Note from the Editor: The "FAQ on Innovations" series represents a specific type of article in The Journal of Orthopaedic Experience & Innovation. The articles in this series are originated by the Senior Editorial Board who develop the questions. The Senior Editorial Board reviews the accuracy of the articles although "FAQ on Innovation" and "Blogs" are the only articles that are not peer-reviewed in the same way that all other articles in the journal are.

How a VR Surgical Training Company Came About: Osso VR

The Founder and CEO: Justin Barad, M.D.

Q: How did the initial idea for Osso VR emerge?

A: "I have always been passionate about video games and initially thought that I wanted a career as a game developer. During high school I secured an internship at Activision. Around the same time, I was dealing with the chronic illness of a family member. It was a real shock for our family and got me wondering, 'Is there any way I could use gaming technology to help people?' I changed my major from computer science to biomedical engineering, but I had no idea how to really get started with medical innovation. I got some advice from a mentor, who happened to be a gastroenterologist, who said, 'If you want to invent something you must first understand the problem, and a great way to understand medical problems is to be a doctor.'"

"I took his advice and he helped me get into medical school at UCLA. From there I chose to go into orthopaedic surgery. While doing my orthopedic training, I began to experience the problem of surgical training first-hand. It was evident that there was significant room for improvement in how we train and assess surgical proficiency. I was working at top hospitals with people flying in from other countries and going under anesthesia…and in certain cases we would need to literally Google videos and technique guides to help us with unfamiliar procedures."

Q: Why was there a need for this innovation? What was missing in the industry?

A: "These days there is so much to learn related to surgical procedures that we are almost victims of our success! The acceleration of science and technology has brought us an ever-expanding library of procedures that we are expected to know on demand. For example, I got a call one day asking our team to go to the Los Angeles Zoo to operate on a gorilla and it was quite the adrenaline rush because we needed to be ready to evacuate the OR if the gorilla woke up unexpectedly! These kinds of unusual situations are happening more and more often."

"Another factor is that recent advances in surgery have increased the level of complexity. Robotics, minimally invasive procedures, and patient-specific techniques…these all have longer learning curves. For example, in my opinion, getting accustomed to an open procedure takes roughly 20 cases, while the learning curve for procedures involving robotics can be significantly longer."

“We’ve already started to see the benefits of our technology. For example, one fellowship trained orthopedic surgeon who was trying to transition from doing posterior to anterior hips did a case that took three hours and 30 minutes. He then did a 2-week Osso VR training involving 91 sessions and remote coaching. Following this, he did the same patient’s other hip, and that case only took one hour and 45 minutes!”

“This space is crying out for innovation as we lack a reliable way to objectively measure our technical abilities as surgeons. With Osso VR you can remotely train and assess a team anytime, anywhere. Regarding proficiency, the platform shows the number of runs someone has done, how you perform relative to yourself, and peer averages. If someone hits a wall, then they can request hints and the program displays how many tips have been requested. In addition, the platform shows a user’s total time versus the target time.”

Q: How was Osso VR developed?

A: “Because of my background I built the first version of Osso VR myself. During this time, I met my cofounder, Matt Newport, online. Along with Matt, a game developer, we submitted Osso VR in a technology competition and ended up with some early investors. We launched Osso VR in 2016 and had our first customers in 2017.”

Q: What drives you?

A: “As a pediatric orthopedic surgeon, I feel a strong mission to improve outcomes via better assessment, as well as to democratize access to surgical education. To date we have trained people in over 30 countries.”

Q: There are other surgical training platforms. What makes Osso VR stand out?

A: “We train 4,000 healthcare professionals each month on 100 modules, and compared to other surgical training platforms, we have the world’s largest surgical training library and the world’s largest medical illustration team. Our 40+ medical illustrators have brought us to the forefront of the intersection of art, education, and medicine.”

Q: VR is still new. How do you get people’s attention?

