

EDITOR'S PAGE



Women in Interventional Cardiology

Past, Present, and Future—Small Numbers, Growing Impact



Jaya Chandrasekhar, MBBS, MS, Kamilia Moalem, BS, Birgit Vogel, MD, Roxana Mehran, MD

For this issue's Editor's Page, I invited one of the journal's Associate Editors, Dr. Roxana Mehran, and her colleagues to pen a page hailing great accomplishments of some of the women in cardiovascular medicine.

—David J. Moliterno, MD

Interventional cardiology has long been considered a man's specialty (1). Although more women are choosing to train in interventional cardiology, they remain a single-digit percentage of all interventional cardiologists, and prospective efforts are needed to increase their ranks (2,3). Despite the relatively small numbers, substantive contributions to the field have been made by female interventionalists, and in this column we attempt to highlight and pay homage to some of these accomplishments and the pioneers who are responsible for a growing impact. That impact covers the spectrum of patient care, education, research, and leadership in administration.

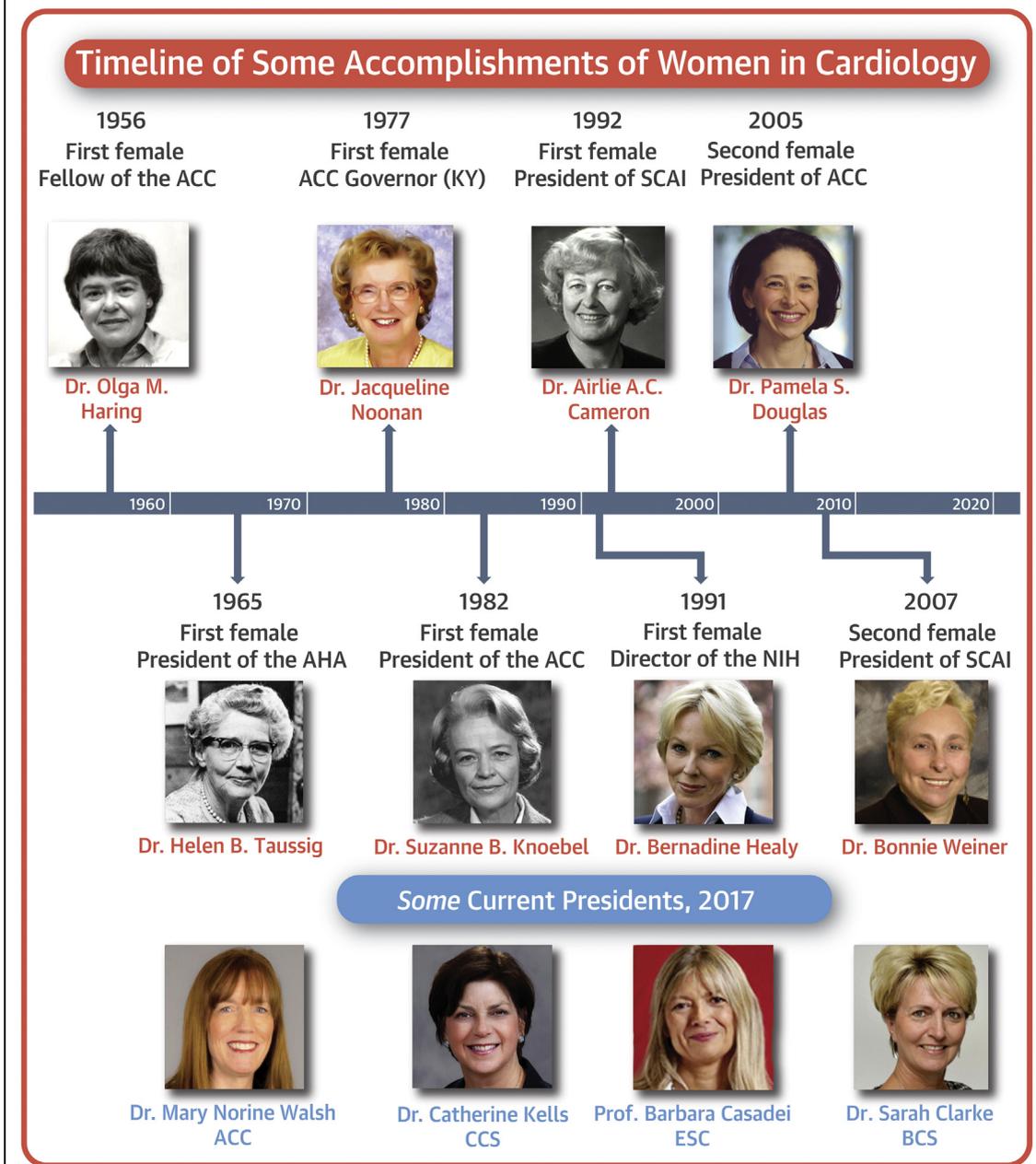
Female interventional cardiologists have made many sentinel contributions to patient care and

