PROGRAM

AND

ABSTRACTS

Association of University Cardiologists
Fifty-Ninth Annual Meeting
Dove Mountain Ritz Carlton
Marana, AZ

January 15-17, 2020

2020

Wednesday, January 15, 2020

9:00 AM – 12:00 PM	**Council Meeting** Location: Alamo Springs
3:00 PM – 5:00 PM	**Emeritus Forum** Location: Tortolita B *Digital Revolution in Cardiology: Big Data Analysis and Interpretation* **Speaker: Robert A. Harrington, MD** *Utilization of Guideline-directed Device Therapies In Heart Failure Patients: Real-world Analysis Using Electronic Health Record Data* **Speaker: Anne B. Curtis, MD** **Emeritus Program Committee:** Nanette K. Wenger, MD; William H. Barry, MD; Rose Marie Robertson, MD
6:00 PM – 8:00 PM	**Reception** Location: Tortolita A and Terrace
8:00 PM – 10:00 PM	**President's Dinner**: (invited guests only) Location: CORE Kitchen

Thursday, January 16, 2020

7:00 – 8:00 AM	**Continental Breakfast** Location: Dove Mountain Ballroom
8:00 - 8:10 AM	**President's Welcome** Location: The Tortolita Ballroom
8:10 – 8:40 AM	**FEATURED LECTURE** *Title: Health haves, health have nots, and cardiovascular disease* **Speaker: Sandro Galea, MD, MPH, DrPH** Dean and Robert A. Knox Professor of the Boston University School of Public Health
8:40 AM – 8:55 AM	Discussion
9:00 AM – 9:30 AM	**The 31st GEORGE BURCH MEMORIAL LECTURE** Title: *An Evolving Healthcare Paradigm: Leveraging Root Cause*

Speaker: Thea James, MD
Vice President of Mission and Associate Chief Medical Officer, Boston Medical Center

9:30 AM – 9:45 AM Discussion

9:50 AM – 10:10 AM **BREAK**

10:10AM – 10:40AM **PRESIDENT'S LECTURE**

Title: Developments in implicit bias: advancing diversity, equity, and inclusion in academic cardiology

Emelia J. Benjamin, MD, ScM, Assistant Provost, Faculty Development Boston University Med. Campus

11:40AM – 10:55 AM Discussion

Scientific Session Day One:

11:00 AM – 5:20 PM **Scientific Session Day One**
Location: The Tortolita Ballroom

11:15 AM – 11:20 AM Introduction of New Members in Attendance

Gregg C. Fonarow, MD	Wendy S. Post, MD
Edward TH Yeh, MD	Donald Lloyd-Jones, MD
Roger Blumenthal, MD	Gregory Michaud, MD
William A. Zoghbi, MD	Kenneth Mahaffey, MD
Jeffrey T. Kuvin, MD	Vincent L. Sorrell, MD
Vera Bittner, MD	Eric J. Velazquez, MD
Roxana Mehran, MD	Vallerie McLaughlin, MD
Howard J. Eisen, MD	Sanjiv Narayan, MD

11:00 AM – 11:15 AM *The Hospital Readmissions Reduction Program: Net Harm*

Gregg C. Fonarow, MD, Professor of Cardiovascular Medicine and Science, Chief, UCLA Division of Cardiology

11:15 AM – 11:25 AM Discussion

11:25 AM – 11:40 AM *Anthracycline-induced cardiotoxicity: Mechanism and Prevention*

Edward TH Yeh, MD, Center for Precision Medicine, Department of Medicine, University of Missouri School of Medicine, Columbia, Missouri

11:40 AM – 11:50 AM	Discussion
11:50 AM – 1:00 PM	**Lunch** Location: Dove Mountain Ballroom
1:10 PM – 1:25 PM	*Use of an ABCDEF Approach for Primary & Secondary Cardiovascular Disease Prevention* **Roger S. Blumenthal, MD,** Director of Johns Hopkins Ciccarone Center for the Prevention of Cardiovascular Disease, Professor of Medicine and Epidemiology, Johns Hopkins University School of Medicine
1:25 PM – 1:35 PM	Discussion
1:35 PM – 1:50 PM	*Mitral Valve Deformation during the Cardiac Cycle in Health and Disease* **William A. Zoghbi, MD,** Professor and Chairman, Department of Cardiology, Houston Methodist DeBakey Heart & Vascular Center
1:50 PM – 2:00 PM	Discussion
2:00 PM – 2:15 PM	*(Re)Defining, Achieving and Maintaining Competency in Cardiovascular Training and Practice* **Jeffrey T. Kuvin, MD,** Chief, Cardiovascular Medicine, Dartmouth-Hitchcock Medical Center
2:15 PM – 2:25 PM	Discussion
2:25 PM – 2:40 PM	*Lipoprotein(a) and Cardiovascular Risk after Acute Coronary Syndrome* **Vera Bittner, MD, MPH,** Professor of Medicine, University of Alabama at Birmingham
2:40 PM – 2:50 PM	Discussion
2:50 PM – 3:15 PM	**Break**
3:15 PM – 3:30 PM	*Can less be More in DAPT after PCI? Lessons learned* **Roxana Mehran, MD** Professor of Medicine, Icahn School of Medicine at Mount Sinai
3:30 PM – 3:40 PM	Discussion
3:40 PM – 3:55 PM	*Biomarkers and Cardiac Transplantation* **Howard J. Eisen, MD,** Professor of Medicine, Penn State Heart and Valve Institute

