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EDITORIAL

The power of visuals: taking patient education to the next level

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This editorial refers to '360° Virtual reality to improve patient education and reduce anxiety towards atrial fibrillation ablation', by A.N.L. Hermans *et al.*, https://doi.org/10.1093/eurheartj/euac246.

The anatomy of the heart is complex, dynamic, and it is an organ with which we as humans have a strong emotional connection with. When something with the heart goes sideways requiring medical assistance, it usually causes a lot of stress and anxiety for patients. Cardiology is a medical specialty that has developed enormously in recent decades and medical–technical developments have made great strides. This has led to vastly improved options for interventions with the support of complex technology, resulting in a much better life expectancy for cardiovascular patients.

As healthcare professionals and scientists we contributed to this and have grown along with it. But what about the patients who enter a modern intervention room today with all that buzzing complex technology around you, maybe even see robots in a corner? And during the procedure, which not unusually can span several hours, they hear all kinds of unfamiliar medical jargon that they cannot follow. Indeed, anxiety will arise and there is growing evidence that it may negatively influence the outcome of the intervention(s). Naturally, at the time of decision making the patients are informed and involved, and during the procedures for sure by the intervention team. But what if you could prepare the patient and the family using modern digital tooling that is able paint a much more vivid picture of what patients can expect other than being informed in a standard fashion orally and by a brochure?

The study by Hermans *et al.*[1] (reference to this article in *Europace*) in this issue of *Europace* entitled '360 Degrees Virtual reality (VR) to improve patient education and reduce anxiety towards atrial fibrillation ablation', describes a new development using a VR presentation to more lively show to patients what to expect during an ablation procedure and tested if that reduces anxiety during the procedures and improving patient satisfaction. The results of this study were favourable for the VR group by indeed reducing the levels of anxiety compared to group of patients being informed traditionally by oral counselling and a brochure.

VR is currently finding its way on a much larger scale and gaining traction in medicine.[2] Until not so long ago, VR was more like science fiction and for computer gaming enthusiasts. It required powerful computing technology with great graphical capabilities, making it complex and expensive. The computer-based movie and gaming industries have undergone an incredible development and that is now trickling down to medicine. What was a powerful computer 10 years ago is now in our pockets and we carry it with us all day long: 'the smartphone'.

Smartphones are going to be fundamental to support the current wave of further digitization of healthcare. Necessary, as we need technological solutions to meet the challenges we face in healthcare, such as a shrinking workforce, a growing elderly population, access to healthcare and improved treatment methods needing additional education and training including remote proctoring. Education is very important for the patients who are more and more involved in their care process and decision making, e.g. patient empowerment.

Pioneering groups have already shown that VR can be great for treatment planning, education and training of physicians, medical students and healthcare professionals.[3] Using VR to reduce anxiety levels for healthcare workers and patients are more recent developments.[4] The first groups to receive 'VR treatment' instead of standard pharmaceutical interventions to reduce anxiety and stress were patients in intensive care units.[5] More recent developments also show a decrease in patients wearing VR goggles during an interventional procedure for distraction and reduction of anxiety levels.[6] So it is no longer a niche to use VR and more results are expected to be reported soon with as good example this study by Hermans *et al.*[1]

An interesting observation of this study is that the investigators did not use dedicated computers or VR glasses, such as the Microsoft Hololens or other gaming oriented visualization devices with high graphical capabilities, but our own smartphones and a disposable cardboard VR viewer. This makes it more accessible for most. However, the production of an informative educational VR movie is still a large project by itself. The Maastricht group (MUMC), ensembled a multidisciplinary team including patients for their project and the VR video was composed in collaboration with an outside specialized company. Although it becomes more easy to make recordings yourself, and having access to editing software, for the time being dedicated professionals to produce such a video are still necessary. These factors and the initial producing costs will have an impact on selecting the patient categories where the VR technology is most beneficent. We hope to see that future researchers will follow the initiative from MUMC to make the VR video openly available so that other institutions may learn from it and replicate it, adjusted for their own setting.

We applaud the Maastricht group for their development, which has made this VR application accessible to many patients with a technically

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simple and therefore 'cheap' solution. And that this indeed works to successfully lower the anxiety of the patients, also leading to higher patient satisfaction.[7] One important takeaway is that the patient can take this technology home by means of the disposable cardboard box. This is also very useful for the family and other loved ones to be so detailed informed about these very complex interventions. All this with the motto that a picture can say more than 1000 words, let alone a video, or in the future perhaps an interactive VR world. A world were a patient can see his own personalized medical problem and see how it differs from a healthy condition. The patient could perhaps even see how the patients' medical condition can be improved by the proposed intervention(s). This can become part of what we often refer to as patient journey.

Besides using VR for patient education, the field of advanced visualization in medicine is rapidly growing even beyond VR carrying names as mixed reality (MR) and augmented reality (AR). These latter two are very likely to becoming more used for treatment guiding in the near future. They can combine simulated imagery with the real world, e.g. the patient on the operation table, as seen through a camera or glasses or head mounted display. Multimodality imaging could so become much more vivid and helpful for the operator while keeping eyes onto the patient instead of a several displays during an intervention. Combining the multimodalities information and having all the relevant information viewable (AR/MR/VR) available on time when the operator needs it, without distracting the operator, will be a key area of focus.

Some years ago the Google glasses made their appearance but they faded away as there were large privacy concerns about wearing these glasses in the public domain. However, there are signs that they could return in the consumer market as rumours suggest that there is a possibility that we could see new smart glasses from the big Tech in the near future. Medical device companies should play a key role by implementing these new technologies safely into a clinical setting, making sure all the safeguards and regulations are met.

Meanwhile, the pandemic caused world-wide havoc with travel restrictions and lock-downs causing amongst others the problem of how to educate and train healthcare professionals in procedures at places where patients could not be transported to specialized centres but still needing complex procedures? That stimulated some companies to transform the former Google glasses into an instrument that could be used for teaching and training of medical professionals, including remote proctoring.

Having said that, if we are going to apply AR for therapeutic interventions, regulation and approval of these devices and software applications becomes necessary. The U.S. Food and Drug Administration has started to listing the medical devices that incorporate AR and VR (https://bit.ly/3IePim7). It also does not comes without risks and to name a few: Cyber sickness, Head and neck strain, cybersecurity, privacy and distraction in operating rooms. As Hermans *et al*. correctly identify, the need for guidelines on this topic is rising.

Wearables have the potential to revolutionize the way we can educate patients, medical students and healthcare professionals. It for sure makes healthcare more accessible and understandable for the patient. It could also provide some types of clinical services to patients at home or other non-hospital settings. Improving the quality of life by lowering anxiety levels before and during interventional procedures is fantastic. However, whether it also has long-term therapeutic effects on a large scale remains the subject of further research.

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