

Injured troops could receive better care and benefits with new research

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Helicopter sounds filled the room to help simulate a battlefield rescue as part of new research between Clemson University and Palmetto Health. Credit: Palmetto Health

Gunshots crackled as a man dressed in camouflage sat on the ground with a red stream trickling from his ear and a purple splotch marking the skin near his cheekbone. A medic asked what happened.

"A clown ran up, balloon popped," the man replied incoherently.

It sounds like a scene out of a warzone, but the man was an actor at a simulation center in Columbia, where researchers from Clemson University and Palmetto Health were recording the events as part of a \$1.6-million project funded by the Department of Defense.

The goal is to begin laying the groundwork for a hands-free system that would document battlefield injuries to improve medical care and ensure troops receive the benefits they are due.

The system is in its early stages, but the idea is that medics would wear hands-free equipment that records audio and video during rescues. The audio would be automatically transcribed, separating words from battlefield sounds, and relevant information would be provided to doctors to help them decide on proper care.

The information would then become part of the permanent record, helping military personnel prove they were injured in battle, which entitles them to benefits.

Kuang-Ching "K.C." Wang, a professor of electrical and computer and engineering at Clemson, said the research is a two-year pilot project. Researchers don't expect to produce a completed product but will show how various components could work, he said.

"We envision in the long run the Department of Defense will have a big data center that will house all the recordings in one place," Wang said. "So, if they need to go in and take out any specific information about a

soldier or a certain injury, they can do that."

Ron Gimbel, chair of the Department of Public Health Services at Clemson, said that when troops seek disability benefits, lack of documentation makes it harder for assessment teams to determine whether injuries were sustained on the battlefield.

There is often no documentation, he said, because battlefield medics are busy caring for their patients and don't have time to write notes.

"I was approached about this disability challenge maybe 10 years ago," Gimbel said. "Now we can actually try to solve it. That's really exciting. If we can reduce the hassle factor around disability claims, that would be great."

Wang is the principal investigator on the project, and Gimbel, a former naval officer, is co-principal investigator. William Gerard, the lead for Palmetto Health, is the medical director for emergency services for Palmetto Health and the medical director for Richland County EMS.

One of the key advantages that Palmetto Health brings to the project is deep experience with the Cerner hospital-documentation system, the same platform used by the Department of Defense.

Gerard said that once a note is transcribed, it would be fed into the Cerner documentation system, which would also include other information, such as patient history, medications and immunizations. The Cerner system adds realism to the research, he said.

"We're trying to make this as real as it would be so when it all comes together it's going to be reproducible in the actual environment," he said.

The team gathered in late November to record audio and video of

simulated rescues at the Palmetto Health-University of South Carolina School of Medicine Simulation Center.

Each run-through began in a debriefing room outfitted to simulate a battlefield. The sound of bombs thudded in the background. A picture of black smoke rising from behind several vehicles was projected on the wall.

Actors, including Rory Gilbert, played the role of wounded soldier. As Gilbert sat on the ground, Simulation Center medical director Christopher Gainey, called, "Over here!"

Two medics wearing cameras on their helmets helped Gilbert to his feet and brought him into a stretcher in the hallway. They took him to another room that acted as the helicopter.

Two other medics with cameras attached to their flight suits secured Gilbert and sat behind him, as he was "flown" away, the sound of rotors cutting the air.

The medics then wheeled the stretcher down the hall and out of the building to a mobile center in the parking lot for simulated surgery with Steve Shelton, medical director of Emergency/Disaster Management at Palmetto Health.

Shelton said that even in a controlled environment it can be difficult to get true information from the scene. It would be even harder with the challenges that come from a battlefield and travelling long distances, he said.

"Sometimes it's important to know what's involved in that wound," Shelton said. "What was the scenario that went into that? What was the other care that was provided before that may not necessarily be visible?"

Kelly Hawsey, who has worked as a critical-care air transport nurse, said that medics don't have much time for documentation as they assess patients and load and secure them on aircraft.

"A lot of times we would have a piece of tape we would put on our flight-suit pant leg," said Hawsey, who is now telehealth lead at Palmetto Health. "We would write notes on that as we were going and pull that off later and use that to trigger our documentation. It can be chaotic. It's not as streamlined as it is in the hospital."

Melissa Smith, an associate professor of electrical and computer engineering at Clemson, watched the simulated rescues unfold on a video screen in a conference room. She is overseeing voice recognition and video detection tasks for the team.

Her job includes developing technology that separates words from battlefield sounds. Anyone who has used commercially available voice-recognition, such as Siri, knows that words can be misunderstood even in the best of conditions.

"Just in a normal environment, it's very difficult to recognize natural language," she said. "There are more advanced techniques we're going to be applying, including some specialized audio techniques, to try to reduce some of the background noise such that we can get that conversation out of the environment."

The simulation was the first of two. The team plans have another in about 18 months. Simulation is a critical piece of the research, and the first went well, Gainey said.

"You could sit around a table and record the audio, or you could see what it's like to have the ambient noise, the background noise, the providers having to move from point A to point B, the multiple

handoffs, other people's conversations," he said. "The only way to really, truly understand that is to run it through simulation."

Researchers are calling their system Complete and Resilient Documentation (CARD) for Operational Medical Environments.

Brett Wright, dean of the College of Behavioral, Social and Health Sciences, said the research positions the team to have maximum impact.

"Our college is proud to have a hand in taking some the guess work out of documenting what occurs during military engagements," he said.

"Wounded veterans deserve to receive care based on accurate information retrieved efficiently, and this research will be a game changer in that regard."

Anand Gramopadhye, dean of the College of Engineering, Computing and Applied Sciences at Clemson, congratulated the team on the grant.

"This is a collaborative effort aimed at advancing health informatics for the nation's military," he said. "The amount of funding is a testament to the team's hard work and relevance of the research."

Provided by Clemson University

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