3:55 PM – 4:05 PM	Discussion
4:05 PM – 4:20 PM	*QT Variability as a Potential Mechanism Contributing to Sudden Cardiac Death in People Living with HIV* **Wendy S. Post, MD** Director of Cardiovascular Research, Division of Cardiology, Professor of Medicine and Epidemiology, Johns Hopkins Hospital
4:20 PM – 4:30 PM	Discussion
4:30 PM – 4:45 PM	*Unraveling the Life Course of Cardiovascular Health: Outcomes, Determinants, and Mechanisms* **Donald M. Lloyd-Jones, MD,** Chair, Department of Preventive Medicine, Northwestern University Feinberg School of Medicine
4:45 PM – 4:55 PM	Discussion
4:55 PM – 5:10 PM	*Computational Approaches to Treat Rhythm Disorders* **Gregory F. Michaud, MD,** Professor of Medicine, Director, Section of Cardiac Electrophysiology, Vanderbilt University Medical Center
5:10 PM – 5:20 PM	Discussion
5:20 PM	**Adjourn for the day**
7:00 PM – 11:00 PM	**RECEPTION AND BLACK-TIE DINNER**
7:00 PM – 8:00 PM	**Reception** Location: RC Ballroom Terrace
8:00 PM – 11:00 PM	**Dinner** Location: The Ritz- Carlton Ballroom

Friday, January 17, 2020

7:00 AM – 8:00 AM	**Continental Breakfast** Location: Tortolita Ballroom Pre-Function
8:00 AM – 9:00 AM	**Business Meeting** Location: The Tortolita Ballroom Honoring Longstanding Members Memorials Election of New Members

	Election of Officers
	Budget
9:00 AM – 11:50 AM	**Scientific Session Day Two**
	Location: The Tortolita Ballroom
9:00 AM – 9:15 AM	*The Project Baseline Health Study*
	Kenneth W. Mahaffey, MD, Professor of Cardiovascular Medicine, Stanford University School of Medicine
9:15 AM – 9:25 AM	Discussion
9:25 AM – 9:40 AM	*Optimal care pathway for CV Screening prior to Liver Transplantation*
	Vincent L. Sorrell, MD, Professor of Medicine, University of Kentucky
9:40 AM – 9:50 AM	Discussion
9:50 AM – 10:05 AM	*Exploring the Contemporary Role for Revascularization in Patients with Ischemic Cardiomyopathy*
	Eric J. Velazquez, MD, Professor of Medicine, Yale University School of Medicine
10:05 AM – 10:15 AM	Discussion
10:15 AM – 10:35 AM	**Break**
10:35 AM – 10:50 AM	*Results of an Expert Consensus Survey on the Treatment of Pulmonary Arterial Hypertension with Oral Prostacyclin Pathway Agents*
	Vallerie V. McLaughlin, MD, Kim A. Eagle Professor of Cardiovascular Medicine, Director of the Pulmonary Hypertension Program, University of Michigan
10:50 AM – 11:00 AM	Discussion
11:00 AM – 11:15 AM	*Mechanisms of Atrial and Ventricular Arrhythmias*
	Sanjiv Narayan, MD, Professor of Medicine, Stanford University Medical Center
11:15 AM – 11:25 AM	Discussion
11:25 AM	**Meeting Adjourns**

Featured Lecture:
Health haves, health have nots, and cardiovascular disease

Sandro Galea, MD, MPH, DrPH
Dean and Robert A. Knox Professor of the Boston University School of Public Health

Sandro Galea, a physician, epidemiologist, and author, is Dean and Robert A. Knox Professor at Boston University School of Public Health. He previously held academic and leadership positions at Columbia University, the University of Michigan, and the New York Academy of Medicine. He has published extensively in the peer-reviewed literature and is a regular contributor to a range of public media. He has been listed as one of the most widely cited scholars in the social sciences. He is chair of the board of the Association of Schools and Programs of Public Health and past president of the Society for Epidemiologic Research and of the Interdisciplinary Association for Population Health Science. He is an elected member of the National Academy of Medicine. Dr Galea has received several lifetime achievement awards. Dr Galea holds a medical degree from the University of Toronto, graduate degrees from Harvard University and Columbia University, and an honorary doctorate from the University of Glasgow.

The 31st GEORGE BURCH MEMORIAL LECTURE:

An Evolving Healthcare Paradigm: Leveraging Root Cause

Thea James, MD

Vice President of Mission and Associate Chief Medical Officer, Boston Medical Center

Thea James, MD, is Vice President of Mission and Associate Chief Medical Officer at Boston Medical Center (**BMC**). She is an Associate Professor of Emergency Medicine and Director of the Violence Intervention Advocacy Program at BMC. Dr. James is a founding member of the National Network of Hospital-Based Violence Intervention Advocacy Programs (NNHVIP). In 2011 she was appointed to Attorney General Eric Holder's National Task Force on Children Exposed to Violence.

As Vice President of Mission Dr. James works with caregivers throughout BMC. Additionally, she has primary responsibility for coordinating and maximizing BMC's relationships and strategic alliances with a wide range of local, state, and national organizations including community agencies, housing advocates, and others that partner with BMC to meet the full spectrum of patients' needs. The goal is to foster innovative and effective new models of care that are essential for patients and communities to thrive. Integrating upstream interventions into BMC's clinical care models are critical to achieve equity and health in the broadest sense.

Dr. James served on the Massachusetts Board of Registration in Medicine 2009-2012, where she served as chair of the Licensing Committee. She is 2008 awardee of Boston Public Health Commission's Mulligan Award for public service, and a 2012 recipient of the Suffolk County District Attorney's Role Model Award. She received The Boston Business Journal Healthcare Hero award in 2012 & 2015. She was 2014 recipient of the Schwartz Center Compassionate Care Award. The Boston Chamber of commerce awarded Dr. James with the Pinnacle Award in 2015, which honors women in business and the professions. Dr. James was awarded the 2019 Leadership in Medicine Award by the Massachusetts Public Health Association.

Dr. James' passion is in Public Health both domestically and globally. For many years she and colleagues partnered with local international partners in Haiti and Africa, to conduct sustainable projects. She is a member of the Board of Directors of Equal Health. Equal Health works with local partners in Haiti to create strong, sustainable medical and nursing education systems.

Dr. James served as a Supervising Medical Officer on the Boston Disaster Medical Assistance Team (MA-1 DMAT), under the Department of Health and Human Services. She has deployed to post 9/11 in NYC, Hurricane Katrina in New Orleans in 2005, Bam, Iran after the 2003 earthquake, and Port-Au-Prince Haiti after the earthquake of 2010. Dr. James traveled to Haiti with MA-1 DMAT one day after the 2010 earthquake.

