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DoD Hospital Robot Opens Up Access To Care - Sandra Basu

WASHINGTON—Robots—once the stuff of science fiction literature and fantasy films—are playing an important role in health care and Army officials are hoping that their use in military hospitals can enhance patient care.

While telemedicine capabilities have for years allowed physicians to access patients and other physicians who are located physically in different locations via teleconferencing equipment, the Army's Telemedicine and Advanced Technology and Research Center (TATRC), located at Fort Detrick, Md., is taking their telemedicine capabilities a step further by exploring the use of remote presence robots at a handful of Army medical facilities.

With the use of a remote presence robot that uses wireless technology, a physician can be sitting at home or in another location and can guide the robot through the hospital using a joystick from a computerized control station. The robot's "head" is a monitor that can be turned in different directions, allowing the physician to see the patient via the monitor and for the patient to see the physician's head through the robot's monitor. The robot can roll to a patient's bedside and it allows for two-way, real time conversation between the user and the patient or patient's family.

TATRC deployed the RP-7 Remote Presence Robotic System developed by InTouch Health, which uses the RP-7 Robot, at Brooke Army Medical Center (BAMC) in San Antonio. Maj. Kevin Chung, MC, USA, the medical director of the Burn Intensive Care Unit (ICU) at BAMC, says that it has given him the ability to check up on his patients at any time of day without having to be physically present at their bedside. From his home he can log on to the robot via a laptop



Dr. Kevin Chung uses RP-7 to instruct a nurse in the ICU at Brooke Army Medical Center.

(photo by Jen D. Rodriguez)

that will allow him to access the robot.

"I use it from home most of the time, but I have taken it on leave or temporary duty assignments, or [when I go] to conferences from outside of the state [in order to have] access to the ICU," Dr. Chung told U.S. MEDICINE in an interview in November. "When I am outside the ICU, and not otherwise available, I am available to the ICU via the robot."

Army officials would like Dr. Chung's experience with the robot to become more widespread and have set out to study how the robot can be used in ICUs in a military medical setting. Col. Ron Poropatich, MC, USA, who is the deputy director for TATRC and is the medical informatics consultant for the U.S. Army Surgeon General, said the robot is already being used in the civilian medical setting and that it could be useful in helping where there are critical care specialty shortages in the military. "We know that people have better outcomes in the ICU, when they are managed by critical care physicians, physicians like Dr. Chung, dedicated to providing critical care to patients," Dr. Poropatich said. "We know there is a better outcome, [but] we don't have enough critical care doctors in the military, nor are there enough in the civilian sector, which is why these robots are an attraction in the civilian sector. As a result, how can we leverage what we currently have and provide support in our [medical] facilities? For example, you [a physician] could be at home and something happens and the way this robot works is you have your laptop computer at home on the network and you, remotely over the Internet, drive the robot. So, Dr. Chung at home drives the robot bed to bed in the ICU zooming in, two-way video, two-way voice, looking at the patient, looking at the monitor, talking with the doctors and nurses, talking to the patients."

Dr. Poropatich said that the Army medical department sent BAMC its first robot in 2006 to study and a second robot has since been sent there. Robots have also been sent to Landstuhl Regional Medical Center (LRMC) in Germany, Madigan Army Medical Center (MAMC) in Tacoma, Wash., and Ryder Trauma Center at the University of Miami/ Jackson Memorial Medical Center in Florida, with future plans to send them to Tripler Army Medical Center in Hawaii and the 121st Combat Support Hospital in Korea. The Army is currently studying the robots use in military medical facilities. "We are adding a robot to the simulation center at Madigan Army Medical Center and the role is, again, under an IRB (Institutional Review Board), we are looking at how surgeons could use the robot to do surgical residence and fellow training at a distance," Dr. Poropatich said.

