

You're a what?

Perfus

You breathe. Your blood absorbs oxygen from your lungs. Your heart pumps the blood, transporting oxygen to all the cells of your body. If this natural rhythm stops, you will die.

Or maybe not. Under certain circumstances, a highly trained medical professional called a perfusionist can sustain the life of a person whose heart has been stopped. David Holt is such a professional. He uses biomedically engineered devices that support the vital life functions normally performed by the heart and lungs. Most commonly, perfusionists operate a heart-lung machine to keep a patient alive during open heart surgery. But their skills have other applications, too.

Holt flashes back to his early days as a perfusionist in describing the typical duties of the occupation. When assisting in a scheduled open heart surgery, Holt comes in to the hospital at 6 a.m., collects all the components of the heart-lung machine, assembles them aseptically, and makes sure the equipment works perfectly. Then, he waits for his cue.

A surgeon connects the patient to the heart-lung machine by inserting tubular instruments, called cannulas, into the proper blood vessels to bypass the heart and lungs. When the surgeon gives the order, Holt administers a drug that stops the patient's heart. "Then the surgeons do their magic," says Holt, "while the perfusionist manages the patient's lungs and bloodflow using the heart-lung machine."

Holt monitors the machine as it draws blood from the patient, adds oxygen, removes carbon dioxide, and then pumps the blood back into circulation. He adjusts the equipment as needed to ensure proper blood pressure and flow during the surgery.

"It sounds simple," Holt says of his work, "but it takes somebody who can see small changes in events, evaluate them in rapid sequence, and think clearly

in a highly volatile situation. Perfusionists have to be brave and believe in themselves and their training. They have to work well with other people, because they don't work alone. They work with a surgeon and an anesthesiologist as part of a team."

According to Holt, the average cardiac surgery takes a little more than 3 hours. Often, a perfusionist has additional roles before and after surgery. Holt may help prepare for a surgery using cardiovascular monitoring techniques. "The heart is a complex pump," he says, "and to get the proper information, we need the proper monitoring devices in place."

In addition, Holt may use devices that assist the functioning of a failing heart to keep a patient alive until surgery can be done. He also may use such devices for days or weeks after surgery to support circulation until the heart regains its strength. Some perfusionists acquire expertise in pacing technology, as well. They help restart a patient's heart after cardiac surgery or stabilize an irregular heartbeat using electrical pacemakers or defibrillating devices.

David Holt explains to students the functioning of a blood oxygenator, the "lung" portion of a heart-lung machine.



Like most perfusionists, Holt does not have a set work schedule. He spends some time on call and may have to rush to the hospital for an emergency. "If you're a clock watcher," he says, "you could not do the job. It's a 24-hour-a-day, 7-day-a-week responsibility."

Most perfusionists spend all of their work hours in a hospital—as did Holt, when he started out 24 years ago. Although he still does perfusion, Holt now changes locales more often than the average perfusionist. He currently works for a medical transport company and serves as a professor of perfusion science.

Holt's job with the medical transport company sends him around the country and around the world. He may work in the back of an ambulance, in a helicopter, in a jet, or from anyplace in which he has access to a computer that is connected to a modem.

Holt supports critically ill cardiac patients in transit to distant medical facilities where specialized heart surgeries are done. "I've done cardiac assist transports from as far away as Malaysia to the Mayo Clinic in Rochester, Minnesota," he says. "In that case, it was for a heart transplant." Oftentimes, Holt does not actually travel with the patient. "I'm able to dial in to cardiac monitoring devices from a remote location," he says, "and communicate with medical personnel by fax or cell phone to help manage a patient's circulatory function and assist in troubleshooting."

As an instructor at the Ohio State University and at the University of Nebraska Medical College, Holt trains perfusionists through extensive hands-on practice and lectures. He shows students how to assemble, prime, and operate a heart-lung machine and related devices. The students must learn by practicing on live animals, because, Holt says, "Some

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things cannot be simulated artificially and have to be experienced.”

Holt also teaches evolving applications of perfusion technology, such as autotransfusion. His students will likely be called upon to assist patients having massive internal bleeding resulting from traumatic injury or as a complication of surgery. Using special tools, perfusionists can recover blood that is hemorrhaging into a patient’s chest or abdominal cavities, recondition that blood, and then return it into circulation.

Instructing students in research methods is another part of Holt’s teaching role. Some perfusionists collaborate with other medical professionals to research and develop better perfusion techniques and tools, so research skills are important.

In the United States, only 21 schools have programs to educate students for a career in perfusion. All these schools combined graduate about 140 students per year. The programs vary in their

Perfusionists use complex electronic and mechanical devices to support a patient’s circulation.



entry requirements and in length. They also confer different types of educational credentials upon completion.

For some programs, applicants need only 60 to 80 semester hours of college credits, including prerequisite science courses. For others, a bachelor’s degree with similar course prerequisites is needed. Still others look for a combination of education and experience in a health-related occupation. Most perfusion programs require 20 to 24 months of study; some require less.

Program graduates may earn a bachelor’s degree, a master’s degree, or a certificate in perfusion science. The choice of a program depends partly on where people are in their education when they decide on a career in perfusion.

Sometimes, medical assistants, nurses, paramedics, or other healthcare workers choose to become perfusionists. They may already have a bachelor’s degree, so they may opt for a master’s or a certificate program in perfusion. Others may decide on this career in high school or early in college, so they may specialize sooner, pursuing a bachelor’s degree in the field. For example, Holt began his undergraduate education at Ohio State University, planning on a future in medical school, but he soon discovered Ohio State’s bachelor’s degree program in circulation technology. “That just caught my eye,” he says. “I found it to be a nice mix of electronics and cardiac care, and I said, ‘Wow, that’s what I want to do.’” After becoming a perfusionist, Holt decided that he wanted to teach others, so he later earned a master’s degree in education.

Today, students who complete perfusion programs typically take a written exam administered by the American Board of Cardiovascular Perfusion to receive professional certification. The board requires

continuing education credits and handling at least 40 perfusion cases each year to renew certification. Some States license perfusionists, but licensure may depend primarily on having board certification.

According to the American Society of Extra-Corporeal Technology, there are about 3,700 perfusionists currently employed in the United States. Holt estimates that starting salaries for perfusionists are about \$58,000 to \$61,000 per year and that earnings for those with 10 years of experience range from \$85,000 to \$100,000 per year. The Bureau of Labor Statistics does not collect data on perfusionists’ employment numbers or earnings.

If you’re like most people, you take for granted every heartbeat and every breath of air. But someday, your luck could run low—and that’s when you might need a perfusionist like Holt to help save the rest of your days on earth. “It’s gratifying,” Holt says, “to find ways to save patients’ lives: to sustain them artificially, to enable them to have corrective surgery, to see them wake up and walk out of the hospital.”

The training of perfusionists involves extensive hands-on practice.



Photos courtesy of David Holt