large-scale clinical trials (Online Appendix). For example, Dr. Cindy Grines in 1999 pioneered efforts to investigate primary percutaneous coronary intervention (PCI) with coronary stenting versus angioplasty for ST-segment elevation myocardial infarction in the PAMI (Primary Angioplasty in Myocardial Infarction) trial. Dr. Grines and her colleagues were also the first to study interhospital transfer to a PCI facility versus on-site thrombolysis for ST-segment elevation myocardial infarction. In 2002, Dr. Marie Claude Morice first studied the efficacy of drug-eluting stents (DES) in the RAVEL (A Randomised [double blind] study with the Sirolimus coated VElocity balloon expandable stent in the treatment of patients with De Novo native coronary artery Lesions) and REALITY (A Prospective, Randomized, Multi-Center Comparison of the Cypher Sirolimus-Eluting and the Taxus Paclitaxel-Eluting Stent Systems) trials. Dr. Morice also studied PCI without the need for chronic oral anticoagulation in the French MUST (Intracoronary stenting without coumadin) registry. She led the SYNTAX (Synergy between PCI with Taxus and Cardiac Surgery) trial as co-principal investigator, examining the outcomes of PCI versus coronary artery bypass surgery in patients with 3-vessel and/or left main coronary artery disease, the results of which not only changed the practice paradigm but also inspired subsequent trials, such as EXCEL (Evaluation of XIENCE versus Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization).

More recently, several female trialists have delved into key contemporary questions, such as the optimal duration of dual-antiplatelet therapy (DAPT) after DES implantation. In answer to a call from the U.S. Food and Drug Administration, Dr. Laura Mauri led the DAPT trial, while Prof. Martine Gilard led the ITALIC

From The Zena and Michael A. Wiener Cardiovascular Institute and The Icahn School of Medicine at Mount Sinai, New York, New York. Dr. Mehran has received institutional research grant support from AstraZeneca, Bayer, Beth Israel Deaconess, Bristol Myers-Squibb, CSL Behring, Eli Lilly/Daiichi-Sankyo, Medtronic, Novartis Pharmaceuticals, OrbusNeich; has served as a consultant for Abbott Vascular, American College of Cardiology, AstraZeneca, Boston Scientific, CardioKinetix, CSL Behring, Medscape, Shanghai BraccoSine Pharmaceutical, Spectranetics; has served on the advisory board for Bristol Myers-Squibb; has received institutional advisory board funding from Bristol-Myers Squibb; has received institutional funding from Claret Medical; owns equity in Claret Medical and Elixir Medical; has served on the executive committee for Janssen Pharmaceuticals and Osprey Medical; has served on the data safety monitoring board for Watermark Research Partners; and has a spouse who has served as a consultant for Abiomed and The Medicines Company. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

FIGURE 1 Chronological Overview of Women in Key Leadership Positions on Cardiovascular and Related Organizations



Timeline of some important recognitions of women in cardiology including appointments to leadership positions on international cardiovascular and related organizations. ACC = American College of Cardiology; AHA = American Heart Association; BCS = British Cardiovascular Society; CCS = Canadian Cardiovascular Society; ESC = European Society of Cardiology; NIH = National Institute of Health; SCAI = Society for Cardiac Angiography and Interventions.

(Is There A Life for DES after Discontinuation of Clopidogrel) trial. DAPT strategies continue to be examined with the ongoing TWILIGHT (Ticagrelor With Aspirin or Alone in High-Risk Patients After Coronary Intervention) trial, led by Dr. Roxana Mehran.

