As medical director of the nonprofit Medical Simulation International (MSI), Melchert’s goal is to help train doctors in countries where the problem is endemic. “Obstetrical fistula afflicts millions of women in the developing world,” he says. “The problem remains because of the lack of sufficiently trained medical personnel. There are perhaps 10 qualified surgeons who can treat and train others on the entire continent of Africa, and there’s an enormous backlog of cases to be done.”

The World Health Organization estimates that between 50,000 and 100,000 women primarily in Africa and parts of Asia develop an obstetric fistula each year. Most are young and malnourished and thus have a small pelvis. Few have had prenatal care, and most delivered their baby without the help of a health care professional. The problem begins when the baby’s head gets stuck in the birth canal. If it remains in that position for long, it can cut off the blood supply to the surrounding tissue. When the necrotic tissue falls away, the woman is left with a hole between her vagina and bladder or rectum.

A team led by a Twin Cities doctor is creating an interactive training program for surgeons in the developing world.

BY KIM KISER

In a tiny office outside the hyperbaric chamber at Abbott Northwestern Hospital in Minneapolis, Pete Melchert, M.D., appears to be playing a video game. He uses the mouse on his laptop to pick up a virtual instrument and place it on a virtual patient, racking up points when he picks up the correct one and places it in the right location and losing them when he gets it wrong. Melchert isn’t sneaking a quick game of Code Blue. Rather, he’s demonstrating software he has created for teaching physicians in Africa to repair obstetric fistulas.

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Fistula has both medical and social consequences. Not only does the baby often die during birth, but the woman may be unable to have more children. The fistula also causes her to leak urine or feces. “So the girl is rejected by her family, has this physical trauma and can’t be part of society,” Melchert says.

The power of technology
Melchert, who practices internal medicine/pediatrics, admits he hadn’t heard of obstetric fistula until 2003, when he traveled to Ghana as part of a Children’s Surgery International team to care for children being treated for cleft lip and palate at Komfo Anokye Teaching Hospital in Kumasi. “Our hosts welcomed our help with clefting, but they said the real problem they had was with fistulas,” he recalls. “All I knew of were GI intestinal fistulas.” In the United States and other Western countries, obstetric fistula is unheard of. “When a woman enters obstructed labor, they know how to get her out,” he says of the OB/GYN teams here.

Consequently, the problem wasn’t on the radar of surgeons in developed countries until recently. And no one had written a curriculum on repairing obstetric fistula until two years ago, when the International Federation of Obstetrics and Gynecology (FIGO) created the Global Competency-Based Fistula Surgery Training Manual. But the manual itself wasn’t enough to solve the shortage of trained surgeons. So representatives from FIGO contacted Melchert, who also now serves as medical director of Children’s Surgery International, which sends surgeons to Third World countries to do procedures and training, and asked for help. “The problem with training is that it takes time and is very costly,” he says. “Many surgeons don’t have the time to go to a center for months to learn to do this.”

The first challenge was figuring out how to make fistula repair training more efficient. “Simulation technologies are becoming the standard for training in the developed world,” Melchert says. “We envisioned an interactive simulator that would bring the manual to life.” But the type of simulators used in the United States are impractical in Africa, as they cost millions and need regular maintenance and repair. Melchert and his team needed something that would work in locations where resources were scarce.

Since establishing MSI two years ago, they have been working with a Seattle company to create software that would run on a basic PC. “Even the most low-resource hospitals in Africa have a computer for their physicians,” he says. Their idea was to combine video recordings of master fistula surgeons performing procedures, narrative commentary, and interactive assessments and quizzes.

To build the software, they have had to record entire fistula repair procedures using high-definition endoscopic camera equipment, identify the key images, and organize the video clips into a logical sequence. The software engineers then embed “hot spots.”

Surgeons who take the training will be required to select the correct instrument from a virtual Mayo stand and drag it to the correct location in the surgical field, among other things. When they make a correct choice, they will progress to the next step. If they make an incorrect choice, they lose points. “We want them to make errors on the simulator, not on a young woman,” Melchert says.

All along, the learner will be tested on pre-op assessment, patient positioning, instrument management, anatomy, post-op management and awareness of complications that may develop. Upon completing a module, the learner will receive a printout with his or her score and feedback about areas where additional training is needed.

The idea is that surgeons will use the software before going to a training center. “This is intended to make it highly productive when they are in the OR,” Melchert says. Surgeons also will be able to refer to the module in their home hospital. “They can pop the disc in, get a refresher and boost their confidence.”

Only the beginning
The first version of the fistula repair simulation will include three cases, which are representative of the types of cases surgeons most often see. Thus far, they have filmed procedures at hospitals in Dakar, Senegal, and Arusha, Tanzania, and are building and testing the modules developed around them. They will film the final case at Addis Ababa Fistula Hospital in Ethiopia in October.

Melchert says MSI plans to begin distributing the software (on CDs) in about a year, adding that it will be included as a supplement to the FIGO manual. “It will be free to providers in the developing world.”

Thus far, the project has been funded through private donations, and the support of fistula foundations and Stryker Corporation.

Melchert says once they complete the fistula repair simulator, the MSI team wants to make others for cleft lip repair, prostatectomy, female incontinence, cataract removal and pediatric airway management. “This will dramatically augment the current capacity,” he says. “The master surgeons who are helping author these are wildly enthusiastic about how much quicker they’ll be able to train their students.”

Kim Kiser is an editor for Minnesota Medicine.