A: “We recognize that we’re asking people to be open to something very new, and that we need to be able to motivate people beyond the perception that ‘VR is cool.’ So, we dug deep, looking at medical innovations throughout history. In ancient Rome, Galen thought that all medical knowledge had been discovered, so for the next 1,000 years there was essentially no progress in medicine. Vesalius, a 16th-century anatomist, created the De humani corporis fabrica, which contained such strikingly beautiful artistic representations of the human body that people were deeply inspired. His work profoundly altered medical training. We thought, ‘How can we use a similar strategy to inspire people to try something new and different?’”

Q: So, what did you come up with?

A: “An outrageously talented team. For example, our art director supervised the first-ever Oscar awarded to a VR film. Frankly, our art team rivals what you might find at major film and game

studios. You could say that our calling card is the visual artistry…not only is Osso VR clinically accurate, but it is exciting."

Q: What research is there behind Osso VR?

A: "There are several Level 1 randomized trials (RCTs) demonstrating the efficacy of Osso VR. One found that UCLA trainees using our technology perform 230% better than traditionally trained surgeons.[1] In examining trainees' ability to do procedures without supervision, a key training metric, a 2017 study showed that of traditionally trained residents who graduated—after 14 years of education—31% couldn't operate without supervision. This study determined that in the traditional training group, 25% could operate without supervision; of those trained with Osso VR, 78% could operate unsupervised.[2]"

Q: How does the technology work?

A: "Osso VR makes use of off-the-shelf VR technology, namely, the Oculus Quest 2. You can put on this $300 headset, and you are immersed in a virtual OR. And because of the haptic sensors, trainees can feel the density of bone. Users are provided with post-training analytics that reflect their performance in various modes."

Q: Have you encountered any resistance to adoption?

A: "The most common issues that arise concern haptic feedback, with some people saying, 'There is no way to replace hands-on training because of the sense of touch.' I tell them that Osso VR is not replacing hands-on training but is supplementing it. Cadaver labs are great, but so often we are doing those too early in the learning curve to be effective. The best strategy is to do the bulk of training in VR and then move on to cadavers and then humans. So, with VR we are leveraging the value of spaced repetition, the idea that for maximum retention it is best to practice complex skills multiple times over a period of time (often weeks or months). Once we reposition it with our colleagues they say, 'That makes sense.'"

An Osso VR User: Rachel Mednick Thompson, M.D.

Q: How did you come to be involved with Osso VR?

A: "As the Associate Residency Program Director for The Department of Orthopaedic Surgery at the David Geffen School of Medicine at UCLA, I want to ensure that residents have the best training opportunities available. We have had the benefit of having Justin, a UCLA orthopaedic residency graduate, on staff at the Orthopaedic Institute for Children, which is affiliated with the University. We have been able to partner with him on education and research, asking, 'Can we decrease OR time, increase safety and improve precision and outcomes if we use Osso VR as an adjunct to educational offerings?'"

"In pediatric orthopedic surgery there are not a lot of sophisticated implants, but there are a lot of skills related to temporospatial relationships that must be acquired for safe surgery. For example, 'If I move my hand like this, what will it look like on an x-ray?' These things are not necessarily intuitive, and many times we don't teach them in the OR due to time constraints and safety concerns for the patient."

Q: What Osso VR research have you participated in?

A: “We just finished a RCT involving senior medical students and junior surgical residents who were randomized to either group A: those who trained on Osso VR and then did a sawbones facsimile of what they trained on, or group B: those who watched a video, read a technique guide and then completed a sawbones exercise of the same surgical skill. Some things we looked at were how many times they penetrated the joint, how many times they came in and out and corrected themselves, etc. While our data has not yet been published, there is a positive trend towards increased efficiency and better outcomes in the trainees that worked with Osso VR.”

Q: What are your plans for using Osso VR going forward?

A: “My goal is to convince colleagues that it is worth their time to incorporate Osso VR into their instruction…to show them that this technology leads to better resident preparation, improved surgical skills, decreased time wasted and ultimately less frustration in the OR. My hope is that five years down the line we will be able to fully integrate Osso VR training into our surgical education program. This would mean that we can use Osso VR to test temporospatial skills from the onset of training and create individualized VR learning plans for each resident based on those results so that we may level the playing field for all trainees, which will simultaneously increase patient safety AND bolster resident autonomy.”

