

Interviews

EMJ had the privilege of speaking with three internationally recognised leaders in cardiovascular medicine, who shared perspectives on the future of prevention, precision medicine, and cardiovascular care. Eric Topol discusses the transformative potential of genomics, AI, and digital health to prevent disease and personalise care. Salim Yusuf reflects on decades of landmark research and the global challenges of translating evidence into population-level impact. Finally, Gosia Wamil explores how advances in multimodality imaging, AI, and precision diagnostics are reshaping the management of cardiovascular disease and cardiomyopathies. Together, these interviews offer a compelling vision for the next era of cardiology.

Featuring: Eric Topol, Salim Yusuf, and Gosia Wamil



Eric Topol

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Q1 What first drew you to cardiology and, more specifically, to the intersection of genetics, digital tools, and cardiovascular medicine?

I was really excited about cardiology when I was training in internal medicine, and it was a very extraordinary time, because this was when clot dissolving therapy for heart attacks and balloon angioplasty to open up arteries was occurring all at once.

So, I changed gears, and that was superimposed onto a great interest I had in genetics that began back in college. All this came together and eventually seeded a deep interest in how we could individualise medicine, not just in cardiology, but much more broadly.

Q2 You've witnessed, and helped shape, decades of change in cardiology. What do you see as the most transformative shifts in the field since you began, and which changes have had the greatest impact on patient outcomes?

Well, I think the biggest thing going forward is going to be actually preventing major diseases like cardiovascular disease, cancer, and neurodegenerative conditions, something we haven't paid nearly enough attention to because we've been so fixated on treatments and the very rare cures.

But I do think that going forwards, our ability to access many layers of data, not just, for example, lipids like low-density lipoprotein cholesterol, but also genetics, such as polygenic risk scores

(PRS) and even whole genome sequencing, means that we'll be able to do much more.

This also includes inflammation, not just high-sensitivity C-reactive protein, but the ability to discern inflammation of the artery through AI-interpreted CT scans and CT angiograms. So, we're no longer just fixated on the narrowing, but also on the inflamed artery.

We also now have the ability to identify new risk factors like lipoprotein(a), alongside new medications. So, I think cardiovascular disease is the prototype of a condition that will be eminently preventable. And it's not just lifestyle factors: we now have a whole toolkit to enable better risk stratification and more effective strategies for prevention.

“**Cardiovascular disease is the prototype of a condition that will be eminently preventable**”

I'm excited about prevention. It comes, in part, from cardiology, but now it transcends that field as well.

Q3 Your work has been central to advancing precision medicine, particularly through large-scale efforts like the All of Us Research Program. What have been the most important lessons so far about integrating genomic data into everyday cardiovascular care?

It's been really frustrating for me, because we're not keeping up with using genomics in everyday cardiovascular care.

For example, we just saw a major study in almost 900 people who had cancer where whole genome sequencing affected the clinical management 40% of the time, but we don't do this in cardiology.

PRSs should be routine to partition risk, but they're not being used. There are many medications that have very clear-cut guidance through genetics, but we don't use this information.

I think that genomics has so much to offer across every domain of medicine, but we haven't seen nearly enough of it being used in cardiovascular medicine.

Q4 You've long been a pioneer in digital health and remote monitoring. How close are we to a reality where continuous, at-home cardiovascular monitoring meaningfully replaces or enhances traditional clinic-based care?

There are some major advantages that people are starting to acknowledge. It's taken a while, but these sensors provide continuous, real-world data on a person's physiology, and that's something you can't get from a one-off visit to a doctor.

Now, we're seeing sensors that are particularly accurate for many different metrics: not just physical activity, but also sleep, stress, and others, such as glucose and oxygen saturation for sleep apnoea.

With all these sensors, there's a realistic opportunity not just to learn more about a person and





their health status, but also, instead of people having to be in the hospital, for them to be monitored at home with validated algorithms that ensure they are safe and that there's no imminent compromise.

So, in the years ahead, we will see more of a shift to the hospital-at-home model, because all these different sensors, with multimodal AI, can be tremendous, not just in terms of cost saving for a patient and their family, but also in terms of allowing people to be in their own home with their loved ones, which is a lot more comforting than being in a hospital setting.

This wearable world that we're in now will continue to grow. It's been slow-moving but made steady progress. Eventually, we'll see it culminate in a big change in how we use hospital beds, which will be more relegated to very acute care, intensive care, operating recovery, and advanced imaging, but not so much for what we use them for today.

Q5 In your book, 'Deep Medicine', you argue that AI could make healthcare more human, not less. In practical terms, how can clinicians ensure that AI enhances the patient-doctor relationship rather than undermining it?