A graduate of Georgetown University School of Medicine, James trained in Emergency Medicine at Boston City Hospital, where she was a chief resident.

Association of AUC University Cardiologists

The Hospital Readmissions Reduction Program: Net Harm

Gregg C. Fonarow, MD, UCLA Division of Cardiology

Starting in 2007, the Centers for Medicaid and Medicare Services (CMS) sought to reduce early readmissions for common medical conditions among Medicare beneficiaries. The policy approaches used by CMS included increasing transparency through public reporting of hospital 30-day risk standardized readmission rates (2007-2009 discharges) starting in 2009 and providing financial incentives tied to readmissions though the Hospital Readmissions Reduction Program (HRRP). The HRRP imposed financial penalties on hospitals based on rates of 30-day risk standardized readmission for heart failure, acute myocardial infarction, and pneumonia, with up to 3% of a hospital's total Medicare revenue from admissions for any condition at risk.

The introduction of HRRP was associated with reductions in readmissions nationally and the program has been declared by policymakers to be a success, worthy of expansion. From the inception of the 30-day readmission measure for public reporting and the HRRP, significant concerns have been raised regarding this being an accurate measure of hospital quality and a valid basis for financial penalties to be applied. This policy has provided strong financial incentives for hospitals to reduce 30-day readmission rates of target conditions, but it has been implemented without any additional resources being provided to hospitals, without the provision of any evidence-based guidance on how to safely and effectively achieve the stated readmission goals, and without any prospective testing.

Evidence has emerged suggesting the concerns regarding potential unintended consequences of the HRRP may have been justified. While associated with reductions in 30-day inpatient readmissions for all 3 initially targeted conditions, HRRP was also associated with an increase in unadjusted and risk adjusted post-discharge mortality in patients with heart failure, the patient population potentially most vulnerable to alterations in care. An analysis of clinical data from Get With Guidelines-Heart Failure linked to Medicare data demonstrated an increase in 30-day and 1-year mortality associated with implementation of HRRP. Evaluation of the full Medicare database also revealed a similar 1.3% absolute increase in 30-day risk-adjusted mortality post-HRRP starting in 2010 in heart failure patients, whereas prior reports had indicated from 1999 to 2010 30-day unadjusted and risk-adjusted mortality rates had been declining. Additional studies have reported an increase in risk-adjusted mortality whether analyzed 30-days from admission or 30-days from discharge.

Irrespective of what may have been intended with the policy, there is no evidence that patients have benefited from the HRRP. Yet, there is now independently corroborated evidence that the HRRP was associated with increased post-discharge mortality among patients with heart failure and recent evidence that HRRP was also associated with increased mortality among patients hospitalized with pneumonia. In light of these findings, it is incumbent upon academic leaders, Congress, and CMS to initiate an expeditious reconsideration and revision of this policy.

Anthracycline-induced cardiotoxicity: Mechanism and Prevention

Edward TH Yeh, MD, University of Missouri School of Medicine

The first anthracycline was reported in 1963 and this class of chemotherapy has remained the main ingredients of cancer treatment protocols for many cancer types. However, the clinical usefulness of anthracycline is limited by a dose-dependent cardiotoxicity. Anthracycline is known to kill cancer cells by poisoning topoisomerase 2a, a critical enzyme responsible for DNA replication. Since cardiomyocytes are terminally differentiated, the cause of cardiotoxicity was attributed to generating of reactive oxygen species and amplification by iron. However, anti-oxidants and iron-chelators failed to ameliorate anthracycline-induced cardiotoxicity. The only drug effective in ameliorating cardiotoxicity is dexrazoxane, a catalytic inhibitor of topoisomerase 2a and 2b. It is known that adult cardiomyocytes express topoisomerase 2b, but not 2a. Using genetic models, we demonstrated that deletion of topoisomerase 2b in the cardiomyocytes prevents anthracycline-induced DNA double strand breaks, generation of reactive oxygen species, and mitochondriopathy (Nature Medicine 18:1639, 2012). Thus, topoisomerase 2b is the molecular basis of anthracycline-induced cardiotoxicity that accounts the pathologic changes and clinical efficacy of dexrazoxane. I will discuss new data on mechanism-based prevention of this dreaded complication.

Use of an ABCDEF Approach for Primary & Secondary Cardiovascular Disease Prevention

Roger S. Blumenthal, MD, Johns Hopkins University School of Medicine

Routine use of an "ABCDEF" approach for the outpatient management of patients with, or at risk for, cardiovascular disease (CVD) can help clinicians keep track of the latest prevention-related guidelines. The most important way to prevent CVD is to promote a healthy lifestyle throughout life and evaluate social determinants of health, which inform optimal implementation of treatment recommendations. Assess for psychosocial stressors and refer for appropriate counseling. Health literacy should be assessed to maximize effectiveness. Otherwise, the core clinical considerations are captured by the ABCDEF approach.

A: Assessment of atherosclerotic CVD (ASCVD) risk with the pooled cohort equations (PCE). Low risk is <5% 10-yr risk, Borderline/Intermediate risk is 5-<20%, High risk is 20%. Use CHA2DS2-VASc score if history of atrial fibrillation.

Antiplatelet/Anticoagulant Rx: use low dose aspirin if clinical ASCVD (including peripheral artery disease) +/- P2Y12 inhibitor if recent arterial revascularization. Aspirin no longer recommended routinely in primary prevention, but may be used selectively in adults younger than 70. For atrial fibrillation with elevated CHAD2DS2-VASC score, use anticoagulation with a direct oral anticoagulant or warfarin.

B: Blood Pressure (BP): target <130/80. Always focus on non-pharmacological interventions. Add drug treatment for BP >140/90 for low risk or >130/80 among patients with PCE >10%.

C. Cholesterol: For very high risk patients, use maximally-tolerated statin first, followed by ezetimibe and then PCSK9i if LDL-C still >70mg/dl. In primary prevention, use statin for high risk individuals. Statins are also reasonable for borderline/intermediate risk patients when guided by shared decision making. Use PCE-estimated risk and risk-enhancing factors to justify initiation of moderate-intensity or higher-dose statin; consider selective use of coronary artery calcium (CAC) score if risk uncertainty. The absence of CAC can justify postponing statin use for several years if LDL-C is at a reasonable level. Cigarette/Tobacco cessation: Motivational interviewing & pharmacotherapy (nicotine replacement ± varenicline or buproprion). Assess at every health care visit for tobacco use or exposure. Arrangement for individualized and/or group social support counseling.

