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Paging Dr. Mario

Over at The Health Care Blog, Douglas Goldstein wrote a post earlier this month on "health eGames," a category of video games "that deliver measurable health benefits" to patients who play them. iConecto, a developer of such games, recently reported that there are already over 300 health eGames available—and that the size of this market over the next year will be $7 billion+. Consumers definitely seem open to the idea of healthy gaming: Wii Fit, Nintendo's fitness video game, is poised to become the best selling title of the year, having already sold 8.7 million units.

This got me thinking: what about video games for doctors?

Kevin M.D. began to answer my question on Tuesday when he posted this YouTube clip on his blog:

This video simulates emergency room situations; surgeons can use it to train themselves in particular operations. This is a pretty cool idea: test the skills of a surgeon, but in a context where his slip-ups won't cost lives.

What's more surprising is that even conventional video games can play a role in training surgeons. In January, the BBC reported that a British hospital asked "eight trainee surgeons to spend an hour playing [non-medical video games] before performing 'virtual reality' surgery" through the program in the YouTube clip above. The hospital found that "game players scored nearly 50% higher on tool control and overall performance than other trainees." The game that was most effective at improving their skills was Marble Mania, in which the player rolls a marble through a maze and obstacle course.

This isn't all that weird when you consider how the technical skills you need for most video games—spatial awareness, fast reflexes, dexterity, and precision—are also vital to successful surgery. If a video game can help a surgeon brush up on

these skills, it doesn't matter whether it's about a marble or a monkey.

This brings us to Super Monkey Ball, a video game in which you play soccer as a kooky little monkey. The game is a favorite at Beth Israel Medical Center in New York City, where it's regularly played by surgeons including the chief of minimally invasive surgery. In 2005, the New York Times noted that Beth Israel surgeons kept "an Xbox, along with PlayStation 2 and GameCube consoles, just a few strides from the operating room...[in order to] warm up...just before surgery."

Super Monkey Ball's popularity at Beth Israel stems from a study that the hospital did in 2004: researchers looked at 33 doctors and found that those who "spent at least three hours a week playing video games made about 37 percent fewer mistakes in laparoscopic surgery and performed the task 27 percent faster than their counterparts who did not play video games." That's because the skill set relevant to Super Monkey Ball and laparoscopic surgery are strikingly similar: an AP report on the study quotes one surgeon as sitting down for a game and exclaiming "yes, here we go!...I need the same kind of skill to go into a body and sew two pieces of intestine together."

There's a clear novelty factor in the fact that surgeons are playing games in order to prepare for surgery. But there are also more serious considerations to reflect on here, and one of them is cost-effectiveness.

A high-end medical training device of the type currently available to most hospitals can be prohibitively expensive. In 2005, Rosser told the Times that he "had been using one" of these machines to practice for laparoscopic surgery, but that the device cost $200,000 (about $224,000 in 2008 money), making it too expensive to serve as a widespread tool for medical training outside of wealthy medical centers. But you can buy an Xbox from Wal-Mart for a couple of hundred dollars, giving poorer hospitals a much cheaper option for keeping surgeons on their game.

Not all of the virtual training programs are kids' stuff. More serious fare also can replace expensive training devices. Consider the work of the Nationwide Children's Hospital, Ohio State University's Department of Otolaryngology and the Ohio Supercomputer Center. The three organizations have come together to develop the Virtual Temporal Bone Project, a computer program that provides medical students with a 3-D model of the temporal bone, which is located near the ear canal.. Through the program, students can practice the drilling that they would perform during ear surgery in the real world.

According to the Ohio Supercomputer Center, the ear diseases addressed by these doctors-to-be account for more than $8 billion in annual health care costs in the U.S. Further, "training the health professional charged with treatment of this significant disease process requires five to seven years at an annual cost of more than $76,000." By contrast, "the simulator's hardware costs about $6,500" and "its software is open source because it is a publicly funded project [thanks in part to grants from the National Institutes of Health]." In other words, because the money and the code are both public, developing the simulator once means that it can be more easily picked up by other hospitals and programs.

But not all virtual medical training is cheap. The University of Wisconsin-Madison is developing a program called Medical Cyberworlds, a "massive multiplayer online game" meant to immerse doctors in a virtual reality hospital setting for training purposes. The price tag for its development: between $20 and $60 million.

These huge numbers are something of a red flag. One of the big—indeed, perhaps the biggest—problem with our health care system is its unfettered proliferation of high-tech, high-cost medical devices that then are used in cases where we really don't need them. America has a tendency to go way overboard when it comes to hi-tech medical gadgets. With that in mind, it's not too difficult to imagine a world where we spend millions of dollars on sophisticated virtual reality programs long after we have reached a point of diminishing returns. Indeed, one gets the sense that software development companies are eager to make such a world a reality: already, iConecto is talking up the size and future growth of the medical video game market as an exciting business opportunity.

