A 3D-Model Program Supporting Patient Education: CardioShowroom

CLD talks with Boris Keweloh, MD, Interventional Cardiologist and Electrophysiologist, Klinik Hirslanden, Zürich, Switzerland; Founder, CEO, Cardiolectra GmbH, Berlin, Germany.

How was CardioShowroom first developed?

As an interventional cardiologist and electrophysiologist in practice for more than 20 years, I have a long history of explaining diseases and therapies in detail to my patients. Cardiologists usually explain verbally to patients, and may perhaps draw a picture of the heart and the problems in the patient's heart. Many cardiologists also have a plastic heart on our desks that can be divided into parts. I wanted to get rid of this plastic heart in favor of something much more modern, something that shows not only the heart anatomy and function, but also diseases and therapies. Four years ago, I began working to move physician-patient communication to a digital and visual level. Together with a group of innovative programmers, we created a digital, 3D model of the heart and diseases, and designed animations detailing various therapies. The goal was a fully interactive program, not simply showing movies or generic videos, but a program that is fully interactive and which can react to the situation. This program is CardioShowroom.

Can you describe the visualizations available?

CardioShowroom has a 3-dimensional heart image that you can manipulate, make transparent, enlarge, or "walk" through. You can cut it open and show a three-chamber view, a four-chamber view, left atrial appendage, or manipulate the blood flow, and close the heart again. It is possible to focus on the conduction system, for example, or the right coronary vessel or great cardiac vein. The main menu goes by disease and treatment. Let's say your patient needs to receive a stent. The menu is divided into the four modern categories of cardiology: coronary artery disease, cardiac arrhythmia, structural heart disease, and heart failure. Choosing "coronary disease" allows you to show the patient a heart attack occurring, then click another button in order to visualize recanalization after a heart attack. If the patient has a question, the program can be paused, and you can even go backwards or turn the image. It is not a video, but an interactive program. In order to see a transcatheter aortic valve implantation (TAVI), for example, choose "structural heart disease" and then "aortic valve stenosis". The view turns to a calcified aortic valve. Choose "TAVI procedure" and it will show putting the wire in the balloon, opening the calcification, and placing the valve. The demonstrated equipment is kept generic in nature. Another available option is cardiac arrhythmia and atrial fibrillation. You can choose to show an animation of atrial fibrillation. I discussed in-depth with the programmers and designers how to visualize the rotors — we ended up using images of galaxies. Visualizations are short animations, perhaps 10-20 seconds per disease, and purified to the key point. You don't need to show exactly how we go through the septum, for example, but you need to show that we are excluding triggers from the pulmonary veins and circumferentially ablating. Let's say the patient has read about the cryoballoon technique on the internet and brings it up in your discussion. You can click the another button and show a cryoballoon animation. In addition, every visualization includes a small amount of text designed and written to be understandable to the patient, which is very important.

Can you share more about your own use of the program?

I have now been using CardioShowroom for more than a year with hundreds of patients. I

Figure 1. CardioShowroom displayed on different hardware options.