D. Diet/Weight. Calculate BMI & measure waist circumference. Encourage increased consumption of fruits, vegetables, legumes, whole grains, lean vegetable or animal protein, fish, and nuts; minimize trans fats, refined carbohydrates, red meats, processed red meats, sweetened beverages, and sodium. Counseling and caloric restriction are recommended for maintaining weight loss.

Diabetes/Prediabetes: Improve dietary and exercise habits. Metformin is first-line drug Rx, followed by consideration of SGLT-2 inhibitor or GLP-1R agonist to improve glycemic control & reduce CVD risk. CVD risk enhancers in diabetes include long diabetes duration, albuminuria, eGFR<60, retinopathy, neuropathy, and ABI<0.9. ACEI/ARB is first line for BP control.

E. Exercise: target >150 minutes/week of moderate-intensity or >75 minutes/week of vigorous-intensity physical activity. Any moderate-intensity physical activity, even if less than recommended, will be beneficial. Reduce sedentary time

F. Heart Failure: ACEI/ARB/Aldosterone antagonist/ARNI should be considered. Consider ICD for those with persistently reduced EF despite optimal medical therapy

Mitral Valve Deformation during the Cardiac Cycle in Health and Disease

William A. Zoghbi MD, MACC, Houston Methodist DeBakey Heart & Vascular Center

Our Laboratory has had a longstanding interest in the structure and function of the mitral valve (MV) apparatus. Few data exist on mitral valve deformation (strain) during systole in humans, the majority being in animal models. Recently, 3D echocardiography has allowed for dynamic MV imaging with high resolution, enabling digital modeling of MV function.

In collaboration with Investigators from the University of Houston Mathematics Department, we developed proprietary software to construct patient-specific modeling of the mitral valve during the cardiac cycle. This allowed the quantitation of MV geometry and MV strain during the cardiac cycle. We prospectively studied patients undergoing transesophageal echocardiography to evaluate valve deformation and assess the determinants of MV strain. Patients with normal MV, mitral valve prolapse (MVP) with and without significant mitral regurgitation (MR), and those with secondary mitral regurgitation were enrolled.

MV annular dimensions were largest in patients with MVP+MR and were comparable in normals versus patients with MVP with no or mild MR. Similarly, MV leaflet areas were largest in MVP+MR. Mitral valve strain was overall highest in MVP+MR and lowest in normals. In all individuals, leaflet strain was larger in the posterior leaflet compared to the anterior leaflet. Patients with secondary mitral regurgitation had overall similar strain to those with normal valves. On multivariable analysis, after adjusting for clinical and MV geometric parameters, leaflet thickness was the main measure that significantly correlated with MV strain. In a small subgroup with MVP+MR, MV repair with valve preservation techniques decreased MV strain to normal.

Thus, mitral valve deformation in man during systole is largest in the posterior leaflet, irrespective of the presence or absence of mitral valve pathology. In patients with MVP and myxomatous disease, MV strain is larger than in normal valves, and is worst in patients with concomitant significant mitral regurgitation. The major determinant of mitral valve deformation is mitral valve thickness, a surrogate of mitral valve pathology. Mitral valve strain decreases significantly in patients with MVP+MR after MV repair. These observations may explain the predilection of mitral annular calcifications to the posterior leaflet and the higher incidence of MV prolapse and flail in the posterior leaflet. Whether the reduction in MV strain after MV repair relates to long term prognosis remains to be determined.

(Re)Defining, Achieving and Maintaining Competency in Cardiovascular Training and Practice

Jeffrey T. Kuvin, MD, Dartmouth-Hitchcock Medical Center

Today's cardiologists practice in a world of evidence-based information utilizing highly-advanced therapies in highly complex patients. It is critical that providers caring for cardiovascular patients appropriately use their knowledge, skills and attitudes, and remain competent throughout their careers in the area(s) in which they practice. How cardiovascular provider competency is defined, measured, achieved and maintained has not typically been standardized. Historically, achievement of competency in medicine has focused on specific periods of time spent in training or practice, numbers of procedures performed, and passing of periodic knowledge-based, secured examinations. More recently, assessment of competency has broadened to include patient surveys and outcomes.

Defining clinical competency for cardiovascular specialists is necessary for the profession and is an imperative for the public. Assessment and maintenance of competency in cardiovascular training and practice continues to evolve. Present tools for cardiovascular trainees, such as the American College of Cardiology's (ACC) in-training examination, the updated Core Cardiovascular Training Statement (COCATS), and Accreditation Council for Graduate Medical Education (ACGME) Milestones help define competency during fellowship. Certification and maintenance of certification, typically assessed by the American Board of Internal Medicine, are competency evaluations based on a written examination. The ACC has now developed training and life-long lifelong learning competency statements in many areas within cardiovascular practice, including non-clinical competencies, which help level the playing field. How these competencies play a role in the ongoing evaluation and accreditation of physicians remains unclear.

The future of learning is personalized education and actionable knowledge. Therefore, innovative tools are needed to allow individuals to continually assess competency in a variety of areas, understand where gaps in knowledge exist, and importantly, find ways to educate and improve, all in an effort to provide safe and effective patient care. In this presentation, I will review established methods for measuring cardiovascular competency, explore novel methods to redefine what competence truly means, and highlight challenges clinicians face during a lifetime of learning.

Lipoprotein(a) and Cardiovascular Risk after Acute Coronary Syndrome

Vera Bittner, MD, University of Alabama at Birmingham

BACKGROUND: Lipoprotein(a) is a low density lipoprotein particle that contains apolipoprotein(a) and apolipoprotein B100 moieties. It has pro-atherogenic, pro-thrombotic, pro-inflammatory and pro-oxidative properties. High levels of lipoprotein(a) have been associated with incident cardiovascular disease and with risk of recurrent events among individuals with coronary heart disease. Proprotein convertase subtilisin–kexin type 9 inhibitors lower lipoprotein(a) and low-density lipoprotein cholesterol (LDL-C).

