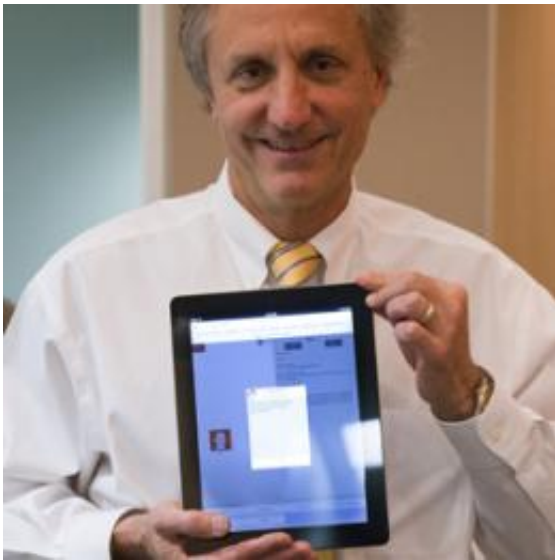


Stanford develops new tool for teaching doctors to treat sepsis

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Stanford Hospital ICU chief Norman Rizk is a strong believer in the value of a new Web-based medical game called Septris. The game trains physicians to treat the deadly complications from an infection known as sepsis. A game character, "Dr. Sepsis," looks like Rizk. Credit: Norbert von der Groeben

Jack was sinking fast, his vital signs registering alarming numbers. With every passing second, his doctor, Charles Prober, could see his patient being overwhelmed by sepsis, a deadly complication of infection that plagues hospitals worldwide.

“Jack is the hardest patient,” counseled Prober’s colleague, Lisa Shieh, MD, PhD, the medical director of quality in the Department of

Medicine at Stanford Hospital & Clinics. “Give him some antibiotics.”

Prober, MD, the senior associate dean for education and a professor of pediatrics and of microbiology and immunology at Stanford University School of Medicine, clicked in the order. A small group of watching physicians clapped in appreciation as Jack’s health almost immediately improved.

“Has he had his blood cultured yet?” said Shieh. Prober took the cue. Then he turned to another patient ailing from [sepsis](#). Just as he finished ordering fluids for that one, his colleagues shouted, in alarmed voices, “Jack, Jack!” — the first patient’s previous gains were rapidly evaporating. “Ah, that’s one thing we want to teach,” Shieh said. “You can’t just give fluids and walk away.”

Prober responded quickly, transferring Jack to the intensive care unit and setting up a surgical procedure to remove infected tissue in Jack’s leg, among other steps. Jack’s status zoomed to complete health: Prober was awarded 500 points.

Prober had scored well, not with real patients, but at a new, first-of-its-kind, Web-based medical game called Septris, which was undergoing a demonstration run on a recent morning at Stanford University Medical Center. Created by Shieh and a team of Stanford physicians, researchers and education technology experts, the game can be played on a mobile phone, a tablet such as an iPad, or a computer, and it represents a promising new approach to medical education. The idea is to plug knowledge about treating sepsis into the brains of clinicians who might find learning by digital game more appealing than a lecture, especially if they grew up with Nintendo, Playstation and Xbox. The name of this medical training tool is inspired by one of the world’s most popular computer games, Tetris.

The game begins with the cartoon image of two patients on the left side of the screen. On the right side are their vital signs — those cues that can tip off sepsis' presence. Along the bottom of the screen are diagnostic tests and treatment options. As every second passes, the patients' images sink down the screen, their vitals deteriorating. It takes less than two minutes for a Septris patient to die, which means observations and decisions must be made quickly. The game's objective is not just to keep the patients alive, but to cure them.

In real life, sepsis begins as a bacterial infection at single source, which, if uncontrolled, spreads to become a systemic attack on the body's kidneys, liver, lungs and central nervous system. It presents as simple sepsis, then moves to severe sepsis and, finally, to septic shock. It can run its entire course within hours. While the condition can be treated successfully, it can present grave challenges. Unless it's stopped at its earliest stage, sepsis can claim one life in every two it invades. More than 200,000 Americans died last year of sepsis. Sepsis care in the last year amounted to \$2 billion in the United States.

“Sepsis is one of those conditions you hear about in med school, but you need to see more of it,” said Shieh, who serves as director of the sepsis course group and is also a clinical associate professor of medicine. “In some cases, it's straightforward, and in some cases, it's not. It takes a lot of clinical sense.”

Complicating its diagnosis are accompanying chronic conditions that can make a patient more vulnerable to sepsis but may also distract a doctor from identifying it. Without a strong understanding of the basics of sepsis, the odds of recognizing a more-sophisticated presentation of the condition are zero. “Everybody needs to have at least the Septris level of sepsis knowledge,” said Norman Rizk, MD, medical director of the hospital's intensive care units and professor of pulmonary and critical care medicine. “This simple training tool begins to establish essential

knowledge that everybody needs to have.”

Playing Septris is free, and it is available at cme.stanford.edu/septris/ for anyone to try. If a physician wants to take a post-game test to earn Continuing Medical Education credits, there is a standard \$20 CME test fee.