Still, it would be unfair to paint Cyberworlds as a harbinger of American excess without noting that the program is also an example of how medical video games can train and educate doctors in the more interactive dimensions of care. One of the

key elements of Cyberworlds is that it's a multi-player game: instead of just having the computer spit out an established medical condition to direct the player's actions, Cyberworlds lets other players control patients or medical professionals in the online universe. The idea is to incorporate a degree of human unpredictability and active cooperation into the virtual training.

The idea of immersing players in virtual scenarios that test more than their precision with a scalpel is a compelling one. In May of last year, the American Geriatrics Society reported that researchers had developed "3-D virtual reality video game [called] RiskDom-Geriatrics." The game was "designed to train medical students to make effective home visits, simulated a patient's home...[it] allowed players to explore and evaluate the home for hazards that could lead to falls and other injuries." (You can check out an online version of the game here). Preliminary data found that "medical students, who were evaluated before and after playing and had to play against time and distractions, showed improvements in their understanding of how to make an effective home visit."

The geriatrics example speaks to the potential of video games to help doctors learn to coordinating care while engaging in "thinking medicine"—an important, but overlooked part of health care. Anything that helps more doctors get better at listening to and talking to patients is a good thing—especially if it's packaged in a way that is broadly accessible.

While teaching doctors how to interact with patients, video games also reveal how racial discrimination can stand in the way of good medicine. In July, researchers from the University of Florida ran an experiment in which two dozen third-year medical students interacted with a virtual female patient. The Gainseville Sun has gives us the details:

"For half the students, the woman appeared to be light-skinned; the other half interviewed a dark-skinned woman. Both women had the same voice, animation and appearance....

"Outside observers [both medical and nonmedical] watched videos of the students doing the interviews, but could not see the skin color of the virtual patient. They then rated the students' empathy toward the woman's medical complaints [on a scale of one to seven]. The students interviewing the dark-skinned woman were rated consistently less empathetic. The results [for these students] correlated with standard psychological tests of [racial bias that the participants also completed.]"

The importance of this study is that it introduces the idea of "automatically detect[ing] bias and, then and there [at the point of detection,] help[ing] medical students" improve their skills "at interacting with people who come from different racial and ethnic backgrounds." This is an important issue to tackle. As I've noted in the past, a systemic bias against racial and ethnic minorities seems to be built into our health care system. (No, I'm not saying all doctors are racist—just that, as a statistical matter, ethnic and racial minorities are less likely to get high quality care).

Earlier this month, the University of Washington released the results of an online survey which tested the unconscious racial attitudes of 2,500 doctors. The study looks for subconscious signs of bias by asking the test-taker to quickly complete a series of questions or tasks that imply a racial preference, such as having to quickly state whether photos of blacks and whites were positive or negative. Reuters reports that "researchers found that most doctors in all racial and ethnic groups showed an 'implicit preference for whites over blacks,' with the exception of black doctors who showed no preference for either race." As the study's abstract puts it, these results "lends support to speculation that provider implicit attitudes about race may represent one pathway to unequal treatment in health care."

So in the end, it turns out that video games can be used for more than just sharpening reflexes: they can also provide simulated, virtual environments that force doctors to stretch their thinking. Just as importantly, they allow for a more controlled, targeted approach to medical training, which can help doctors hone specific skills in a more targeted way than might be possible without the limitless possibilities of a virtual world.

To be sure, the verdict is still out in terms of how useful video games really are for training doctors. But there are a number of interesting possibilities here. Video games can (a) help control costs for expensive medical training, (b)

democratize access to effective training across institutions by providing a low-cost alternative to over-priced devices, and (c) revitalize the teaching of “thinking,” patient-centered medicine. And you thought video games were just time-wasters.

Posted by Niko Karvounis on October 31, 2008 | Email this post

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I'm a little puzzled about a rather primitive video game being likened to virtual reality simulators in widespread use. While it was quite primitive, I built a prototype, somewhere between 1973 and 1976, of a cardiac life support training tool in which I actually modeled the conductive system of the heart, the effects of some drugs, and would generate the EKG changes from the student's responses.

Real-world medical training devices are far beyond what you are describing. For example, many intravascular and endoscopic procedures, which are often cheaper and safer than open surgery, are controlled by vernier knobs. Current simulators have the trainee looking through the same eyepiece or at the same monitor that would be used for a real patient, and the control knobs don't just turn the cursor; they give tactile resistance that feel like the procedure. Some 1995 work is at
http://ovrt.nist.gov/projects/health/vr-envir.htm

May I suggest you look a bit at the value of advanced flight simulators in aviation safety, before suggesting this is a "verdict is out" because some video game company put out a news release? Yes, a full-motion Boeing 7x7 cockpit simulator, to say nothing of military aircraft simulators, is expensive. It also lets the crew practice for emergency conditions that would be far too dangerous to try in an actual training flight. What is the value of having experienced taking a wide-body jet into a controlled overrun off a runway, maintaining braking control? IIRC, there was a save last week involving just such a contingency.

Incidentally, the Laboratory of Computer Science at Mass General was doing physician-patient bias studies sometime before 1970; that's when I ported the patient interviewing software to Georgetown.

Am I missing something?

Posted by: HCBerkowitz | October 31, 2008 at 03:05 PM