OBJECTIVES: In a prespecified analysis of the placebo-controlled ODYSSEY OUTCOMES trial in patients with recent acute coronary syndrome, we determined whether alirocumab-induced changes in lipoprotein(a) and LDL-C independently predicted major adverse cardiovascular events (MACE).

METHODS: 18,924 patients with recent acute coronary syndrome on high-intensity or maximally tolerated statin therapy were randomized to alirocumab or placebo and followed for a median of 2.8 years. Lipoprotein(a) was measured at randomization and 4 and 12 months thereafter. The primary MACE outcome was coronary heart disease death, nonfatal myocardial infarction, ischemic stroke, or hospitalization for unstable angina.

RESULTS: Baseline lipoprotein(a) levels (median 21.2 [interquartile range 6.7-59.6] mg/dl) and LDL-C (corrected for cholesterol content in lipoprotein(a)) predicted MACE. In the placebo group, individuals in the highest (compared to the lowest) quartile of lipoprotein(a) were 46% more likely to experience MACE. Alirocumab reduced lipoprotein(a) by 5.0 [0-13.5] mg/dl, corrected LDL-C by 51.1 [33.7-67.2] mg/dl, and risk of MACE (HR: 0.85; 95% CI: 0.78 to 0.93). Alirocumab-induced reductions of lipoprotein(a) and corrected LDL-C independently predicted lower risk of MACE, after adjustment for baseline concentrations of both lipoproteins and demographic and clinical characteristics.

CONCLUSIONS: Baseline lipoprotein(a) and corrected LDL-C levels and their reductions by alirocumab predict the risk of MACE after recent acute coronary syndrome. Lipoprotein(a) lowering by alirocumab is an independent contributor to MACE reduction, suggesting lipoprotein(a) as an independent treatment target after acute coronary syndrome.

Can less be More in DAPT after PCI? Lessons learned

Roxana Mehran, MD, Icahn School of Medicine at Mount Sinai

Continuous advancements in percutaneous revascularization techniques has allowed expanding treatment indication to patients previously considered inoperable. However, such vulnerable subjects have an increased risk for periprocedural and long-term complications that could potentially offset the benefit of coronary revascularization.
Occurrence of acute kidney injury due to contrast media administration following percutaneous coronary intervention (PCI) has been listed as a major complication by the National Cardiovascular Data Registry. Although the incidence of contrast induced nephropathy has declined in recent years, it still remains associated with accelerated progression of underlying chronic kidney disease and mortality. For this reason, several risk-prediction models have been developed to help clinicians identify clinical variables characterizing patients at risk.

Bleeding after PCI represents another fearful complication. It may arise from either periprocedural vascular complications or long-term antithrombotic therapy. Post-PCI bleeding has been shown to impact on survival to a similar extent as myocardial infarction. Multiple mechanisms may be involved. Among those, dual antiplatelet therapy (DAPT) non-adherence plays a major role by triggering recurrent thrombotic events. Hence, a need for careful monitoring of bleeding complications has been emphasized by academic and scientific organizations. The Bleeding Academic Research Consortium (BARC) represented the first formal attempt to provide standardized definitions of bleeding events grading them according to their severity. The aim of this initiative was to promote consistency and interpretability of clinical research on bleeding risk in the modern era of PCI.

As clinicians' primary imperative remains primum non nocere, identification of patients at high bleeding risk (HBR) is crucial to optimize antithrombotic therapy. Different risk scores to predict the patients' bleeding risk and inform decision-making are currently available. However, most of these scores were derived from clinical trials on low-risk populations that limit their predictive value and clinical applicability in real-world scenarios. To address this issue, the Academic Research Consortium for HBR recently provided a consensus-based document with a list of twenty clinical criteria, classified as either major or minor, to define HBR patients. These criteria represent a useful tool for point-of-care clinical assessment, and their widespread use promises consistency in future research on HBR patients undergoing PCI.

Current guidelines recommend shorter DAPT duration followed by aspirin monotherapy for patients in whom the bleeding risk is thought to outweigh the ischemic risk. Nonetheless, HBR patients also experience higher rates of recurrent thrombotic events, further enhanced by the prescription of less intense antiplatelet regimens. In this context, prolonging the use of P2Y12 inhibitors after early aspirin discontinuation may constitute an appealing therapeutic option to reduce bleeding risk while preserving ischemic protection. Such hypothesis has been tested in the TWILIGHT trial, which randomized more than 7,000 high-risk PCI patients discharged on aspirin and ticagrelor to either stop or continue aspirin after 3 months. Results from this trial demonstrated that among high-risk PCI patients, early aspirin discontinuation followed by ticagrelor monotherapy significantly reduced the risk of bleeding complications without a concomitant increase in thrombotic events compared to DAPT.

Biomarkers and Cardiac Transplantation

Howard J. Eisen, MD, Penn State Heart and Valve Institute

Acute cellular rejection is a major cause of morbidity and mortality in cardiac transplant recipients. The immunosuppression that is the cornerstone of post-transplant therapy is directed at blunting the allo-immune response to the cardiac transplant. While these therapies have become very successful at blunting the allo-immune response and preserving allograft function, continued monitoring of the presence of acute cellular rejection is important in guiding post-transplant therapy. Since the early 1970s, the mainstay of determining the presence of acute cellular rejection is endomyocardial biopsy where several pieces of cardiac tissue are obtained and severity of rejection is graded by extent of lymphocytic cell infiltration and myocyte necrosis. This procedure is invasive and expensive and highly subjective to interpretation. It is also uncomfortable and not well liked by patients. Highly reliable, noninvasive approaches for detecting acute cellular rejection would be very desirable. One such approach is to assess gene expression profiling of the genes in peripheral blood monocytes, many of which are the cells that mediate acute cellular rejection. This approach which has become commercially available was able to provide a high negative predictive value for the presence of biopsy documented ISHLT Grade >2R rejection which is the threshold for treatment ($p<0.001$). This test can be used as a screen for determining whether a patient needs an endomyocardial biopsy. Head to head comparisons of gene expression profiling to endomyocardial biopsy driven managment showed no difference in clinical outcomes in heart transplant recipients (Pham M et al. N Engl J Med. 2010;362:1890-900; Kobashigawa J. et al, Circ Heart Fail 2015;8:557-564). This gene expression profiling test does not detect antibody mediated rejection or cardiac allograft vasculopathy. A marker of myocardial tissue injury, caused by both of these diseases can be detected by elevations in donor derived cell free DNA in the serum and this has been shown to detect the presence of antibody mediated rejection. An ongoing study is evaluating the utility of donor derived cell free DNA to noninvasively detect cardiac allograft vasculopathy. Ongoing studies of micro-RNA and exosomes as biomarkers of cardiac allograft vasculopathy are underway.