In the Ryder Trauma Center at the University of Miami, a civilian center where Army medical teams train before deploying to Iraq or Afghanistan, officials will conduct a study to see how constructing a trauma note for a patient compares between a physician who is at the site of the patient versus a physician who has accessed the ICU via the robot.

"If someone comes into the trauma center, you [the physician] conduct a brief history. Most of the time, the patient can't talk to you because they are critically ill or unconscious, so you talk to family members or you talk to other people," Dr. Poropatich said. "You may be talking to the paramedics that bring the patient in. You conduct the history with the patient, the medics and the family members. Then you do an initial assessment, a physical exam, then you conduct an assessment of 'this is what I think is going on,' looking at x-rays, looking at

EKGs, looking at lab data, and you construct a plan. That is the trauma note. The study at the University of Miami Ryder Trauma center is to do all of that remotely in conjunction with someone doing that on site. They will separately develop their own notes. What we are trying to determine is, 'how accurate is the information of the remotely developed note with a note that is developed by a physician on-site?' The point being that eventually we may be able to put these robots, if it's shown that it is a good correlation and a good outcome, you could put these units in the trauma or the emergency rooms in various Department of Defense facilities where you don't have a trauma surgeon or higher levels of medical expertise."

Dr. Poropatich said that the robot deployed to Landstuhl will be used for TBI teleconsults in which physicians at Landstuhl will interface with the National Capital Area Neurosurgery Program in Washington, D.C.

Dr. Poropatich said that they are also looking for the robot to potentially go to Iraq or Afghanistan where it would be taken into operating rooms in military facilities. Having the robot in theater could be advantageous in that experienced military physicians who are located in the U.S. could access the operating rooms of military facilities in a deployed setting and provide assistance to young physicians who may have little experience with wartime injuries. One of the challenges in making this happen is that the robot system relies on wireless connectivity, which is still a challenge in the war theater in Iraq and Afghanistan, Dr. Poropatich said. "A young surgeon who may be one month, two months or three months out of training [may have] never seen the kinds of horrific polytrauma explosive events that go on with polytrauma patients in Baghdad or up in Mosul and now you can have the robot in the OR [in theater] talking back to the surgeon [with more experience] in the United States," he said. "So the whole point is to have that senior surgeon scrub in with you remotely, which is what we do in the U.S. on a routine basis."

Dr. Poropatich explained that the use of the robot is not meant to replace humans, but to augment care by bringing in medical expertise to medical settings where it may not otherwise be available, or when time is critical and the physician cannot be physically at the hospital in time to deal with the event. "Whether it is in the operating room, the emergency room or the ICU, I think [the robot] augments care, that is the key," Dr. Poropatich said. "It is never meant to replace the surgeon. Most of the time, time is critical, especially when someone is critically ill. To save yourself the time of driving in, to be there immediately in the ICU to see and hear everything that is going on, is incredibly important."

Dr. Chung, who is using the first robot that was deployed to BAMC to help care for patients in the hospital's ICU called the technology that enables him to use the robot "remarkable." From his home he is able to see clear pictures through his computer monitor of the patient and he is able to move the robot's head around via a joystick, allowing him to see and hear what is happening in the ICU as if he were there. "It allows you to move the head, and you can move the entire body," Dr. Chung said. "You can move the head up and down and there is a zoom camera, which is I think the most important feature. I can zoom in and do a pupil exam on a patient. You see it with great clarity on the video screen. That is one of the things that we are capturing data for [in our study]. How good is the video quality? To be able to look at the burn wounds [via the robot] and know that it is infected, for instance, to visualize

the respiratory pattern."

The use of the robot is more sophisticated than a simple video screen, in that multiple cameras would be needed at different angles in a room to be able to access what is possible to see via the robot. "The ability to move the head, zoom in and out and drive around adds another dimension to the traditional telemedicine concept that has been around for a couple of decades," Dr. Chung said.

