University of Connecticut Professor Helps Prepare the Next Generation of Biomedical Professionals

Eileen Putman

If you wanted a textbook for Frank Painter's class in Clinical Engineering Fundamentals, you would be out of luck. The field is changing so rapidly that Painter has to rely on professional journals to cover new developments an etched-in-stone text cannot.

Frank R. Painter, CCE

For Painter, who 3 decades ago embarked on what was then the fledgling field of clinical engineering, that fact eloquently illustrates the sea change in medical technology that has reshaped his job and, indeed, that of many in the biomedical field.

"Things are changing a lot. But the health care professionals—the clinicians—need technical people to help them interface with technology. The job security of clinical engineers and biomedical technicians is very strong," Painter said.

Painter should know. As clinical engineering internship program director for the University of Connecticut's biomedical engineering graduate program, he is training the engineers of the future. It's a challenging task, given the growing complexity and computerization of medical devices and the invariable need to contain costs. "Curriculum has changed as the technology has changed," Painter said.

Frank R. Painter, CCE

Residence: Trumbull, CT

Occupation: Clinical Engineering Internship Program Director, Adjunct Assistant Professor at the University of Connecticut.

Education: BS in Mechanical Engineering, Clarkson College of Technology, 1971; MS in Mechanical Engineering/Biomedical Engineering, State University of New York at Buffalo, 1975.

Work History Highlights: Promoted from Biomedical Engineer to Director of Biomedical Engineering, Millard Fillmore Hospital in Buffalo, NY, 1875–80; Director of Biomedical Engineering, Bridgeport Hospital in Bridgeport, CT, 1982–92; Director of Biomedical Technology Services, Operations and Executive Director of Biomedical Technology Services, 1987–99. Current position since 2000.

Painter's courses—Clinical Engineering Fundamentals, Engineering Problems in Hospitals, Human Error and Medical Device Accidents, and Medical Instrumentation in the Health Care Environment—encompass a wealth of technological advances like digital imaging, computer-based medical instrumentation, virtual instrumentation, artificial intelligence and biomaterials. But they also emphasize the bottom line.

"The health care environment and medical device development/production environment now require an even greater focus on economic business and financial management issues," Painter said.

Equipment management wasn't always so complicated. When Painter started out in the early 1970s, medical devices were simpler, larger, and fairly easy to troubleshoot.

"The electronics that go inside the device used to be repairable by the users," Painter said. "You could almost take generic components bought at an electronics store and fix medical equipment. Now, it's so specialized that circuit cards are triple-layer and have microcomponents so it's almost impossible to repair."

The goliath of tiny components is, of course, the computer microprocessor, which has revolutionized everything it touches, marshaling in seconds data that would otherwise take years to gather and turning cumbersome tasks into a breeze.

"The computer's ability to manage databases and information has helped in every single nook and cranny and every single aspect of this technology management business—from organizing the inventory of medical equipment in the hospital, to finding a vendor to supply defibrillators, to looking at what's available in new infusion pumps," he said. "All of this information wasn't available when I first started."

Students must master computer principles and technology because for many hospitals the lines between information and technology management have blurred.

"There's a change in philosophy that has made many in-house clinical engineering departments now, rather than part of the maintenance or engineering group or a stand-alone department, more integrated with information services," Painter said.

With hospital networks able to carry data from IV pumps, bedside monitors, anesthesia machines, and other equipment, less and less data will be transferred by hand.

In Painter's classes, "interconnectivity of medical equipment is a big deal," he said. "In nearly every course I teach, we're talking about using databases and devices on the network or passing data back and forth along the network."

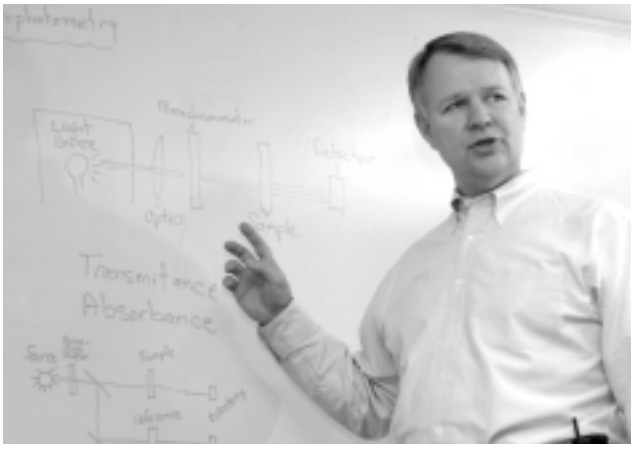
For his master's thesis, Painter designed a controller for an artificial knee to enhance and stabilize the gait of an amputee wearing a prosthetic leg. That device, he said, "was the catalyst that opened the curtain" and showed him the promise biomedical engineering holds for improving lives.

But while altruism brought him into the biomedical field, Painter quickly recognized that the business side of health care equipment maintenance would always be key. His career, in fact, has paralleled the industry move toward containing medical equipment costs through third-party service organizations.

In 1976, Painter managed medical equipment at a 200-bed suburban satellite hospital and four shared services hospitals. By 1999, when he became a health care management consultant, he was directing shared biomedical technology services for more than 60 hospitals and health care providers in southern New England.

"When I was first starting my career, I'd say 40 or 50 percent of maintenance was done by manufacturers, 35 or 40 percent was done in-house, and the rest was done by independent service organizations (ISOs)," Painter said. "Now, it's probably 50 percent done by ISOs, 10 to 15 percent by manufacturers, and the rest in-house. The ISOs have taken off."

The reason, of course, is the ever-pressing demand on hospitals to save costs. Administrators must juggle that mandate against others, like Joint Commission on the Accreditation of Healthcare Organization standards that require hospitals to base equipment inspection schedules on a device's potential risk to the patient.



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For clinical and biomedical engineers, then, the burden is increasing. Managers are expected to do much on shoestring budgets. "The gap between what should be done and what is done is getting wider, and that's what scares me," said Painter.

Before receiving the master's degree in biomedical engineering, Painter's students complete a two-year, 20-hour-per-week internship in one of four major hospitals in the central Connecticut area. It gives them a taste of what's to come, though perhaps not the whole of the business pressures that await clinical engineers.

"The frustration level is higher with 5 to 10 years of experience than they thought it would be," Painter said. By then, "they're dealing with budgets, purchasing issues, management and personnel issues that all are money-based, and we may not prepare them well enough for that."

But Painter also believes that the people he is training "are going to be the leaders in 10 or 20 years" who will have "a very positive impact on reducing medical costs and improving care."

On balance, Painter is optimistic about the ability of biomedical workers to meet tomorrow's technology and economic challenges. "We're preparing them pretty well that it's a brutal environment out there, but on the other hand it's an exciting career," he said.

"There are people who are somewhat negative because they've had a rocky road, but you've got to get over that," he adds. "You're helping to improve a lot of humanity, in your way."