

AN INTERVIEW WITH...

Mohamad A. Alkhouli, MD, FACC, FAHA, FSCAI

Dr. Alkhouli discusses his receipt of the Thomas J. Linnemeier Spirit of Interventional Cardiology Young Investigator Award, tips for a successful academic writing career, and his research and trial plans in the areas of disparities, innovation, and structural heart disease.



Among your many projects and responsibilities, you started a new position in 2021 as Chair of Research and Innovation for Mayo Clinic's Division of Interventional Cardiology. What does this role look like for you?

My role is to help steer our interventional group's efforts in key areas of innovative research: big data, artificial intelligence (AI), virtual/augmented reality, and device innovation. For example, we now have a full-time PhD data scientist and a National Institutes of Health-funded research fellow working with several clinicians to explore novel applications of AI in the cath lab. We are currently working on integrating multiple imaging and clinical data sources to devise a new AI-powered method of staging valve disease and predicting outcomes of transcatheter interventions.

Congratulations on your recent achievement of the Transcatheter Cardiovascular Therapeutics (TCT) 2021 Thomas J. Linnemeier Spirit of Interventional Cardiology Young Investigator Award, which awarded you for your commitment to academic research, clinical excellence, and leadership. What type of research do you hope to pursue with the grant funding you received?

The Thomas J. Linnemeier Spirit of Interventional Cardiology Young Investigator Award provides an excellent opportunity for networking and collaboration with current and future leaders in the field. It also comes with a modest monetary award. I plan to leverage the award to research the impact of structural heart disease (SHD) interventions on physiology, hemodynamics, and flow dynamics. These interventions are currently designed to correct abnormal anatomies, with little emphasis on cardiac physiology. I believe that future SHD interventions will be tailored to resorting both normal anatomy and physiology, and I am keen on being at the forefront of that research.

Through conference presentations, published literature, and your experience with a new four-dimensional device, you've established your support of intracardiac echocardiography (ICE) for SHD interventions, particularly left atrial appendage occlusion. What do you consider to be the main advantages of ICE for complex transcatheter interventions, and what do you think the conversation surrounding ICE will look like over the next decade?

The ability to complete the procedure under moderate sedation has clinical, logistic, and, potentially, cost-saving advantages. In addition, it enhances patient satisfaction and advances the operator's understanding of and ability to navigate complex anatomies. ICE abilities are not yet comparable to those of transesophageal echocardiography. However, I speculate that in 10 years, ICE will become a mainstream imaging modality for guiding most SHD interventions. That is why almost every leading company in the SHD field is investing in futuristic ICE technology.

A common theme found in your research is disparities across a wide range of disease states, from ST-segment elevation myocardial infarction (STEMI) to atrial fibrillation to heart disease. Why did you choose to make this a focus of your work?

I was attracted to disparity research for two reasons. First, disparities remain common, profound, and consistent across all areas of cardiovascular disease and interventions. Second, most disparity research has been purely descriptive, with limited practical implications. Our research attempted to go further and delineate potential root causes of these disparities, with some success. The next step is to identify practical interventions that would mitigate or minimize these disparities. This requires concerted efforts by stakeholders, including scientists, professional societies, government agencies, and insurance companies.

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Two of your recent studies explored the treatment effect of primary percutaneous coronary intervention (PCI) in patients with STEMI, first in men versus women and then in dialysis patients.^{1,2} In the former, it was determined that women were less likely than men to undergo primary PCI. How do we move forward and bridge that gap?

Our aim was to challenge the notion that some disparities in the provision of care may be “justifiable” due to the heightened risk of intervention in certain cohorts. We felt that this was based on an implicit bias rather than scientific evidence. Our findings showed that even with different risk profiles, primary PCI provided similar benefits in women versus men and in dialysis versus nondialysis patients, which emphasizes the need for equitable provision of care to optimize outcomes. More studies are needed to eliminate other potential implicit biases, such as the undertreatment of women and dialysis patients with STEMI in current practice.

You have been a national and local principal investigator for numerous studies. Can you share what you’re currently up to in terms of clinical trials?

Our lab is involved in several early feasibility studies/investigational device exemption trials on cutting-edge transcatheter valve interventions. However, my main interest at present is to spend more time on early proof-of-concept device innovation work. I am currently working on early animal testing of prototypes of a device that uses cryoenergy to remove intravascular thrombus.

What are the biggest issues that still need to be tackled in transcatheter edge-to-edge tricuspid and mitral valve repair?

Functional mitral and tricuspid regurgitation are poorly understood. The current revolution in their transcatheter treatment is inspired by technologic advances (ie, device availability) that outpaced our understanding of the disease itself. To move the field forward, device innovation needs to go side by side with fundamental research to better understand the pathophysiology and natural history of valvular heart disease and the physiologic impact of the various transcatheter and surgical treatments.

You underwent years of training and mentoring as part of the Society for Cardiovascular Angiography & Interventions/TCT/American

College of Cardiology Emerging Leader Mentorship (ELM) Program’s 2019-2021 class of the next generation of interventional cardiology leaders. How did this experience prepare you for the next stages of your career?

Interacting with many gifted mentors and peers in the ELM program taught me that professional growth depends on building collaborations and complementing one’s skills with those of others. This is true regardless of whether your passion is to be a clinician, educator, innovator, or basic science researcher.

In addition to your position as Associate Editor of *Journal of the American College of Cardiology: Cardiovascular Interventions*, you’re also a prolific writer yourself, with > 300 published papers. What advice would you give to someone new to medical writing and research, particularly when balancing research work against other clinical obligations?

Here are a few tips for a successful writing career:

1. Passion is the fuel for success. When you have passion, true balance becomes a myth.
2. To be a good writer, you need to be a good reader.
3. Do not be discouraged by failures, mistakes, and rejections. They are part of the journey.
4. If you do not have resources, start with case reports, review articles, and letters to the editor.
5. Seize opportunities to write under the mentorship of an excellent senior author. These are rare and priceless. ■

1. Sulaiman S, Kawsara A, Mohamed MO, et al. Treatment effect of percutaneous coronary intervention in men versus women with ST-segment-elevation myocardial infarction. *J Am Heart Assoc.* 2021;10:e021638. doi: 10.1161/JAHA.121.021638

2. Kawsara A, Sulaiman S, Mohamed M, et al. Treatment effect of percutaneous coronary intervention in dialysis patients with ST-elevation myocardial infarction. *Am J Kidney Dis.* 2021;S0272-6386(21)00922-7. doi: 10.1053/j.ajkd.2021.08.023

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