Dr. Chung said that the robot is battery-operated and is plugged into a wall when not in use. From his home, or wherever he is located, he can log on to the robot from his laptop. "It is positioned in the ICU and I log on and drive it out and it basically unplugs itself. It is specifically designed so you can do that, and really there is no limitation," Dr. Chung said. "The only limitation is the speed at which the robot travels. It is not designed to go from one end of the hospital to another. Its use is limited to, usually, one ICU. If I need it in the other ICU before I leave [the hospital for the day], I preposition it there. Basically, I preposition the robot in front of the sickest patient before I go home at night. [That way] if I get a call, I am right in front of the patient's room and I am able to drive it to the room."

Dr. Chung said that once he is done accessing the robot from his computer, he remotely drives the robot to a socket from his computer and someone who is physically on-site plugs it back in.

Physicians who use the robot do not need to be the most tech savvy, Dr. Chung explained. "I am not very technology savvy. If you know how to turn on a laptop and get on the Internet, that is pretty much what it takes," Dr. Chung said.

Dr. Chung said that when technological issues with the robot do arise, there are on-site IT personnel at the medical center who are able to assist him, as well as online technology support. "We have on-site IT folks that have now been 'trained on the robot.' It is their responsibility to maintain it and answer to any technical problems. So I will email them if there is something I can't figure out myself. For example, there was a wireless access point that had gone bad, so everytime I drove through this area the robot would log off," said Dr. Chung, who noted that the IT personnel were able to remedy the problem.

Dr. Chung said that the robot does not replace real human presence, but that it can make a difference in the hospital setting by enabling the physician to administer direction to hospital staff when the physician is not physically present.

"It is not real presence obviously, so the remote presence robot is limited to interactions that you would otherwise get from a two-way video communications platform," Dr. Chung said. "But we have residents and other staff that are available [at the site of the patient] that are able to do the procedures that are necessary. The types of interventions [we've done with the robot], we've recorded over 250 over the last year [that] really run the gamut. They could be preventative, so we do preventative rounds essentially, checking on things, making sure all of the medications are correct and so on and so forth, to the more acute interventions. On three different occasions, I've used the robot to conduct a cardiac arrest code scenario. A patient's

heart stopped on one occasion and I ran the entire cardiac pulmonary resuscitation from home. So, basically, if I had been present I would have been standing at the foot of the bed and giving direction to the nursing staff and the resident. On this occasion I did all that with the robot at the foot of the bed from home. Had I tried to come in, I would have missed the whole thing."

Dr. Chung said that, as a physician, being able to see the patient through the screen and give directions to hospital staff is an advantage over hearing about the patient over the telephone. "Over the telephone, it can be communicated, labs and vital signs can be communicated, but actually being able to look at the patient is priceless," Dr. Chung said. "You can take one look at the patient and determine whether someone is sick and that cannot, no matter how well you describe it over the phone, it can't do it justice."

Dr. Chung said that the robot is helpful in cutting the time it takes for a physician to gain access to a patient, particularly when driving to the hospital to see the patient would not be quick enough to help in an emergency situation.

"It's remote presence in situations where it would be impossible for you to be present, and so if you can grasp that concept, and physicians who have gotten it absolutely love it," Dr. Chung said. "But there are some physicians who say, 'if I need to come in, I will come in physically and I don't need the robot.' That is nice, but what if you can't come in when you are in another state, or if you are a neurosurgeon and there are no neurosurgeons in this hospital?"

Dr. Chung said that the reception he has gotten from patients and their families when using the robot has surprised him.

"I was quite surprised by the reception I got from family members and patients. Most patients are sedated and asleep so they don't interact with me, but the few that I have interacted with just can't stop talking about it months later," Dr. Chung said. "At night when I am doing routine rounds, on a few occasions, I was rolling through the ICU [via the robot] and family members saw me and they would say, 'Dr. Chung can I talk to you?' On four or five occasions, I gave updates [to the families] at 11 or 12 o' clock at night, so their option was, 'don't talk to anybody, versus talk to me [through] the robot.'"