QT Variability as a Potential Mechanism Contributing to Sudden Cardiac Death in People Living with HIV

Wendy S. Post, MD, Johns Hopkins Hospital

Background: People living with human immunodeficiency virus (HIV+) have greater risk for sudden arrhythmic death than HIV-uninfected (HIV-) individuals. HIV-associated abnormal cardiac repolarization may contribute to this risk. We investigated whether HIV serostatus is associated with ventricular repolarization lability using QT variability index (QTVI), defined as a log measure of QT interval variance indexed to heart rate (HR) variance.

Methods: We studied 1123 men (589 HIV+ and 534 HIV-) from the Multicenter AIDS Cohort Study (MACS), using the ZioXT® ambulatory electrocardiography (ECG) patch. Beat-to-beat analysis of up to 4 full days of ECG data per participant were performed using an automated algorithm [median analyzed duration (Q1-Q3): 78.3 (66.3-83.0) hours/person]. QTVI was modeled using linear mixed-effects models adjusted for demographics, cardiac risk factors, and HIV-related and inflammatory biomarkers.

Results: Mean (SD) age was 60.1 (11.9) years among HIV- and 54.2 (11.2) years among HIV+ participants ($p<0.001$), 83% of whom had undetectable (<20 copies/ml) HIV-1 viral load (VL). Compared to HIV- men, HIV+ men had higher QTVI [adjusted difference of +0.077 (95% CI: +0.032 to +0.123)]. Magnitude of this association depended on the degree of viremia such that in HIV+ men with undetectable VL, adjusted QTVI was +0.064 (95% CI: +0.017 to +0.111) higher compared to HIV- men, while in HIV+ men with detectable VL adjusted QTVI was higher by +0.150 (95% CI: 0.072-0.228) compared to HIV- referents. Analysis of QTVI subcomponents showed HIV+ men had: (1) lower HR variability irrespective of VL status, and (2) higher QT variability if they had detectable—but not with undetectable—VL, when compared to HIV- men. Higher levels of C-reactive protein (CRP), interleukin-6 (IL-6), intercellular adhesion molecule (ICAM)-1, soluble tumor necrosis factor (TNF)-receptor 2, and soluble cluster of differentiation (CD)-163 (borderline), were associated with higher QTVI and partially attenuated the association with HIV serostatus.

Conclusions: HIV+ men have greater beat-to-beat variability in QT interval (QTVI) compared to HIV- men, especially in the setting of HIV viremia and heightened inflammation. Among HIV+ men, higher QTVI suggests ventricular repolarization lability which can increase susceptibility to arrhythmias, while lower HR variability signals a component of autonomic dysfunction.

Unraveling the Life Course of Cardiovascular Health: Outcomes, Determinants, and Mechanisms

Donald M. Lloyd-Jones, MD, Northwestern University Feinberg School of Medicine

Cardiovascular diseases (CVDs) remain the leading cause of death and disability in the world, despite dramatic advances in prevention and treatment over the last several decades. Much of the focus, however, has been palliative and remedial, rather than primordial, leading to diminishing returns in risk reduction. In 2010, I led a committee for the American Heart Association that changed the paradigm, creating a bold new focus on "cardiovascular health" (CVH) promotion in addition to CVD risk reduction. This novel construct of CVH can be measured in individuals and populations, monitored over time, and modified to improve outcomes. Classification of CVH is determined through measurement of 7 health behaviors and health factors, including diet quality, amount of physical activity, smoking status, body weight, blood cholesterol, blood pressure, and blood glucose levels; overall CVH can be characterized by a 14-point score representing the sum of these metrics. An individual's stock of CVH is highest at birth, but is typically attenuated throughout the lifespan.

Our group at Northwestern has led the focus in defining CVH across the life course and understanding its outcomes, correlates, determinants, and mechanisms. Higher CVH in young adulthood and middle age has been associated with numerous positive "downstream" health outcomes related to longevity, healthy longevity, avoidance of morbidity (including CVD, cancer, kidney disease, dementia, depression, and other chronic diseases), compression of morbidity, better quality of life, and lower healthcare costs. Such beneficial outcomes do not appear to be accomplished through avoidance of subclinical cardiovascular changes, but rather through development of more benign forms of atherosclerosis.

At the same time, maintenance of higher CVH into young adulthood and middle age has been associated with a broad range of "upstream" lifestyle factors, psychosocial factors, and social determinants of health, indicating its modifiability and plasticity. We have demonstrated that the heritability of CVH as a trait in middle age among related individuals is modest, indicating substantial influence by earlier life environmental and behavioral factors. Recent work by our team has defined early life trajectories of CVH for the first time. These data indicate that there are several distinct trajectories of CVH from at least age 8 years onward, and that there appears to be a significant downward inflection point in CVH scores in the late teens and early 20s, suggesting a critical period for the study of CVH. We have also observed that CVH trajectory group membership in young adulthood is associated with distinct patterns of epigenetic modification and acceleration/deceleration of epigenetic age, a marker of physiologic aging.

Thus, measurement of CVH allows unique insight into the life course and mechanisms of CVH and CVD, and it is catalyzing critical interest in primordial prevention strategies to maintain high CVH into middle age and achieve longer, healthier lives.

