

## Tornadoes and Disaster Management: Not Just in Kansas, Dorothy

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After-action reports detailing the preparation, response, and outcomes after large tornadoes are sparse in the medical literature. Thus, the retrospective report by Ablah and colleagues<sup>1</sup> in this issue of *Disaster Medicine and Public Health Preparedness*, documenting the EF5 tornado that devastated Greensburg, KS, in May 2007, is a timely and important contribution to the growing disaster medicine literature. Moreover, its publication reinforces the importance of this new journal in bridging the gap between the acute care medicine and the public health worlds.

Approximately 40,000 tornadoes struck the United States between 1950 and 2000. Of those, 45 killed  $\geq 18$  people. Of the tornado-related injuries, 50% occur during rescue, cleanup, and post-tornado activities.<sup>2</sup> Tornadoes are not just a problem for Kansas and the Great Plains, however. Although Texas ranks first among the states in total number of tornadoes, Florida leads the United States in annual tornadoes per 10,000 mi<sup>2</sup> and Mississippi is number 1 in total tornado path length per 10,000 mi<sup>2</sup>.

Ablah and colleagues note that the near-total destruction of the entire community's infrastructure presented not only a distinctive challenge but also an opportunity to describe the regional response system. Some of their report reinforces familiar axioms. Problems of physical barriers of transportation and accessibility to hospitals have been described elsewhere,<sup>3</sup> as has the tendency for the majority of patients to seek care at 1 hospital despite the availability of several.<sup>4</sup>

The authors highlight their use of the injury severity score (ISS) as a means to calculate a critical mortality rate (CMR). In this case, the reporting of CMR is more important than the actual ISS. As described by Frykberg and Tepas, the CMR is a more accurate reflection of event-related mortality and, more specifically, affords a means to assess the handling of the disaster, the amount of overtriage, and the number of possibly preventable deaths.<sup>5</sup> The authors report a CMR of 18%, perhaps heightened by the number of older adults in the target area. Such data go a long way in establishing benchmarks for future researchers and planners.

The number of deaths could have been higher had it not been for the tornado emergency warning system, which provided a second tier of notification. The first notification took place

more than 20 minutes before the average tornado warning for prior EF5 tornadoes, and the use of a hierarchy of terminology indicating the tornado's advanced strength may have galvanized residents to take precautions, mitigating the disaster.

The article makes a strong case for regionalization as a model for ensuring health system capacity to respond to disasters. The fact that multiple emergency medical services (EMS) agencies from diverse jurisdictions integrated by a mutual aid agreement ably responded is a testament to the success of planning and exercising. Ninety patients were transported to 5 hospitals within a 100-mi radius, including 2 level I trauma centers, which received 6 of the 11 patients with an ISS  $>15$ , a conventional marker for a major injury. This supports further development of statewide trauma systems built around trauma centers integrated into the larger community as a means to enhance statewide emergency preparedness.<sup>6</sup>

Finally, the article reinforces the call for the development of programs for rural trauma care. What is often overlooked in our increasingly urbanized society is that based on the 2000 US census, 21% of the population still lives in the 83% of our land mass that is considered rural.<sup>7</sup>

As with any good piece of research, Ablah and coworkers' article raises as many questions as it answers. The authors note that the responding EMS units had been trained to use the START triage methodology. However, an inability to record triage data was attributed to the overwhelming devastation and the problems this presented to EMS. Did this affect the decision for patient transport? Were triage tags used and found to be ineffective, or not used at all? Was aeromedical evacuation used to any extent? The need for some standardization in field triage schema is recognized and is being addressed by national organizations. The authors could tell us more about communication, uniformly described as a major obstacle to disaster response.<sup>8</sup> As a corollary, the use or nonuse of hospital incident command was not described. How was the response coordinated? These questions suggest that we need some mechanism for uniform reporting and standardized datasets to maximize the benefit of after-action reports.

Perhaps the most important contribution of this article, however, is the inclusion of aspects of EMS, acute hospital-based

care, and public health in the same place. All too often these disciplines speak only to themselves, and both plan and operate in “silos,” which is counterproductive to an optimal outcome. We can thank Dr Ablah and her colleagues for describing the manner in which Kiowa County approached this event in a comprehensive way and broke down those barriers.

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