Virtual Patients Help Medical Students Link Basic Science With Clinical Care

Rebecca Voelker

Sometimes Catherine Niewoehner, MD, does her best writing in the wee hours of the morning. Her subject could be whether William Coolfeather’s depression will improve in the face of economic upheavals at work and the fact that his volatile, elderly father has moved in with him. Or she could be plotting 80-year-old Elias Trappen’s downward health spiral and how to help his family deal with his decline.

“I wake up at 3 AM and just jot things down,” says Niewoehner, professor of medicine at the University of Minnesota Medical School, Minneapolis.

Niewoehner is not trying to compose medical journal submissions or even the Great American Novel. The case reports that rouse her from sleep aren’t even real patients. Coolfeather, Trappen, and a cast of others are virtual patients that are the cornerstone of the Minnesota Virtual Clinic, a Web-based educational tool that is helping first- and second-year medical students relate the sometimes murky concepts of basic science to real-world patient care.

PROVIDING CONTEXT

The virtual clinic debuted a year ago for first-year students at the University of Minnesota Medical School. The concept is straightforward: almost every Wednesday, students log on to a Web site where they find medical records for a list of “patients” waiting for treatment in a primary care clinic.

The patients’ constellation of health concerns—a hand laceration, cystic fibrosis, chronic obstructive pulmonary disease (COPD), cirrhosis, childhood immunizations, Alzheimer disease, deep vein thrombosis, and more—correlate with course material. The hand laceration appears when students are studying muscles of the hand in anatomy; COPD comes up in physiology.

“This gives context to the material they have in class,” says Niewoehner. At Minnesota, the idea of creating a virtual clinic as a bridge between the basic sciences and clinical medicine first came up a decade ago, says Douglas Wangensteen, PhD, director of preclinical education. When it comes to recognizing the relevance between the two, Wangensteen says, “some students get it, but some ask why we’re studying [basic science].”

It was not until a comprehensive curriculum review in 1999-2000 that the virtual clinic idea gathered steam. In addition to giving first-year students an entrée to patient care, the clinic strengthens the continuity of course material while it fosters cooperation among faculty, says Niewoehner.

“We realized a major stumbling block was the lack of communication between courses in a given year and courses in the preceding and following years,” she explains. “The faculty are focused on...
their own topics. We wanted to increase communication and collegiality."

"LEADING EDGE"

It is difficult to track how many medical schools have created virtual patient panels or virtual clinics, but Minnesota’s apparently is one of only a few such programs in the United States—or the world, for that matter. “The University of Minnesota is probably at the leading edge in using a simulation system to bring clinical activity in line with the sciences basic to medicine,” says Deborah Danoff, MD, associate vice president of medical education at the Association of American Medical Colleges.

She cites Dartmouth Medical School as one other institution that is using virtual patients, in courses related to HIV and AIDS. In addition, another six US medical schools—those at Brown University, Wake Forest University, West Virginia University, University of Florida, University of Miami, and the University of Michigan—are among 39 medical schools worldwide that are involved in the development of the International Virtual Medical School (IV Med), which is aimed at developing high-quality e-learning resources that can be used as a stand-alone curriculum or to complement existing courses.

This fall, Hull-York Medical School in England is the first of the IV Med schools to begin using virtual patients in its curriculum for first-year students. Stephen Smith, MD, associate dean for medical education at Brown University School of Medicine, wrote 70 cases that are the foundation of the IV Med virtual patient panel.

The use of virtual patients “comes close to replicating what it is we really expect a doctor to do,” says Smith. The concept teaches students how to access online patient care information from their first day of medical school.

“It helps them develop the skills of being lifelong learners,” Smith says.

Danoff says medical schools that are considering the use of virtual patients have to weigh the benefits—flexibility and cases that fit well with course material—with potential drawbacks of cost and having the information technology capabilities to set up clinic Web sites.

In its current configuration, the Minnesota Virtual Clinic is technologically straightforward, says Stuart Speedie, PhD, director of educational informatics at the medical school.

“We had to write a Web-based application that would simulate a medical record,” he says. “We used simple tools—commercial software to link the database of cases to the clinic presentations.” Speedie notes that the virtual clinic could be replicated easily at other medical schools, and that its cost was minimal.

“We put the technology [into place] in about three weeks,” he explains.

TEACHING ITEMS

When students log on to the Web site, they click on a patient’s name and see that person’s medical record with tabs that include health history information, laboratory results, medications ordered, and imaging such as x-rays. The tabs include links to progress notes and teaching items. For example, the medical record for 28-year-old virtual patient Melissa Harriman, whose pregnancy is in its first trimester, includes a teaching item that explains the Centers for Disease Control and Prevention’s recommendations on flu shots for pregnant women.

Even though the technology is not overly complex, the real challenge is for faculty to find time to create patient scenarios for the clinic, Speedie says. Adds Niewoehner, “It’s very hard to get my colleagues to write fiction. But what I wanted them to do was make [the virtual patients] real people.” Students will follow the patients not only through each course, but during their under-graduate medical education as the virtual clinic expands into the second-through fourth-year curricula.

The virtual clinic’s most important critics ultimately will be the students who hope to learn from it. Second-year student Ann Giese says the clinic helps first-year students by familiarizing them with terms and abbreviations used in medical records. Catherine Ehlen, a second-year student, notes that the clinic gains relevance as basic science material gives way to more clinically oriented pathophysiology and physiology courses. But Giese says the clinic is still a work in progress. “It’s not set up as a very interactive resource,” she notes.

Nancy Luger, also a second-year student, is the Class of 2006 representative to the virtual clinic committee composed of faculty members and students. She says students have suggested ways in which the clinic can become more interactive. Some would like to be able to diagnose the patients after viewing their laboratory results; others want to see more x-rays or magnetic resonance images and computed tomographic scans showing healthy and diseased states. “Others have mentioned making it a game,” Luger notes.

Faculty members recognize that it takes time to refine a new teaching tool and use it to its optimal potential. Jim Pacala, MD, an associate professor of family medicine and community health, says ways to use the clinic as a teaching tool are limitless.

In Pacala’s “The Physician and Society” course this year, students will study end-of-life care issues, and also follow a virtual patient who presents with complications of heart disease and a murmur that suggests aortic stenosis. As the patient’s condition worsens, students will use concepts of evidence-based medicine to decide the course of his care.

Pacala’s course focuses primarily on health systems and health plans. In one exercise, students vote as a class on which of several health plans they should join, assuming they are patients in the plan. But after the vote, Pacala tells the students they will be the plan’s board of directors instead. The virtual patients are cast as the plan’s enrollees, and students have an opportunity to see how the policy decisions they make affect the care of individual patients.

Pacala hopes that in the end, the virtual clinic will help students appreciate the longitudinal nature of patient care. “Establishing relationships with patients and caring for them over the years is much more rewarding than I ever thought it would be,” he says. “I hope the students will get an idea of what that is like.”

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