Can Atrial Fibrillation Be Prevented?

Gregory F. Michaud, MD, Vanderbilt University Medical Center

The incidence of atrial fibrillation (AF) is increasing worldwide and is the most frequently treated and costly arrhythmia. AF is associated with stroke, heart failure and death. AF prevention may be a more effective strategy to avoid these costly downstream consequences.

Risk factors for atrial fibrillation are numerous and include underlying structural heart disease, obesity, hypertension, diabetes mellitus and inflammation, among others. Risk factor modification, including weight loss and exercise, aggressive treatment of hypertension and lowering A1C have been shown to lower future risk of AF. Upstream therapies aimed at the renin-angiotensin system (ACE Inhibitors and ARBs) and inflammatory pathways (atorvastatin, omega 3 FAs, colchicine and corticosteroids) have produced mixed results.

In this presentation I will review briefly the most important data regarding AF prevention and highlight work we are doing as part of an AHA SFRN grant. We are studying the anti-inflammatory effects of a naturally occurring molecule, 2-HOBA, in preventing acute AF following catheter ablation. 2-HOBA (or a molecule like it) can be administered orally with probably acceptable long-term tolerance. Unlike colchicine and corticosteroids, 2-HOBA does not prevent oxidation, but scavenges oxidation products that crosslink and adduct proteins, rendering them dysfunctional. I will present data from mouse models as well as outline our clinical study.

The Project Baseline Health Study

Kenneth W Mahaffey, MD, Stanford University School of Medicine

The Project Baseline Health Study (PBHS) was started from a collaborative partnership with Stanford University, Duke University and Verily (formerly Google Life Sciences) to map human health. The PBHS is a prospective, multicenter, longitudinal cohort study that aims to enroll thousands of diverse participants who represent the United States population and the entire health spectrum. Participants will include those without known disease and those with or at risk for cardiovascular disease or specific cancers. These participants will be evaluated initially and then annually with the collection of clinical, molecular, imaging, functional and with continuous sensor data. Periodic self-reported information about behavioral, psychological, socioeconomic, environmental, and other health-related factors and values will also be collected. Thus, PBHS will contribute to the creation of a biomedical information system that accounts for the highly complex interplay between the multi-dimensional data elements that will be aggregated. Understanding the participant perspectives about clinical research and a developing a thoughtful, comprehensive program for return of results to the participants is also a fundamental objective of the PBHS investigators. An initial deeply phenotyped cohort will help guide the evolution of the PBHS to eventually include a larger virtual cohort as data are continually collected, collated and analyzed. Ultimately the PBHS investigators hope to partner through open data sharing with others to leverage knowledge gained to identify new approaches to precision health.

Optimal care pathway for CV Screening prior to Liver Transplantation

Vincent L Sorrell, MD, University of Kentucky

As the Chair of Cardiovascular Imaging for the UK Enterprise, I oversee all types of noninvasive cardiac imaging including Nuclear Medicine, Echocardiography, Cardiovascular CT and MRI. From my early career experiences running a multimodality imaging lab (at the time, only nuclear & echo) and also the Chief of the Division, I became interested in the ability to match imaging with outcomes. I quickly recognized that conventional clinical practices had flaws and a better workflow structure that incorporated all aspects of the patient experience (including the perspective from all stake holders) would be beneficial.

I established a 1st generation 3D echo lab (1995) that performed off-line processing in a 3D lab (adjacent to the echo lab) and then sent these 'near-live' 3DE images to the OR for display on a large monitor (plasma screen) prior to Robotic (1st generation DaVinci) surgery (we performed the 1st robotic MV repair and 1st robotic MV replacement with this set-up). That taught me that conventional approaches could be improved through innovation and effort. We became the central hub for DaVinci robotic training programs throughout the country.

At the University of Arizona, I expanded my MMI skill set to include Cardiovascular MRI & CT and combined Cardiology with Radiology to create a CV Imaging Specialist gate-keeper practice. I started an Imaging Consultant hotline and an advanced fellowship training program. We entertained many visitors from other Universities interested in creating their own Collaborative Cards/Rads program modeled after our successes. My research was focused on using CV imaging in prediction of Sudden Cardiac Death and optimal Continuous Chest Compression (Hands-Only CPR). We obtained the currently accepted model of sustained untreated VF leading to stone heart and impact of mild hypothermia.

Since arriving at UK, I have expanded this collaborative experience into an even greater role for CV Imaging implementation to existing basic, clinical, and translational programs aimed at slowly establishing the link between imaging and outcomes. This ACI (Advanced CV Imaging) clinical and educational program has expanded to a Directors Council (Lab Directors from all imaging labs) who meet regularly to understand best practices, successes, and failures from each other and to coordinate efforts aimed an selected Optimal Clinical Pathways (OCPs). These OCPs are chosen by clinical volumes, impact to the UKH Enterprise, current practice variability, proven accuracy of diagnostic options, and stake-holder buy-in.

I will present how we created one of these OCPs (*approach to CV screening for ESLD*) and highlight some early data during my UAC presentation.

Exploring the Contemporary Role for Revascularization in Patients with Ischemic Cardiomyopathy

Eric J. Velazquez, MD, Yale University School of Medicine

Dr. George Burch, founder of the Association of University Cardiologists, initially reported on the syndrome of ischemic cardiomyopathy in the early 1970s as myocardial dysfunction that results from occlusive coronary disease. He went onto to describe the dire clinical course of the patients afflicted writing that “once damage has occurred to the extent of the ischemic cardiomyopathy described… the disease is irreversible even with absolute bed rest.” While ischemic cardiomyopathy remains today as then the most common cause of cardiomyopathy worldwide, much has changed in its management with fortunately corresponding improvements in clinical outcomes. Advances in pharmacological and device therapies, diagnostic imaging, and procedural approaches to revascularization of coronary disease associated with left ventricular dysfunction are now available. Until recently the paucity of high-quality evidence resisted the establishment of systematic multifaceted strategies to the care of such patients. Pursuing various methods including the use of observational analyses of available cohorts and the execution of a randomized controlled trial, a multidisciplinary collaborative investigated the syndrome of ischemic cardiomyopathy with a focus on the role of surgical revascularization. These studies culminated in the completion of the Surgical Treatment of Ischemic Heart Failure (STICH) program. The STICH results, several which have challenged pre-existing dogma, have established a new knowledge-base for care guidelines. The historical context, results and implications of the STICH program will be explored along insights shared that may stimulate the future inquiry needed to further reduce morbidity and mortality and improve quality of life of patients with ischemic cardiomyopathy.

