Robots Carry Weight — and Blood Components — at Transfusion Centers

By Elissa Fuchs

Tug makes his way across the halls of the University of California-San Francisco Hospital easily, transporting blood for transfusions. He quickly goes up and down elevators and through doorways with his products safely guarded. When he reaches his destination, he drops off the contents and heads back to the laboratory to wait for his next assignment.

Even though he has been working at the center for a year-and-a-half, Tug does not exactly fit in with his colleagues. He doesn't grab lunch with them or discuss a difficult patient case. You see, Tug is not your traditional blood banking employee. For one, he is not exactly a person. He is actually a member of the robot species.

Human or not, Tug has been a huge asset to the San Francisco blood bank, said Delene Johnson, SBB, its transfusion service supervisor. Tug is efficient, effective and knows his way around — which makes sense, considering he comes installed with a preprogrammed computerized map as well as a camera to "see" his path and any obstacles along the way.

"The robot fills in the gaps at our center because we have a very busy service and don't have pneumatic tubes to all locations" Johnson said. "It takes the burden off our staff, especially at night and on the weekends, when there are not as many employees here."

In the digital age in which we live, robots are becoming more commonplace in the health care sector. Their advantages are numerous: They are consistent and accurate; can help facilities save money; and, unlike humans, are never in a bad mood. They arguably have the most acclaim in the surgical fields, where robots have been known to make insertions and assist in procedures. They also are increasingly being used as carriers, with more and more organizations using them to transport drugs, medical records, meals and laboratory samples from one end of the hospital to another. Expanding on this carrier concept, some facilities are using robots to take blood from the laboratory to a transfusion site.

At Johnson's facility, the laboratory staff load Tug with blood products, select a preprogrammed destination on a computer touch screen, and press the robot's green "go" button. Just like that, the machine is on its way to a medical wing of the hospital. When it reaches its destination, the robot verbally announces its arrival, at which point personnel must enter an electronic code to unlock the cart cabinet and access the contents. As with accepting components from a human deliverer, staffers must sign to confirm the blood products were received; the robot then returns the signed document to the laboratory.

The robot can go to multiple locations in one trip, and people can watch its progress on a computer screen in the laboratory. It is programmed to go through doors with card key access and on elevators. If something is blocking its path, it can ask for help.

“The onboard camera takes a picture, sends it to [the robotic manufacturer’s] headquarters, who alerts the blood bank. Someone will then go move the obstacle or manually move the robot past it,” Johnson said. The robot’s company also can move the robot remotely, if necessary.

Occasionally, people push the robot without authority. “I’ve had to pick it up in the ER,” Johnson said. Because it relies on wireless Internet signals to use its map, signal loss is a periodic concern and something the laboratory staff look out for after the robot is dispatched. Its battery, Johnson said, is long-lasting, but it does need to be recharged on occasion.

Because it is not extremely fast, Tug is not used for emergency situations but rather in times when the transfusion can be started within the hour, like for hematology and oncology cases.

Johnson, who is very happy with the robot at her facility, is looking for ways to make it a more integral fixture there.

“Moving forward, it could be a possible recruitment tool to encourage families to donate blood,” she said, adding that there is space on the robot to stick posters.

San Francisco is not alone in using robots to transfer blood products. At the VA Boston Healthcare System, Skippy and Lucy also are hard at work moving blood around for transfusions. They have been in the clinical laboratories for about a year, after staff saw how effective robots were in other parts of the hospital.

“Our pharmacy started using them about three years ago to take drugs up to different floors,” said Gifford Lum, MD, the blood bank director at the Boston VA. “We saw that it was working well and piggybacked on that idea.” Around the same time, the Boston VA began using a cooler that could keep packed red cells within a 1 C and 6 C temperature range for more than 24 hours. Because this cooler could be inserted into the robot, Lum said that these two technologies “dovetailed nicely” and were quickly adopted by the blood bank. The robots also transport platelets and fresh frozen plasma to other wings of the hospital, which does not have a pneumatic tube system.

Skippy and Lucy’s biggest benefit is that they have given nurses more time to spend with patients, said Michael D’Amarino, JD, MT(ASCP)BB, the VA’s blood bank supervisor. “Beforehand, if there wasn’t a runner available, the nurses would have to take the blood from the laboratory,” D’Amarino said. “Now, we are using the robot modality to transfer the blood products. They are freeing up scarce resources.”

D’Amarino estimates that Skippy and Lucy take about 10 to 15 minutes to go from the laboratory to medical floors. As with San Francisco, these robots are not used for emergency transfusion situations but for less time-sensitive procedures.

Even though each robot came with a price tag, Lum insisted that they are very cost-effective, saving the facility money on personnel time. Lum and San Francisco’s Johnson agree that the robots are easy to use, and Lum is encouraging health care workers in nearby facilities to adopt this product.

“We’ve really had a good experience with the robots,” he said. “They never tire or call in sick.”

Robots' Other Applications

Facilities are branching out and using robots for other aspects of blood banking and transfusion medicine besides carrying components. In Korea, for example, scientists at the Pohang University of Science and Technology developed a robot that could perform almost 100 different types of tests on blood. In the U.K., a robot known as the "Bloodbot" has been designed to draw blood samples from humans, although it is still in the experimental stages.

Three robots are being used to sort blood samples at the Red Cross Plasma Sample Management Facility in Birmingham, Ala. The relatively new facility, which opened in 2007, receives bar-coded samples of donated plasma, which it freezes and stores for several days. At that point, one of the robots — who have called the plasma sample management facility home since February 2007 — scans the bar code for its identification number. Using this number, it retrieves information about the sample from two laboratory information systems and determines if the sample meets three criteria: it has corresponding plasma for fractionation; it has been tested and results are acceptable; and it has been managed within 72 hours of collection. If all these criteria are met, the sample is placed in a rack and sent for further testing before the plasma is eventually manufactured into blood-derived products. The robots' speed in this process is almost unbelievable — they can sort 2,700 tubes an hour or nearly 30,000 samples each day.

"Using a robot has definite advantages. Its benefits include reducing human handling of potentially hazardous specimens, improving productivity and eliminating mistakes," said Cynthia McCrorie, director of plasma sample management at the Red Cross. "It takes the human error part out of the equation. The repetitive nature of manual sorting would be pretty overwhelming for a person."

The robot also frees up employees to handle other jobs, McCrorie said. "It is an automated process with staff intervention only to load and unload," she said. "A person doesn't have to sit and watch the robot work. They can perform other tasks."