We're already seeing some of those effects, although it's been 7 years since 'Deep Medicine' was published. The forecast there was that we need to get back the gift of time, because we don't have enough time with patients to listen to their concerns and their story, do a proper physical exam, have eye-to-eye contact with real presence, and build that intimate relationship that we had decades ago.

What we're seeing now is that these ambient conversations that occur during a clinic visit are being written using automated notetaking, which is far better than the notes that doctors make. This saves at least a few hours of time each day of data clerk function for clinicians.

This is just the beginning, because automated notes create so many other opportunities to check on patients about the things that

were discussed during the visit. No longer do we have to do all this keyboard work, because so much of it can be done through the automated synthetic node.

This is just the start of relieving clinicians of their data clerk burden, which has really taken away that connection with patients.

Patients are also gaining more autonomy. They're using AI tools to answer questions, to query their lab results, to prepare for a visit, all sorts of things, and this really helps make their time with a doctor even more valuable. I'm optimistic that we'll see this continue in the future.

Q6 Your recent work spans foundation models in medical imaging to decoding sleep with AI. Which of your current research directions do you believe holds the most immediate promise for improving cardiovascular outcomes?

There are so many different directions this can take us.

For example, the echocardiogram is one of the most complicated sets of images because of

the multiple different window positions. You can have an untrained individual guided by AI (so long as they can put the transducer on the chest somewhere), and the AI can tell them to move it up or down, or clockwise or counterclockwise, and obtain a state-of-the-art echocardiogram. We're seeing AI being able to interpret all of that as well as, or even better than, an expert cardiologist.

This is really striking, because it shows you the complexity of what an image-based AI system can do. But what I think is really important is that this is just one layer of data.

We know there's all kinds of cardiovascular information embedded in an X-ray, CT scan, MRI, or ultrasound that are not extracted: things that humans can't see. When you add to that, for example, lab data for a person (even normal lab values, where trends picked up by AI can be especially important), and when you integrate all this data with electronic records, sensors, the images I mentioned, genetics, proteins, and biomarkers, all of a sudden you have a holistic picture of a person that can be used in a predictive mode.

What is the person's risk in the years and decades ahead, and how can we then move into high-gear prevention? That's what I'm most excited about for the future.

Q7 You've also been vocal about the limitations and risks of health AI. What are the biggest pitfalls the field must avoid right now to ensure these technologies are safe, equitable, and truly beneficial?

There's a potential to worsen inequities, and that's the last thing we need. There are also biases

that are embedded in AI models, but it's not so much the AI that is the problem as our cultural, societal biases that are captured by training models.

The big thing is that we need to do compelling research validation. We have to commit to the same type of rigorous research that we've done over the years, because you've got to validate it, and we're not doing enough of that. There are some examples, like we've seen from mammography or colonoscopy, but they are the exceptions rather than the rules.

So, we have to commit to doing the critical work that it takes to change a field, to accept the importance and net benefit of using AI in daily medical practice, because there's always going to be potential risk.

Q8 Looking ahead, particularly in light of your work on longevity and 'Super Agers', how do you envision cardiovascular care, and healthy ageing, evolving over the next 10–20 years?

What I tried to position in my book, 'Super Agers', is that we're at a remarkable, momentous time in medicine, where we've learned that lifestyle factors are critically important, but there are many layers that extend beyond just diet, sleep, and exercise. We also have environmental burdens, like air pollution, plastics, and 'forever chemicals', that we have to deal with, and we're not addressing those nearly enough.

But if we can capture data about a person at many levels and chart the trajectory of their risk over the next 2 decades, we can do much more.

Cardiovascular disease, for example, gets its roots more than 2 decades ahead. We already know there is atherosclerosis developing in people in their late teens and 20s, even though they might not have a heart attack until their 50s or 60s. So, we have a long runway to prevent this disease, and we should be doing that. This serves as a prototype across neurodegenerative diseases and cancer as well.

With our growing ability to detect inflammation, we can go further. Let's say a person does everything right: they have the perfect lifestyle to prevent heart disease, but they still have residual evidence of inflammation in their arteries. We have to address that, and there are new ways to block inflammation with different medications that are coming on board.

This is exciting, because we didn't previously understand how important that process was. We couldn't diagnose it, quantify it, or treat it, but now we can. So, this is a turning point, and something I'm especially excited about, because we've seen heart disease as the leading cause of death all this time, and that has to change. There's no good excuse for that in the years ahead.

I think we are now empowered. We're not yet fully using the information or the knowledge that we have, and we're not doing the critical validation research to take this forward, but we will. It is inevitable. Eventually we'll get there and that realisation of making a huge dent in the toll of heart disease will be actualised.