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The Future of Cardiovascular Medicine – Technology, Gender Bias and Treatment Strategies

Prof. Mamas A Mamas is a structural interventional cardiologist, treating patients with underlying coronary artery with percutaneous coronary intervention (PCI) in both the elective and emergency setting and undertaking Transcatheter Aortic Valve Interventions (TAVI). He is also the Associate Editor of *Circulation Cardiovascular Interventions* and leads a large research groups focussed around electronic health record research. HealthManagement.org spoke to Prof. Mamas about the future of cardiology and how technology can help improve diagnosis, treatment, and prevention of cardiovascular disease and how the gender bias in cardiology could be tackled.



There is a great deal of discussion these days on the lack of women in cardiology as a profession. Why do you think that is?

One of the primary issues, in my opinion, are perceptions of the profession. So often, when people have exposure to cardiology as a specialty whilst as medical students, there is the obvious lack of female role models. If your first experience of a specialty is in a very man-orientated setting, you may feel that there is no one that you can identify with; that there is no role model. It's like when you are a child, and you want to do something, you look for role models. And if there are not any role models,

you may think that this job is not for me. At the end of the day, our career choices are often informed by our experiences as medical students, and if you see a specialty full of white middle-aged men, and you are not from that demographic, you are not going to be able to identify with or feel that you belong to that profession.

I also think cardiology training is very long, and I think women are disadvantaged in many ways in that it's not really a family-friendly specialty. Therefore, many women are put off entering into this specialty by the competing considerations around wanting children, and wanting a

family life. I think that the profession itself hasn't really been that innovative in thinking around what are the training needs of men vs. women. It is very much a one-size-fits-all and that one size is very man-centric. The field of cardiology doesn't really consider that perhaps the training needs of women have to be more flexible – flexible around motherhood. It also needs to be more innovative. As medical students, you start from A, you carry on training, you finish at B, and you go on and become an attending without the thought that half of our attendees may want or may need to take time out to have a family. I don't think the profession

is particularly supportive and neither are the training systems. For example, if you look at both training and meetings, there aren't any facilities to cater to women and their families. Looking at it from my perspective, I have often said to female members of my group that they can use my office if they need to breastfeed. But you shouldn't have to do that. At the end of the day, the institution should provide facilities to women. Similarly, at meetings, why is it that women can't bring children to meetings if they wish to do so? Why are there not breastfeeding facilities for women? Why are there no crèches where women can keep their children to help them attend meetings?

Another factor is that often, when you have meetings, it's who gets to the table. When you go to a meeting, and you see a symposium or a session where the whole panel is white and male, how representative is that of the wider profession? I'm not saying that you should give talks or panel memberships just to women by virtue of their gender; I'm saying there are lots of very accomplished women in our field. Why are they not in the panel? Why are they not on the podium? You can't tell me that for many of these sessions there is not a single woman or a single individual of ethnic origin who does not have sufficient expertise to be on the panel.

There is a lot of uncomfortable discussions that need to be had around what we need to do to make our profession more visible and open to people. And it's not about being open to minorities. Women are 50% of the population. How do they get equality? There are a number of ideas and things we can do to address this, and I think that it is a much-needed change because when you have a profession, and it only consists of a small minority of the population, it's not good for the profession. At the end of the day, we deliver a service, and if our profession is not made up

of the wider population, we cannot deliver our service effectively and it will not resonate with our end-users.

What about the lack of treatment strategies and protocols that consider sex and gender impact when treating cardiovascular disease? How can we tackle that?

The treatment paradox is that often patients that are at a greater risk of adverse outcomes are less likely to receive optimal treatments. Women fit this treatment paradox. For example, after a heart attack, women are at a higher risk of having adverse outcomes, and yet they are less likely to receive optimal care. People often say that women present with atypical features. I think that's wrong. Why is it atypical? It's typical for a woman. How can 50% of the population present with atypical features? You have got to then define what is a typical feature. Part of it may be the way that women use language to discuss symptoms. It may be slightly different from men. But that doesn't make it typical or atypical. It just makes it different. Actually, there are more similarities than differences, and this perception that somehow women have atypical symptoms is probably more of a myth than reality.