Results of an Expert Consensus Survey on the Treatment of Pulmonary Arterial Hypertension with Oral Prostacyclin Pathway Agents

Vallerie V. McLaughlin, MD, University of Michigan

Background
Only 5 randomized trials of oral prostacyclin pathway agents (PPAs) have been reported to date, and these did not specifically characterize patients most suited to treatment. The Prostacyclin International Expert Panel (PIXEL) was convened to develop consensus opinions to aid clinicians prescribing oral PPAs.

Methods
An electronic survey was used to collect PIXEL input on the most important patient/disease factors to consider when deciding to add an oral PPA to background therapy with an endothelin receptor antagonist (ERA) plus a phosphodiesterase type 5 inhibitor (PDE5i). This information was then used to create case scenarios. The RAND/UCLA Appropriateness Method and nominal group technique were used to reach agreement on case scenarios in which a PPA should be considered.

Results
The initial survey identified several factors which the PIXEL group considers most important when prescribing oral PPAs: PAH etiology, functional class [FC] (II or III), hemodynamics, hospitalization, right ventricle function, B-type natriuretic peptide (BNP)/N-terminal-pro-BNP level, and 6-minute walk distance (6MWD). PIXEL developed the following opinions regarding when to consider adding selexipag in patients being treated with an ERA + PDE5i. 1) In IPAH or CTD-associated PAH patients who have high-risk hemodynamics, parenteral prostacyclin is the treatment of choice. 2) In IPAH patients who have FC II symptoms and low-risk hemodynamics and hospitalization for PAH within the last 6 months; or if they had not been hospitalized, have moderate/severe RV dysfunction. 3) In IPAH patients who have FC II symptoms and intermediate-risk hemodynamics. 4) In IPAH patients who have FC III symptoms and low-risk hemodynamics. 5) In IPAH patients who have FC III symptoms and intermediate-risk hemodynamics and no hospitalization for PAH within the last 6 months; or if they had been hospitalized, have normal or mildly impaired RV function. 6) In CTD-PAH patients who have FC II symptoms and low-risk hemodynamics and hospitalization for PAH within the last 6 months; or if they had not been hospitalized, have any degree of RV dysfunction and abnormal BNP/NT-proBNP levels. 6) In CTD-PAH patients who have FC II symptoms and intermediate-risk hemodynamics. 7) In CTD-PAH patients who have FC III symptoms, low-risk hemodynamics and hospitalization for PAH within the last 6 months; or if they had not been hospitalized, have abnormal RV function and BNP/NT-proBNP levels, and 6MWD ≤440 m. 8) In CTD-PAH patients who have FC III symptoms, intermediate-risk hemodynamics and hospitalization for PAH within the last 6 months, but normal or mildly impaired RV function; or if they had not been hospitalized.

Conclusions
These recommendations are based on expert consensus opinion in the absence of clinical trial data and need to be validated in clinical trial settings.

Mechanisms of Atrial and Ventricular Arrhythmias

Sanjiv Narayan, MD, Stanford University School of Medicine

Sanjiv M. Narayan directs an NIH funded lab which conducts “bench-to-bedside research” on complex heart rhythm disorders in patients. Our focus is to apply bioengineering to detailed mapping of atrial fibrillation (AF) and ventricular tachy arrhythmias (VT/VF) to clarify mechanisms and guide management.

Tissue level mechanisms for AF. The electrical pathophysiology that predisposes to the onset and subsequent maintenance of AF are poorly understood. We extensively studied repolarization, conduction and propagation in both atria in patients with and without AF. We found ‘unstable’ atrial repolarization in AF patients compared to controls, with marked oscillations after ectopic beats even in sinus rhythm. Such patients also demonstrated rate-related slowing in left atrial conduction (restitution). In combination, these findings provide tissue-level electrical substrates for reentry that may explain AF onset and represent mechanistic phenotypes. Computational models are being used to suggest cellular mechanisms to explain these tissue mechanisms.

Identification of AF-sustaining mechanisms. We extended our studies of bi-atrial propagation patterns to ongoing AF, performing detailed mapping using contact catheters and patient-specific computer models in near-real-time. Our results were the first in humans to support the basic concept that chaotic waves in AF may in some cases not be chaotic or random, but instead be driven by localized focal or rotational drivers. Our results have recently been validated by concurrent optical mapping of human AF, and clinical studies by other groups using alternative techniques. Ablation of potential AF drivers is a highly active field, and has produced benefit in substudies of randomized trials although definitive evidence is awaited. We have developed machine learning to identify patients in whom AF drivers are important, and others in whom other mechanisms predominate. We have also used neural networks to predict cerebrovascular events based on observed patterns of AF on ambulatory monitoring.

Tissue level mechanisms for ventricular arrhythmias. VT/VF are predominant causes of sudden cardiac arrest (SCA), that affects over 250,000 individuals annually in the US alone. However, it is unclear if specific tissue-level electrical phenotypes can be described or predictive value. A primary focus has been to define in vivo abnormalities in the dynamics of action potentials, that define repolarization, and conduction preceding VT/VF in at-risk patients. We reported rate-related oscillations in ventricular repolarization preceding the onset of VT/VF that also predicted future SCA. Computer models show that these dynamics may reflect myocyte calcium overload. Localized electrical patterns could also be identified whose ablation prevented recurrence of VF. We have recently shown that supervised machine learning of intracardiac ventricular electrograms may predict SCA.

The work described would not be possible without Dr. Narayan’s dedicated team members including fellows, of whom >75% remain in academia and at least one has been awarded a research prize or funding each year since 2003. We have made software and data freely available online (http://narayanlab.stanford.edu).

Notes:

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