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Q1 What does your role as Chair of the European Society of Cardiology (ESC) Committee for Young Cardiovascular Professionals (CYCP) entail, and what have you achieved so far in this position?

The CYCP emerged 2 years ago as a transformation of Cardiologists of Tomorrow. It was a very important step, leading to young cardiologists gaining official positions at the ESC with their representation on the ESC board. This allows us young cardiologists to directly shape the future of the ESC. It is a great example of the progressive and innovative character that enabled this society to achieve a leading role in the world's cardiology in the last 10 years.

The mission of CYCP is to implement ESC's activities into the young community. We started with organising surveys to learn what the needs of young cardiovascular professionals were. Afterwards, we started to develop special e-learning activities that were tailored for the young. We also developed a distant mentoring project to support mentorship for young cardiologists who can't travel. Last, but not least, we organise the best clinical case competition, an event that has already become a tradition at the annual ESC Congress. Being the Chair of the CYCP is not an easy task and it demands a lot of effort and time. Besides leading the projects of our committee, I had to attend regular ESC board meetings and participate in different activities. On the other hand, this was rewarded by a valuable experience and precious friendships.

Source: Linda Kisková Bohušová

"While in preventive cardiology we apply long-term, usually quite unpleasant lifestyle interventions to avoid the disease, in the predictive medicine we just wait and, thanks to telemonitoring and AI, we know exactly when the disease manifests itself."

Q2 You were one of the first members of the ESC Digital Health Committee (DHC). How important do you believe digital health (DH) interventions are for the prevention of cardiovascular disease?

Creating the DHC a few years ago was another display of the innovative and progressive character of the ESC. Up until then, the vast majority of cardiologists didn't know what DH was. Fortunately, there were some that understood the immense power of the digital transformation, which gave the birth to the committee. Today, we know that DH is an inseparable aspect of high-quality healthcare. Thanks to DH, especially telemedicine and artificial intelligence (AI), we can tailor various preventive strategies to the personal needs of each patient.

Furthermore, we can move from preventive cardiology to predictive cardiology. There is quite a difference between the two. While in preventive cardiology we apply long-term, usually quite unpleasant lifestyle interventions to avoid the disease, in the predictive medicine we just wait and, thanks to telemonitoring and AI, we know exactly when the disease manifests itself. It means that we have to act only at the particular moment. This enables the patient to avoid complicated and inconvenient interventions that have to be applied long-term.

Q3 In your opinion, what actions can the ESC undertake to ensure that digital healthcare remains a key priority for the cardiology community?

There are two very important activities of the ESC in the field of DH. Number one is the *European Heart Journal – Digital Health*, which was an explosion right from the start. Even though it does not have an impact factor yet, there is a huge interest in publishing in this journal. It keeps the DH research community on fire. Another priority is the Digital Summit: the annual congress of the ESC that is dedicated to the DH. The latest DH discoveries and technologies in cardiovascular medicine are presented there every year.

Q4 In 2015, you founded the Premedix Academy (Bratislava, Slovakia), which is focused on education, research, and implementation of precision medicine in Slovakia. Please could you provide an overview of the organisation's ongoing projects in precision diagnostics and personalised treatment?

Our research projects try to improve personalisation of diagnostics and treatment in the field of cardiovascular medicine. Personalisation is the cornerstone of precision medicine. To achieve this, we use methods of molecular biology (e.g., genomics and microRNA research), DH technologies (e.g., telemedicine and mobile health) and big data analysis (e.g., AI and different machine learning techniques).

A lot of our previous research was dedicated to plasmatic biomarkers of atrial fibrillation and thrombosis. Recently, we started to implement more and more machine learning and DH. For instance, in the #STOPSHOCK project (Premedix Academy) we developed a machine learning scoring system for prediction of cardiogenic shock in patients with myocardial infarction. This is also a nice example of predictive medicine that enables us to act right before the

onset of the disease. The idea is to use mechanical circulatory support in stable patients before cardiogenic shock develops. Soon we will also launch the TESTIMONY trial, which will test pure telemedicine via multifaceted mobile health system versus standard of care in the treatment of arterial hypertension. Lastly, we are also developing a machine learning photoplethysmography analysis to diagnose, monitor, and predict various cardiovascular diseases.

"Our most advanced service is probably the so-called intelligent monitoring. It is reserved for high-risk patients."

Q5 You established the Premedix Clinic (Bratislava, Slovakia) in 2021, the aim of which is to "implement precision medicine into clinical practice so that we can provide a superior health-care to our patients." How close are you to achieving this goal and what research priorities should be set to facilitate this?

In cardiology, I believe that we have reached this goal. For instance, we offer genotyping, meaning that we can identify predispositions to various diseases and assess the pharmacogenomic profile to tailor the therapy for each patient. We use a lot of DH technologies. Our most advanced service is probably the so-called intelligent monitoring.[1] It is reserved for high-risk patients (e.g., patients after myocardial infarction). They receive a set of telemedical devices to monitor their blood pressure, body temperature, heart rate, respiratory rate, and O_2 saturation, and a machine learning algorithm is continually analysing these data. It can detect severe health deterioration 24 hours before it occurs. The physician gets a notification and decides if they should examine the patient remotely or in-person. Thanks to this, we can prevent large proportion of acute hospitalisations and even deaths.

Q6 Have there been any recent technological innovations in cardiovascular prevention that you believe are particularly noteworthy?

There are many with new ones emerging every day. The important thing is that they are backed up by serious clinical trials. At the recent ESC Congress, there were some mentioned even in the hotlines. For example, the EchoNet trial showed that AI can assess left ventricular ejection fraction better than human sonographers.[2] Another trial eBRAVE-AF tested atrial fibrillation screening with a smartphone app and found it to be superior to the conventional care.[3] Additionally, research from Cambridge, UK, showed that using causal AI can substantially improve the validity of estimating cardiovascular risk and benefit.

Q7 Please could you summarise the key take-home messages from the presentation you delivered at ESC Acute CardioVascular Care 2022, entitled 'Artificial Intelligence Model for Prediction of Cardiogenic Shock in Patients with Acute Coronary Syndrome'?

It was the pilot research of our #STOPSHOCK project. We trained a machine learning algorithm on a huge database of patients with acute coronary syndrome to predict cardiogenic shock. The algorithm achieved high predictive power (area under the curve: >0.9). However, an even better achievement was our recent validation of the algorithm on an external dataset. We reached an area under the curve of 0.84 and we can't wait to publish the results.

> "I thought that I could interpret clinical trials but only in the course I learned how wrong I was."

Q8 You are studying clinical research at the University of Oxford, UK. How will you utilise the skills learnt during this course to advance the Premedix Academy and Clinic?

The MSc in clinical trials was one of my best career decisions. I'm really impressed by the whole course, the lecturers, and just everything about it. I thought that I could interpret clinical trials but only in the course I learned how wrong I was. And interpretation of clinical trials is the cornerstone of modern evidence-based medicine. I believe that one can't be a good physician without being able to understand clinical trials. And this is the skill one learns right at the beginning of the course. Finally, at the end of the course, one is able to design their own clinical trial and that's exactly the skill Premedix Academy needs in order to translate different precision medicine strategies and technologies into clinical practice.

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