Research in other specific coronary conditions has been championed by women. Dr. Jacqueline Saw, Dr. Sharonne Hayes, and Dr. Marysia Tweet have directed major efforts in increasing awareness of spontaneous coronary artery dissection, while

Dr. Noel Bairey Merz, Dr. Martha Gulati, and others have drawn attention to ischemia in nonobstructive coronary artery disease. Sex-specific ischemic heart disease/PCI studies designed by the WISE (Women's Ischemia Syndrome Evaluation), VIRGO (Variation in Recovery: Role of Gender on Outcomes of Young AMI Patients), and GENESIS-PRAXY (GENdEr and Sex determinantS of cardiovascular disease: From bench to beyond-Premature Acute Coronary SYndrome) investigators also warrant serious commendation.

The proportion of patients in PCI trials who are female is generally 20% to 30%, and this smaller sample size adversely affects statistical power to show sex-related differences. The SCAI-WIN (Society for Cardiovascular Angiography and Interventions - Women In Innovations) group, cofounded by Dr. Mehran and Dr. Alaide Chieffo, set out a charter for female-focused research in interventional cardiology. As a result, several international investigators collaborated for a pooled dataset from 26 DES trials to compare first-generation versus second-generation DES among women. With respect to structural heart interventions, the first transcatheter aortic valve replacement (TAVR) was performed by Dr. Alain Cribier and Dr. Helene Eltchaninoff in April 2002. Since then, several female interventionalists have performed and studied sex-related outcomes in TAVR and other structural interventions. The SCAI-WIN group designed the first all-female TAVR registry enrolling >1,000 women with mandated collection of female-specific variables, and this research is highlighted in the present issue of *JACC: Cardiovascular Interventions* (4). Indeed, this issue of the journal is particularly focused on outcomes among female patients, with 7 original research papers, including a meta-analysis of 17 TAVR trials and nearly 24,000 female patients (5). This paper, shepherded by Dr. J. Dawn Abbott, has shown that despite more early complications among women versus men, a greater long-term survival advantage with TAVR was gained.

Although clinical trials form the cornerstone of evidence-based medicine, uniform endpoint adjudication is crucial for comparisons across trials. The Academic Research Consortium definitions for neurology outcomes were pioneered by Dr. Alexandra Lansky and others, while

Dr. Mehran chaired the Bleeding Academic Research Consortium to establish standardized definitions. Likewise, risk scores support rather than substitute for cognitive physician decision making, and it is important to highlight that several risk calculators, such as for acute kidney injury, bleeding, and DAPT duration, were developed by research groups with female interventionalists at the helm or as key members.

Female cardiologists are also playing important roles in education and leadership locally and nationally. Dr. S. "Betsy" Knoebel, Dr. Pamela Douglas, and Dr. Mary Norine Walsh have all served as president for the American College of Cardiology, and many other leading female cardiologists have served key leadership roles in the college and other cardiac societies worldwide (Figure 1, Online Table 1). Several prominent women in interventional cardiology have served as mentors, catheterization laboratory directors, fellowship program directors (Dr. J. Dawn Abbott, Dr. Cindy Grines, Dr. Annapoorna Kini, Dr. Jacqueline Saw, and others). Women—too many to be named—are leading the charge with innovation, and are critically involved in the setup of structural heart disease programs (Dr. Kimberly Skelding, Dr. Anita Asgar, Dr. Ruby Satpathy, and others). As the rigors of subspecialty training become even more protracted and the requisites in some ways more onerous, concurrent advances and meaningful dialogues on equal pay and supporting pregnancy and early parenthood during training are important steps in a positive direction (6). Collaboration and networking with our peers is crucial to foster new science. The presence of women at the table serves to energize other women to join the discussion and rally for our collective cause. As Dr. Marie Claude Morice once put it, a star-shaped partnership, not a pyramid-shaped organization, is the goal. Hear, hear!

ADDRESS FOR CORRESPONDENCE: Dr. Roxana Mehran, The Zena and Michael A. Wiener Cardiovascular Institute, The Icahn School of Medicine at Mount Sinai, One Gustave L. Levy Place, Box 1030, New York, New York 10029-6574. E-mail: roxana.mehran@mountsinai.org.

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APPENDIX For the supplemental table and references, please see the online version of this paper.