New disaster preparedness tool calculates casualty estimates

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Emergency Medical Technicians practice treating a chemical spill victim during a training session in Baton Rouge, La. EMCAPS software provides estimated casualty figures to help make training exercises more realistic. Credit: FEMA

In the aftermath of a dirty bomb, hundreds or even thousands of victims could require medical attention. First responders conduct extensive training to prepare for such a cataclysmic event, but planning is difficult without a solid estimate of how many people could be injured.

The toll would be influenced by a number of variables. For example, the toll from a dirty bomb detonation would depend upon the population density at the explosion site and the components used in the explosive. To plan effective training scenarios and tabletop exercises, first responders need a simple way to estimate realistic casualty figures as a result of catastrophic events.

To provide first responders with this ability, the [Department of Homeland Security](#) (DHS) Science and Technology Directorate (S&T) continues to support the development of the Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) software. Sponsored by the National Center for the Study of Preparedness & Catastrophic Event Response (PACER), a DHS Center of Excellence, an updated version of EMCAPS is scheduled for release in 2011. The state of Maryland provided some startup funding for the software program.

Johns Hopkins University Office of Critical Event Preparedness and Response (CEPAR) and the Johns Hopkins University Applied Physics Laboratory are responsible for the software's development. The current version was first released in 2005 and is available as a free download at www.pacercenter.org/pages/about_emcaps.aspx. The program allows first responders to customize nine scenarios for their geographic area and then estimate the number of likely casualties.

Researchers used high-consequence threat scenarios identified by DHS to incorporate into the software program. These include a pandemic flu outbreak, a chlorine gas release, a truck bomb, and inhalation anthrax exposure. The scenarios can be customized for different conditions. Thousands of people have accessed the software, according to Heidi R. Whiteree, DHS S&T program manager. "The advantage of this [program] is it is so easily downloadable, and you can manipulate the variables to suit your own jurisdiction," said Whiteree.

Federal emergency managers work with their state counterparts in Louisiana during a mock hurricane exercise. EMCAPS software helps emergency managers estimate casualty numbers when they are planning training exercises. Credit: FEMA

For example, in the case of a dirty bomb scenario, first responders can customize information about the explosive and detonation site to match their own locations. One way to customize a scenario is to select the population density of the affected area. While a crowded New York City sidewalk might have one person every 25 square feet, a small town's pedestrian area might contain one person every 225 square feet. A guide in the software assists users in selecting the population density that most closely mirrors the local community.

James Scheulen, chief administrative officer for the Johns Hopkins University School of Medicine's Department of Emergency Medicine, recognized a need for a technology like EMCAPS when he was attending an emergency response drill several years ago. The drill scenario involved an explosion at a baseball stadium filled with 45,000 fans. As part of the scenario, participants were told to plan to treat 30,000 patients. The number struck Scheulen as unrealistic.

This lack of realism was problematic, because without credible

estimates, it is difficult for emergency preparedness officials to judge just how many hospital beds, ambulances, personnel, and equipment truly would be needed in an emergency. EMCAPS mitigates this problem by providing first responders with an estimate rooted in scientific facts. For example, EMCAPS relies on data from explosive experts about the likely force and circumference of a dirty bomb blast to calculate the number of casualties first responders could expect in that situation. "It's meant to tell you if you're talking about 100 people being hurt or 1,000 people being hurt," Scheulen said. "Now you have some realistic numbers you can use to go about the rest of your planning."

EMCAPS helps emergency response officials ensure they are ready for a large-scale threat. Melinda Johnson, Metropolitan Medical Response System program coordinator for the north central region of Colorado, began using the software three years ago. With EMCAPS, she can run a scenario and see how the estimated number of patients compares to the surge capacity at area hospitals. If a given situation would overwhelm a particular local hospital, medical personnel would work with local and state officials to move patients to another hospital in the 10-county region or elsewhere in the state. Prior to the creation of EMCAPS, first responders and emergency planners had few tools to calculate the likely impact of an emergency. "It's difficult to find an algorithm that says x disaster in this community causes y casualties," Johnson said.

In addition to estimating the numbers of casualties in a given disaster, EMCAPS lists the kinds of injuries victims are likely to sustain based upon the disaster type. With this information, first responders participating in training scenarios can consider what equipment and planning would be needed to effectively treat patients. Victims of a dirty bomb detonation, for instance, would likely experience partial or total hearing loss. In that situation, first responders must consider ways to effectively communicate with patients during the triage process, according to Scheulen.

When the significantly upgraded version of the software is released next year, it will offer even more scenarios, including earthquakes and hurricanes, so first responders can plan for natural disasters as well as terrorist attacks, according to Whiteree. Researchers are reviewing the existing scenarios to see if the calculations can be improved or updated. The release also will revise the injury severity scale used in the current EMCAPS, according to Johns Hopkins University Applied Physics Laboratory Epidemiologist Jacqueline Coberly. To make the software more applicable to real emergencies, the injury scale in the new version will match the designations used by emergency room doctors to rank injuries.

Johns Hopkins University researchers and DHS also are exploring the possibility of linking future versions of the EMCAPS software to a mapping program, according to Whiteree. The capability would allow first responders to consider the best locations for shelters and other emergency facilities.

More information: For more information, visit www.pacercenter.org/pages/about_emcaps.aspx .

Provided by US Department of Homeland Security