Also, we are not identifying women as being at risk of cardiovascular disease, and we do not recognise it when they present with cardiovascular disease. Diagnosis of women often takes much longer, and in effect, it takes longer to apply evidence-based treatments for women. This may be due to our own perceptions and our own biases. From medical school we are taught by men that it is men who are more likely to have heart attacks and cardiovascular disease and in women it is not that common. This is also a complete myth. Cardiovascular disease is the most common cause of mortality in women. It's more of a cause of mortality than cancer, and yet we

fixate on cancer, and we don't think about cardiovascular risk. There is a lot of data to suggest women don't get treated optimally. Why? Perhaps it has to do with the perception of risk in women. So even though you diagnose a woman with a heart attack or another event, one of the problems is that physicians may think that women, for some reason, will not benefit from an intervention or the risks from the intervention are too high. And again, we see this consistently in our work, and other peoples work that after a heart attack women are much less likely to be offered an angiogram, much less likely to be offered a PCI, even though they benefit from these interventions as much as men.

What we have to do as a community is to recognise that women have a huge burden of cardiovascular disease, and once we have recognised it, to offer women the same treatments and the same access to treatments that we offer men. I don't think it is appropriate that women are 20% less likely to receive cardiac catheterisation following a heart attack than a man is. There is no biological reason for that. It is absolutely unacceptable that women are getting substandard care compared to men. One way to address this is to broaden the workforce because women are not making these decisions. If we have a workforce that is more reflective of the patients we treat, the biases that we have pertaining to provision of treatment will be a lot less.

They say that cardiology still lags behind other specialties when it comes to embracing digital health technologies. Do you agree? And if yes, why is that? How do you think this can be improved?

I personally think that cardiology is ahead of many other specialties, but I don't think we use digital health effectively. I think one of the reasons is that digital health is often as-

sociated with an upfront cost. The healthcare system that we work in has a fixation on the upfront cost rather than the bigger picture.

There are also a lot of services that aren't conditioned towards digital healthcare solutions. A lot of the services that we offer as doctors are 9-5 services. The issue around digital health is that it is not 9-5. The information is delivered 24/7. The question is about how we can access this information 24/7 for services that are delivered 9-5? How do we action this information because there is no use capturing this information unless you can action it. There is no point collecting this information 24/7 unless you can do something about it 24/7. Services aren't structured around that. There is also the question of what we can do with all this information. A lot of it is being collected from devices that we're implanting as cardiologists such as pacemakers, smartwatches, telemetry and so forth. But what do we do with this information and how can it improve what we are doing already? Does it impact on outcomes? This is the big challenge for us as a community. It's understanding what this information can add to the model of delivery that we have currently and how it can change patient outcomes.

You are one of UK's top health pioneers. Your data analysis skills and your focus on personalising patient treatment is a leading reason for this. What is your motivation behind this? How do you think Big Data can help cardiologists?

Big Data can mean many things. My interest is electronic health care data, which is patient records. Every time you see or interact with a healthcare provider that might be a doctor, a nurse, or a pharmacist, data is created and stored. My group's interest is using this data to study outcomes of patients and to study

effectiveness of treatments for patients and develop risk models. But Big Data can be many other things. It can be imaging data. Every time you have a chest X-ray or a CT scan or a heart scan, that is also data. Every time you wear a smartwatch, that is also data. Data is produced from procedures that we do for example, intravascular imaging during PCI or data derived from healthcare like pacemakers. Again, that is data.

“THE TREATMENT PARADOX IS THAT OFTEN PATIENTS THAT ARE AT A GREATER RISK OF ADVERSE OUTCOMES ARE LESS LIKELY TO RECEIVE OPTIMAL TREATMENTS”

It is about looking at all these different types of data and determining how we can use this data or combine this data to help individualise patient treatments and whether individualising treatments by using this very different data is actually better than the one-size-fits-all approach. There is not really much point collecting this data if it doesn't impact on outcomes. We can develop lots of clever risk models, but if the risk models don't change what we do for patients and don't change their outcome, there is no point.