Q: “Do you see any hindrances at this point?”

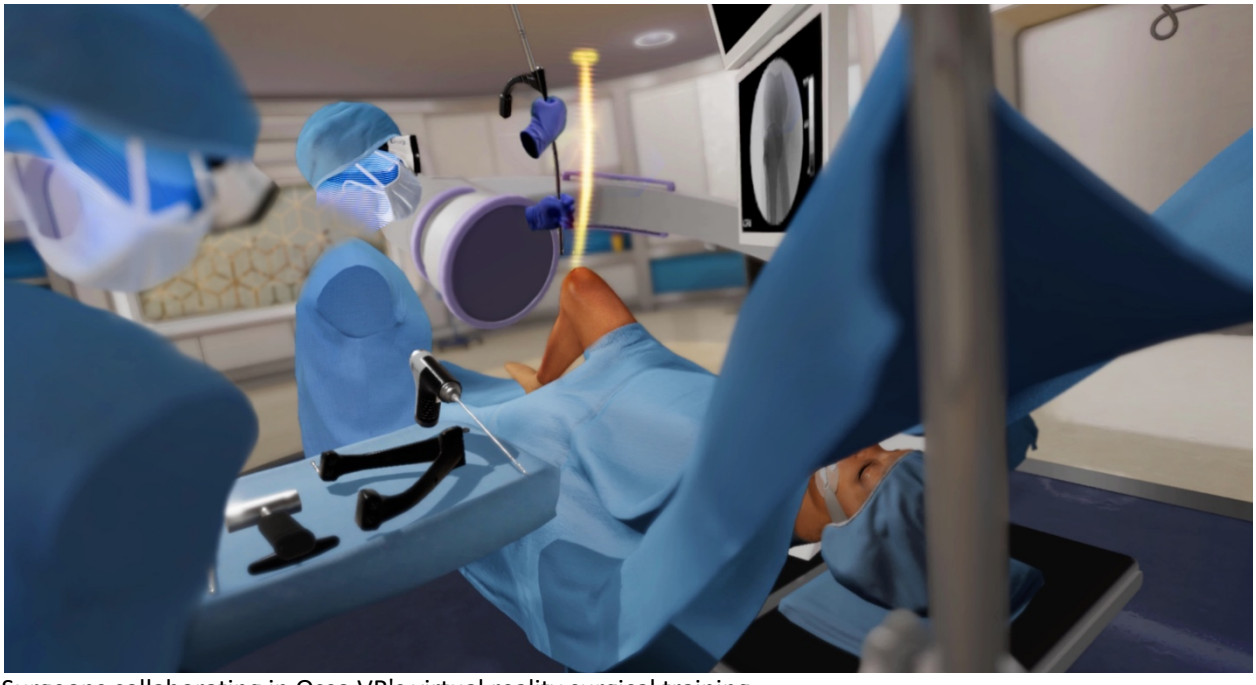
A: “As attending surgeons, we have many responsibilities. First and foremost, our responsibility is to the patient. We need to ensure optimal outcomes and safety. For that reason, there is often concern for ‘allowing’ residents to participate fully in surgery without knowing, through an objective assessment method (like Osso VR), that they are ready for surgical autonomy. While we know this, and we know that Osso VR can bridge this gap, surgeons are also very busy and may not want to spend the upfront time investing in the surgical training of residents outside of the operating room. We need to bring surgical educators—my colleagues—to a point where the return on investment of an hour of Osso VR training yields significant benefits in consistency and efficiency in the operating room, which may translate into improved patient outcomes.”

Images:

In Osso VR, you can enter the virtual operating room at any time and from anywhere.

Put on a VR headset and step into the future of surgical training with Osso VR.

A visually stunning and lifelike virtual reality patient in Osso VR.



Surgeons collaborating in Osso VR's virtual reality surgical training.

References:

1. https://pubmed.ncbi.nlm.nih.gov/32769533/
2. https://pubmed.ncbi.nlm.nih.gov/28742711/