

Can you outdo a doctor at these video games?

Newer games for physicians seek to both educate and entertain

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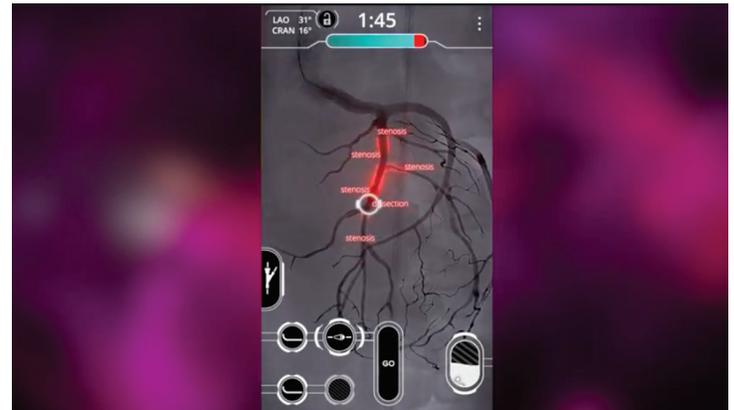
In the smartphone video game *Dr. Game: Surgeon Trouble*, players match colored shapes to gain points, although gameplay is occasionally and deliberately paused and the player is presented with a problem they must troubleshoot to resume playing. It will certainly never rival the commercial success of *Candy Crush Saga*, a game that reportedly generated \$1.5 billion in 2018 alone. But that isn't the point. The aim of this free game is not to make money, but to make better doctors.

The idea for *Dr. Game: Surgeon Trouble* came from Marlies Schijven, a professor of surgery at the Academic Medical Centre in Amsterdam, who recognized that surgeons are often ill-prepared to troubleshoot their surgical hardware. She wondered whether students training in surgery could learn the necessary skills by tinkering with a malfunction-prone virtual version of the hardware embedded in a computer game. Schijven worked with the video game company WeirdBeard to get the idea off the ground.

"I call it stealthy learning," Schijven says. "You need to slide in a layer of educational content preferably in a way that makes it easy to learn by just playing the game." It seemed to work: a 2017 study found that during minimally invasive surgical practice on a live anaesthetized pig, students who had played *Dr. Game: Surgeon Trouble* as part of their curriculum solved almost twice the number of hardware problems they were presented with as compared with students in a control group who had received a games-free curriculum.

Games that aim to teach and entertain in equal measure are beginning to make inroads into the field of medical education. According to advocates, the right game can help a surgeon improve their manual dexterity or help a clinician make better triage decisions.

Chicago-based Level Ex sees the value of games for teaching better decision-making during surgery. In March 2019 it launched



Level Ex's Cardio Ex game trains doctors on decision making and their knowledge of vasculature.

Cardio Ex, a game for practicing cardiologists. It is the fourth smartphone-based game in the company's portfolio. The games are proving popular with players: the firm says that its most popular game — *Airway Ex* — has over 235,000 registered users. Eric Gantwerker, who is vice president and medical director at Level Ex, says the company's games are now being studied by physicians in several institutions. "We want to be peer reviewed," he explains. "We can't go out and tell people we change knowledge and attitudes and skills without evidence to demonstrate that."

Putting games to the test

Studies have found evidence of a link between video gaming and improved hand-eye coordination. As early as 2002, a US-based research team was exploring whether this might be an advantage in the operating room. They compared surgeons with no gaming experience to surgeons with a history of playing video games for more than three hours per week. The gamers made 37% fewer errors and were 27% faster when assessed through a laparoscopic skills and suturing program.

As a trauma surgeon, Deepika Mohan of the University of Pittsburgh became aware that doctors do not always send people with serious but visually subtle physical injuries (such as those experienced during a fall) to the hospitals best equipped

to treat the trauma. Mohan collaborated with a local video game company, Schell Games, and developed an adventure video game — Night Shift — that would help physicians improve their triage skills. The game puts the player in the shoes of a young man working as a triage doctor.

The adventure component comes from the game's narrative: the young man is also trying to learn more about the mysterious disappearance of his grandfather from the people he interacts with at work. Mohan and her colleagues asked physicians working at US trauma centers to play the game for at least an hour and had a control group engage with standard trauma-related learning apps. Later, when the participants were assessed in an emergency department virtual simulation in a 2017 study, those who had played the game were significantly less likely to underestimate the severity of injuries.

But the same study found that among the physicians who used the standard learning apps, 91% reported enjoying doing so. In contrast, just 40% of physicians asked to play Night Shift described the game as an enjoyable experience. Some said they found the game's narrative distracting or annoying.

This may reflect a general sense of disbelief among physicians — particularly those over the age of 40 — that video games are anything but a frivolous waste of time. “There are plenty of naysayers,” Gantwerker says. Attitudes are now shifting, though, perhaps in part because younger doctors grew up playing games.

Money matters

Arguably, the real problem here is money: educational games are often developed using generous research grants — but the budget is still tiny compared to the money available in the video game industry. Mohan says her team ultimately spent about \$700,000 developing two games. Many video games have budgets in the tens of millions.

Some companies are now spending more on educational games. Level Ex has received venture capitalist backing and raised more than \$20 million, enabling the firm to

spend a few million dollars on developing any single game. Gantwerker says the extra money makes a difference: Level Ex's games may be designed with medical professions in mind, but the download figures suggest they appeal to anyone. “There are lots of people who aren't physicians but who play our games,” he says. But finding the right balance between education and entertainment is still a huge challenge. Schijven took a relatively hands-off approach when working on Dr. Game: Surgeon Trouble because she was concerned that members of her research team would interfere too much with the game design and compromise the features that made it engaging to play.

Mohan found that Night Shift — and a follow-up puzzle video game Shift: The Next Generation she co-developed — began to become enjoyable games to play only after her team of researchers and the team of game designers had worked out the balance between education and entertainment. Nevertheless, she notes it's tough to vie for players' time when pit against non-educational games. “Night Shift is not going to compete against a game you might choose to sit down and play on a Sunday evening,” she says. Noah Falstein, a longtime California-based game designer and producer who has consulted for Level Ex, is hopeful that educational games might gain more popularity. “There's a lot of collaboration [in serious games] and that's quite exciting,” he says. “It feels like the whole game industry did back in the early 1980s.”