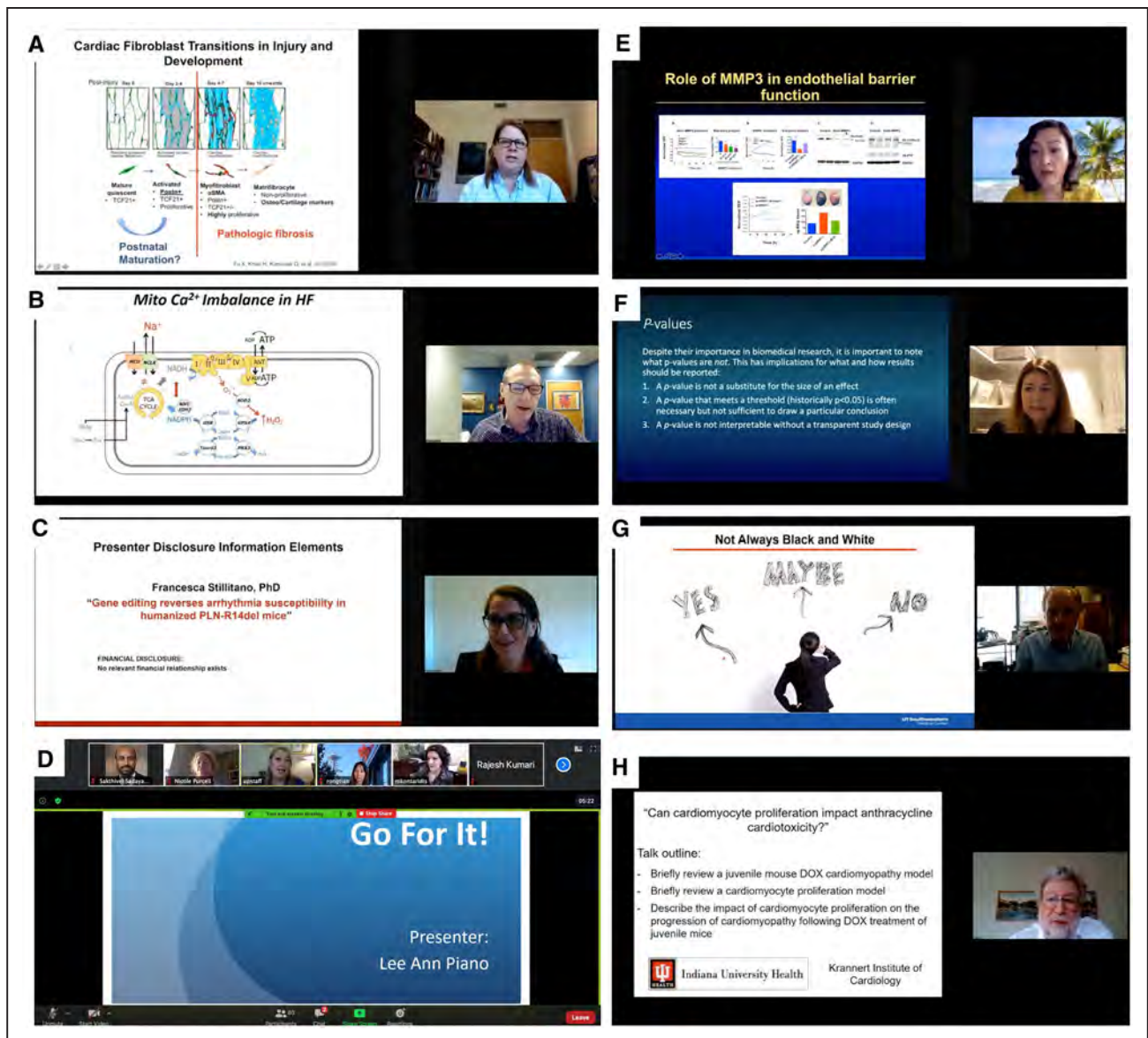


Figure 5. Signature sessions and speakers at #BCVS20.

Plenary Session speakers for #BCVS20: (A) Katherine Yutzey, PhD, (B) Brian O'Rourke, PhD, (C) Francesca Stillitano, PhD, (D) Women in Science: Go For It by Lee Ann Piano, (E) Rongxue Wu, MD, PhD, (F) Jennifer Below, PhD, at Workshop 1 on Nailing Your Statistics: Rigorous Analysis for Grants and Papers (hosted by *Circulation Research*), (G) Joseph Hill, MD, PhD, at Workshop 2 on The Practice of Biomedical Research: Honesty Transparency and Early Career Funding Opportunities and (H) Loren Field, PhD.

mortality and morbidity remains high. Despite the high prevalence of HFpEF, the molecular mechanisms underlying its development remain poorly defined. Therefore, #BCVS20 provided the opportunity to present and discuss various pathophysiological mechanisms of HFpEF. The subject was discussed in 2 Concurrent Sessions: 7A entitled HFpEF in Metabolic Diseases, moderated by Jonathan Kirk, PhD, and 11B entitled Diastolic and Contractile Dysfunction in Heart Failure, moderated by John Ralphe, MD. In addition, several sessions provided novel insights into defining HFpEF, including Defining Immune Mechanisms of HFpEF Using CITE-Seq by Meena Madhur, MD and Disparate Roles for Phagocytes in Heart

Failure with Reduced Ejection Fraction versus HFpEF by Edward Thorp, PhD.

CONCLUSIONS

Bringing cardiovascular scientists together from all over the world to promote collaboration, dissemination of novel ideas and exchange provocative hypotheses is an essential component of advancing modern cardiovascular research. While the initial planning for #BCVS20 was up-ended by the COVID-19 pandemic, considerable effort was taken to ensure that the collaborative nature of the meeting was maintained on all

levels, with many lessons were learned. For example, large in-person meetings can be completely reprogrammed in a few weeks when the programming committee has no other choice! We hope that we are able to be back in a face-to-face format next year, but we are confident that we will be ready to bring together an outstanding group of scientists who will present their work in a fast-paced, yet relaxed format, no matter what the future may bring.

ARTICLE INFORMATION

Affiliations

Division of Cardiovascular Health and Disease, Department of Internal Medicine, Heart, Lung and Vascular Institute, University of Cincinnati, OH (S.S.). Department of Biomedical Engineering and Medicine, University of Arizona, Tucson, AZ (J.C.T.). College of Nursing (L.E.W.) and Department of Physiology and Cell Biology, College of Medicine, The Ohio State University, Columbus, OH (L.E.W.).

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Disclosures

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