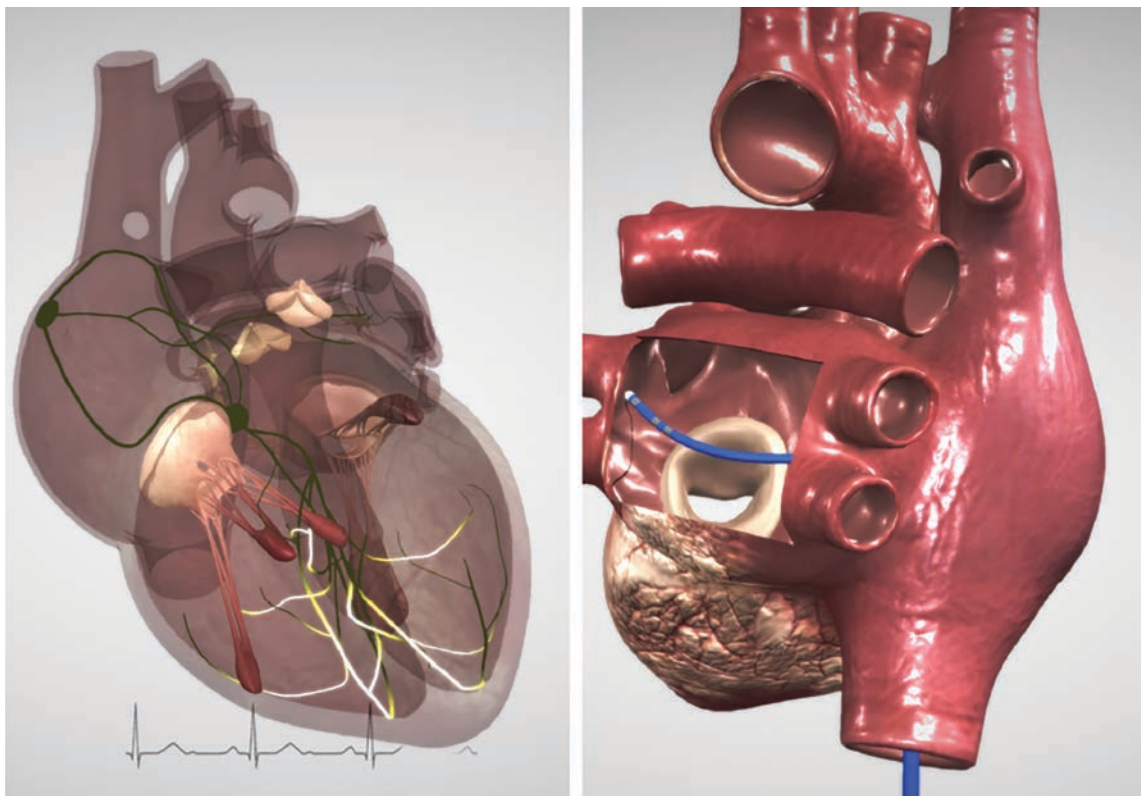

Figure 2. Sample views from CardioShowroom.

Figure 3. Demonstrating VR use at a patient informational meeting.

display the program on my desktop computer or handheld computer during the outpatient clinic visit by the patient. Once the diagnosis has been made, I show the program to the patient, and briefly explain cardiac anatomy and function. Then I show the patient their particular disease, and click some more buttons and show the therapy. In cardiology, we do have a lot of elderly patients and I wasn't sure if they would be able to cope with these quick and animated images, but they absolutely can, and it has helped further their awareness and understanding. My patients love it. I also feel that the quality of the program, which is well designed and sophisticated, helps the patient trust in us as physicians.

If a structural heart disease patient is planned for TAVI and needs a stent, everything about their planned treatment can be shown to them via CardioShowroom?

Exactly. Take our heart center as an example. I work with three heart surgeons, nine cardiologists, and six interventional cardiologists. Two or three do structural heart disease. One does rhythmology (that's me). We do operate. My colleagues all have CardioShowroom on their computers. Let's say they have a patient requiring mitral valve repair, which is their primary focus at that moment for explanation to the patient. But then the patient asks about their atrial fibrillation. At that point, the doctor can switch into rhythmology diseases and also use the program to explain further. It enables the physician to better explain diseases and treatments outside of their specialization to the patient. So it could be helpful for a rhythmologist to explain about TAVI, or it could be helpful the other way around.

What other uses do you envision for CardioShowroom?

While we originally designed CardioShowroom for doctor-patient interaction, of course it can be used for a lot of other purposes, such as nursing and technologist education, and the med-tech or pharmaceutical industry, in order to explain cardiovascular disease. Some of the larger companies can have hundreds of new employees every year coming from different fields, who are working in cardiovascular medicine for the first time. CardioShowroom could be a tool to help them quickly become educated. Another possibility is to have it customized with certain devices. We have done this with two products for companies in the cardiovascular field. The two devices were branded and imported into the software, creating a specialized, customized, and approved version of the programme for the company that they can use to sell their products to physicians or hospitals.

Another use of the CardioShowroom I see is for patient or customer events. One of our creative heads convinced me to go for a virtual reality (VR) version of the heart and the CardioShowroom. This VR version is always a highlight whenever we present CardioShowroom. It has already been very successfully used for patient informational events, as it allows the physicians and their patients to step into the heart.

Any final thoughts?

The idea is to revolutionize the communication between doctor and patient; to bring it into the digital era. When I started to try to sell this to older generation German cardiologists, they didn't really want to change their way of talking to patients or behaving. That is very typical. It reminds me of when I was shown a smartphone in 2004 by my brother-in-law. I said, what do you need that for? Now I laugh about my reaction. I think programs such as CardioShowroom will become standard, because visualization is such an improvement. Currently the program is available in English, Spanish, and German. ■

The current global crisis has made it absolutely essential for doctors and medical staff to inform, consult, and teach online. The CardioShowroom (CSR) (Cardiolectra) is an online 3D model of a heart and the perfect tool to be used in video conferences.

The CSR explains the function of a healthy heart as well as the most frequent diseases from the four categories of modern cardiovascular diseases (Coronary, Structural, Arrhythmia, Heart Insufficiency), showing the different technical therapy possibilities of the diseases displayed. The modern 3D view provides a better understanding of the pathologies. Many questions about certain techniques and procedures may be answered by simply clicking on the therapeutic device to be used.

With the CSR, you can continue to treat and consult your patients without the risk of infection and not only answer their questions, but go beyond, using a modern tool to help your patients improve their understanding of cardiovascular treatment and diseases. Cardiolectra's CSR makes it possible to provide top-quality cardiac consultation and care, even during these turbulent times. The CSR will enable you to offer the best possible cardiac care, and help you serve and support all those depending on you.

Please feel free to use the special voucher code CLD2020 at www.cardiolectra.com. With the use of the code, readers will get the CardioShowroom for 12 months for the price of 9 months.