Cardiology is increasingly recognising the value of personalising approaches to patients, but it is then about trying to refine our ways of predicting outcomes. Traditionally we have used electronic health care record data. Now the challenge is to use other data – imaging data, blood result data, genetic data – and in-

corporating this information into risk scores and algorithms. Traditionally, we developed these risk scores and risk algorithms using traditional statistical models, but now we're using much larger datasets and different types of data. That's where machine learning and artificial intelligence comes in. There are a lot of new scores being developed now using artificial intelligence where we are using different types of data. The big question to me will be whether these scores will impact patient outcomes or change how we deliver treatments to patients. If we have developed a risk score, we should test its function and whether it changes how we do things or patient outcomes. That should be the endpoint of the risk score, not the risk score itself.

Can you give us some insight as to what measures you think could further improve cardiology practice?

I could talk about my interest in acute coronary syndrome and interventional cardiology. Lots of the data that we measure are related to hospital outcomes and hospital complications. Mortality is a rare event, so we need to think about other important things that occur commonly and that have a big health economic impact and, most importantly, a patient impact.

These include things like patient complications post-discharge. We often think about in-hospital complications, but what about post-discharge complications? What about post-discharge readmissions? 1 out of 10 patients following a PCI or a heart attack and 1 out of 5 patients after a heart failure event will be re-admitted after 30 days. Why don't we have risk scores that can predict these? We also need to understand how the patient feels and what is important to the patient. We do interventions, and we provide treatments. We should also determine how this treatment makes the patient feel

– we need to incorporate patient-relevant outcome measures. For example, we are not offering PCI for the prevention of heart attacks; we're not offering it to the patient to live longer. We are offering it for patients to feel better. Why is it then for assessment of outcomes, we only look at risk of mortality in 30 days, risk of readmission in 30 days or risk of complications at 30 days? Why are we not asking patients if the intervention has helped them feel better? I think it is about taking a step back and thinking of more patient-relevant endpoints as well.

You are very active on Twitter and a very vocal advocate of how SoMe can help clinical education. Why do you feel so strongly about this?

You can look at it from two perspectives: the population perspective and the healthcare provider perspective. One impacts the other. Looking at it from the healthcare provider's perspective, I think social media is fantastic. It helps provision of education across different healthcare providers that include doctors, scientists, and other health professionals from all over the globe. SoMe helps you to interact with these people on a daily basis. It promotes education. Having someone, a doctor who is partaking in discussions from all over the globe and learning from colleagues from all over the globe and becoming familiar with new data from all over the globe in real-time will only be a benefit to patients. SoMe is also great as it gives us a support network. You develop friendships. That is particularly important in a profession where you have very high rates of burnout.

From a patient perspective, it can help develop patient networks. You can see what treatment options are available. It can show you the importance of risk factors, controls, and lifestyles. You get some amazing patients that share their experiences and their strategies to improve their

health and lifestyle. There are real patient advocates. SoMe can be an excellent resource for patients.

Our cover story for this issue focuses on the healthcare bottom line and how rising costs are a big challenge. Innovation and technology could possibly save the day. How accurate do you think that is for cardiology? How do you think the economic burden of cardiovascular disease can be handled effectively?

Number one is to prevent cardiovascular disease from developing, and for that, I strongly believe lifestyle is the key. Our population is getting heavier, more sedentary. The government has a responsibility, and they can help. For example, tax deductions can promote healthy activity, and can offer incentives for gym memberships. Nowadays, many of the schools in the UK are selling their playing fields to property developers, so children don't have spaces to run and be active. I think exercise should be emphasised even at a young age. I think healthier lifestyles, encouraging people to lose weight, making activities in gyms and gym membership cheaper can really help prevent cardiovascular disease.

As for secondary prevention, we could change the way we deliver healthcare by using more digital solutions. Many practices are open 9-5, and that's not conducive for people to visit as often, especially people with low incomes who can't afford to take a day off work. We need to be more innovative about how we deliver healthcare, such as evening clinics, or weekend clinics, which people are more likely to visit. We also need better screening in high-risk populations, and include patients from different backgrounds. For example, people of South East Asian background have an increased risk for future cardiovascular events. We know that individuals such as

these don't often have much in the way of contact with their healthcare providers. By diversifying our healthcare workforce, we could improve engagement if the doctors that these communities are being served with are from their community. We need to capture people and deliver healthcare in people's communities rather than the traditional practice model of 9-5.

Screening for cardiovascular disease, promoting lifestyle changes, reducing obesity, reducing smoking, and making people more active can all help reduce the prevalence of cardiovascular disease. ■