The Septris team did not start out with the idea of creating a computer game. Key symptoms for sepsis and protocols for how to address it are routinely taught in lectures or daylong workshops, and that’s the format the Stanford group initially pursued after it was awarded \$30,000 from Stanford medical school’s CME program. (This development grant was one of 12 approved this year as part of a three-year, \$3 million grant from Pfizer Inc. to encourage innovation and advanced technology use in CME courses that will improve clinical outcomes.)

By the team’s second meeting, though, members began to question their initial approach. “People were looking at their phones and losing interest,” said Eileen Pummer, RN, quality manager at Stanford Hospital and the course’s co-director. “I thought, ‘Oh, no, this is falling apart already.’ Then Matt Strehlow said something to the effect of, ‘How about a mobile app? People are always on their phones.’ The energy just turned completely around, and we started brainstorming from there.”

Strehlow, MD, is a clinical assistant professor of surgery and an emergency medicine physician. He is also the assistant medical director of the [hospital](#)’s emergency medicine department, with a special interest in educational technology and in sepsis. Strehlow is so addicted to computer games that he doesn’t have any on his phone or at home to avoid the disruption it would cause to his life. He’s very aware of the popularity of computer games and of how many medical students and young physicians use their iPhones and iPads as knowledge support tools. During a postdoctoral study in India, Strehlow tested the teaching

power of gaming against more traditional simulation methods and reading. In initial comparisons, the simulator-learners performed better than did the gamers. Three months later, however, he retested the group and found the gamers ahead on skills. “They’d been going back into the lab to play the game,” he said.

The clinicians brought the idea to instructional technology manager Brian Tobin and instructional technologist Jamie Tsui in the medical school’s Office of Information Resources & Technology. While the team had solid content — best practices and guidelines based on medical literature — there were different questions to be answered for a game format. One of the biggest, Tsui said, was whether to allow the game patients to die. “Players had to be allowed to fail, but also to have a chance to fix their mistakes,” he said. So, patients die once and then reappear with the same symptoms, thus providing the opportunity for knowledge acquired by failure to be applied with success the second time through. The designers also limited the number of patients in play at a time to two, though Tsui noted that more could be added in the future if users are “up for that higher level of play.”

The goal was to keep fun in the experience, despite the gravity of the topic. “You want to let the learner create and play, and you want to offer them choices,” said Tobin. “It also has to be suitably hard enough so that not anybody can get right through it.”

“At first, we made it way too hard and patients were dying too fast,” Strehlow said. That first version had eight patients on screen at the same time. The group beta-tested the game on several groups of physicians in order to work out the combination of symptoms and timing that would be challenging without being impossible to beat. There’s also a classic trick: At least one of the patients doesn’t have sepsis, Strehlow said.

They also adjusted the speed of the game to accommodate clinicians

who “like to take their time reading test results versus those who work very quickly,” Tsui said. They did not include images of CT scans or X-rays, however. “That added a layer of complexity to a game we wanted to keep as simple as possible,” he said.

“We wanted to build something that would work across all platforms,” said Tobin, “whether someone is using a handheld with a touchscreen, or a computer, where you can just click a link and the game displays right then and there.” They’d already had the idea that there might be other topics that would work with this approach, he said. “We planned for it to be easily expandable, so everything is in text files.”

The Septris team had to make medical decisions, too. In real life, some antibiotics work better in combination with others; the game awards points if a player understands the possible positive or negative effects of those combinations. They also wanted to reward players with something more than points for making good choices. When a good choice is made, a pop-up appears with words of praise and wisdom from a “Dr. Sepsis” whose knowledge-reinforcing tips are meant to be like those from an attending physician to a younger physician. The game’s tips section has links to medical journal articles with data to back up the practice guidelines Septris teaches.

The game is not without a bit of subterranean Stanford medical community humor. The cartoon figure of Dr. Sepsis looks a great deal like Rizk, the ICU chief and senior associate dean for clinical affairs. The pretend patients (Jack is accompanied by Ben, Charlie, Hugo, Libby, Kate, Jacob and Claire) are drawn with features that can be found on some other Stanford physicians.

The Septris team is aware that some people are uncomfortable with the idea of a game to teach such a serious subject. Even some recent visitors from the gaming community were a bit troubled by it. “The comment

was that there's something about the word 'game' that doesn't feel like the right fit when you're thinking about treating patients," said Clarence Braddock, MD, associate dean for undergraduate and graduate medical education and a professor of medicine.

But Septris is not conceptually different from the modes of simulation now being used at Stanford and other medical schools to train physicians. "What you're talking about are ways to activate a learner's mind to engage and connect." Braddock said. "You're trying to mimic the cognitive pressures and drilling around the application of concepts to clinical problems."

Braddock and other medical school educators plan to study the game's effectiveness as compared with other types of training methods. The first large-scale group of subjects will be this summer's incoming group of interns.

Already, though, the game appears to have one benefit. People like playing it. "Septris puts people through an increasingly more realistic and challenging simulation, and generates adrenaline by having fun and engaging in it," Braddock added. "You're not thinking of it as learning, but as play, which from a neurochemical standpoint, is a win-win."

Provided by Stanford University Medical Center

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