

REBOOTING THE BRAIN

Virtual Reality Assists Critical Care Patients

By Symone C. Skrzycki

A woman relaxes in the sand, her eyes drawn to an iridescent ocean. Trips to the beach are one of her beloved pastimes.

But something's different today. In place of sunglasses, she's wearing virtual reality goggles and a headset. A long hospital gown replaces her swim gear.

Still, she's cherishing every moment.

By her side is Dmitriy Golovyan, an Indiana University School of Medicine pulmonary and critical care doctor. He's part of the team behind a new study titled "VRICU: Virtual Reality to Improve Cognition in the Critical Care Unit."

"I put these goggles on her and she said, 'I love beaches and I don't think I'm ever going to really be able to go to the beach again for the rest of my life.'

"How did she phrase it? It was so touching. She said something along the lines of, 'This is one of the nicest things anybody's (ever) done for me.'"

The woman, in her 70s, is a test patient for the VRICU study. Phase One kicked off in the spring of 2018. The goal is to reduce the impact of post-intensive care syndrome, which is characterized by cognitive impairment and emotional issues such as depression, anxiety and post-traumatic stress syndrome.

"We know the biggest risk factor for developing these (symptoms) is intensive care unit (ICU) delirium," Golovyan relates. "We also used to think ICU delirium was something that comes and then goes. Now, we realize it certainly is something that comes – but doesn't go away very easily."

"What we've recognized, mostly over the past 10 years, is that there is not this rosy picture for patients who survive the ICU. And that once they leave our service, they don't just live happily ever after. Actually, (what begins as) the critical illness for many of them becomes the starting point of a chronic illness (post-intensive care syndrome). And people don't recover quickly."

Gaming element

Leading the study is Dr. Babar Khan, research scientist at the Regenstrief Institute and assistant professor at the IU School of Medicine.

"We're trying to do it twice a day for 10 to 15 minutes at a time," he reflects. "But ideally, as we go forward, we would need to define, No. 1, that it's acceptable. It's feasible. It's safe. And No. 2: What would be the dose (duration) of the intervention?"

"Those are some really good questions that still need to be answered. But I think that given the boom of virtual products now, we will be able to answer those questions in a faster manner than would have been possible say 20 years ago."

Although virtual reality has been tested in hospital patients previously, it's never been done in intensive care units.

Wen Krogg, an IU School of Informatics and Computing graduate, designed the virtual environments. In addition to a beach landscape,



Patients are transported to relaxing places through visual simulations, fans, heat lamps and sound effects.



Dmitriy Golovyan is passionate about enhancing people’s quality of life with the VRICU study. He says more than half of patients suffering from post-intensive care syndrome experience cognitive impairment that’s on par with traumatic brain injury.

there is a sculpture garden and a park.

“The technology itself isn’t all that unique. The programming that’s been put into it to allow for someone who has no (or limited) mobility to use it is what makes it unique,” she affirms.

Typically, the patient is lying down. The nurse applies the headset and goggles. If the patient is mechanically ventilated or otherwise immobile, the medical professional controls movement from a computer.

“If they (patients) have the ability to move their thumb, they can use a little remote control that can let them go forward in the scene,” Krogg explains. “Walk around in the scene. Jump from place to place.”

As a child, Krogg’s family was told that her father would be brain dead if he survived a motorcycle accident. He defied the odds, relearned how to read and write and is thriving today.

She finds fulfillment in providing solace to others in similar situations through her gaming talents.

“You’re able to use skills that people think should only be used in movies and film – in the entertainment industry. Instead, you can use this technology to help people. You can comfort the parents of the children or patients who are in the ICU. They (patients) stare at a ceiling all day long. It’s basically about escaping that horrible situation, even if it’s just for 15 or 20 minutes a day.”

Khan observes that it serves as an escape of sorts by putting them into a virtual space.

“Having them feel that they are in a separate place, where they have to use more of their brain power, would help them reorient or do more brain activity that may be able to reset that equilibrium in their brains (and) would prevent them from developing delirium. Or we could reduce the duration of delirium or acute brain failure in the intensive care unit and, with that, hopefully see important effects downstream when they come out of the ICU.”

Beyond the ICU

When Khan was pursuing pulmonary critical care training several years ago, one of his professors was unexpectedly admitted to the ICU.

“He was on a ventilator. We did not have much idea about brain failure delirium at that time. And we did not have much clue of the complications that were happening in people getting out of the ICU. He survived, but it took him a long, long time to get back to work. His story left an imprint on me, enough to start developing these programs for patients in the ICU and also for patients who survived the ICU.”

In 2011, Khan launched the Eskenazi Health Critical Care Recovery Center, which assists with patients’ recovery after a stay in the intensive care unit. It’s the first clinic of its kind in the United States.

Following feasibility testing within the ICU, the next step is to continue therapy “in the clinic or outside the ICU setting to continue with the recovery of the brain

through a virtual reality platform,” he notes.

Dose of compassion

Golovyan contends that the virtual reality technology helps patients overcome a perceived loss: their sense of selves.

“In a large part, we define ourselves with how we think and how we feel and our thoughts and emotions. If you can’t go back to being yourself after you survive, what’s the point of going through all of this pain and suffering? ... It’s (virtual reality therapy) really like a life support system for the brain. It’s the one part we haven’t been focusing on.”

Khan shares those sentiments.

“There could be any of us who can go out, get the flu and get on a ventilator – and our whole life is going to change. It’s all about trying to get them back to their feet. Trying to get them back to work. Trying to get them back to what they want to do.

“If this thing is not harmful and it is showing early signs (of success), I would like this to be part of critical care in the ICUs,” he continues. “We are awakening patients now. We are mobilizing them. Why can’t we have them do brain activities, those that can do a virtual reality brain activity, so they can improve?”



“With all of the negative studies going on with pharmacological approaches (to preventing/treating post-intensive care syndrome), we started thinking, ‘Ok, it’s time that we should do some non-pharmacological (methods).’ ”

– Dr. Babar Khan

RESOURCES: IU School of Medicine at medicine.iu.edu | IU School of Informatics and Computing at www.sice.indiana.edu | Eskenazi Health Critical Care Recovery Center at www.eskenazihealth.edu/health-services/recovery-center | Regenrief Institute at www.regenrief.org