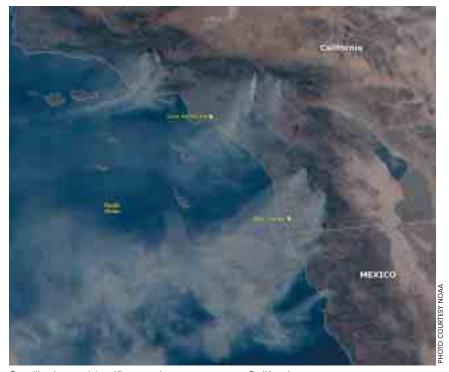By A.J. Heightman

Innovations from Hell's Fury

Throughout my career, I've handled plenty of fire stand-bys and rehab operations, watching as flames consumed households full of precious possessions and memories. In northeastern Pennsylvania, where many homes are located close together or in linked rows, it wasn't uncommon to witness a structure fire get out of control and leap from house to house or race through a block of row homes.

These fires often occurred on cold winter evenings when the wind whipped the flames at 10–20 miles per hour, water pressure was low and limited manpower prevented crews from mounting a circumferential attack on all exposures. They were frightening fires that devastated the lives of the affected families and often injured rescuers.

But what I witnessed in October near our office in San Diego was beyond imagination. Wildfires fueled by dry brush that hadn't been touched by rain in more than five months and hot, 60 mph Santa Ana winds blowing west off the desert pushed 100' tall walls of flame at 8 mph directly toward the city of San Diego, America's seventh most populous city.

San Diego, a city of 1.3 million residents, is spread over 423 square miles and surrounded by mountains to the east, Mexico to the south and the Pacific Ocean to the west.

Before they were contained, the wildfires destroyed more than 3,000 homes and killed 16 San Diego County residents and one firefighter. The incident presented new challenges for the fire and EMS personnel sent to battle the blaze, which acted more like an erupting volcano, igniting homes with intense radiant heat as it approached. The fires leapt across (and closed) multi-lane highways as well as single-lane access roads, burned in hard-to-reach terrain and changed direction without warning. Firefighters worked feverishly to extinguish hundreds of simultaneously burning homes. Smoke covered the entire county and turned daylight into darkness.

I thought it important to pass along some of the critical actions taken by incident managers during this incident—actions that helped the San Diego EMS system continue to operate and respond to normal system demands, as well as those presented by the massive wildfire effort.

Command & preparation

San Diego operates daily under a unified command system and is a part of the California mutual aid response system, a statewide system that serves as a model throughout the country. Because most air resources had already been committed to other fires in the state and the San Diego fires started at dusk when available resources were grounded, incident managers implemented a ground attack system complete with base camps and rehab sectors to support the more than 5,000 emergency responders battling the blazes.

Satellite image identifies smoke patterns over California.

PHOTO COURTESY NOAA

Wayne Johnson, chief operating officer of the San Diego Medical Service Enterprise, mobilized his staff to adjust for the event's real and anticipated demands. Off-duty personnel were called in to staff extra ambulances; wheelchair units were staffed to assist with evacuations; and the city's supply department was tasked with preparing extra EMS units and supplies for deployment. The city increased its normal fleet of 29 ALS ambulances to 36, 16 BLS ambulances to 22 and seven wheelchair units to 10.

Because the city plans and drills on a regular basis, its fire and EMS infrastructure is prepared to respond to unexpected demand. The supply department was able to fully equip five spare BLS ambulances, eight ALS ambulances and 10 extra drug boxes in less than two hours. The supply department is aware of its "par" levels for supplies and has purchase orders that can be immediately activated at a local wholesale drug firm to provide and replenish supplies rapidly.

Rural/Metro Corp., a partner in the San Diego Medical Service Enterprise, played a key role in obtaining overnight shipments and made the purchasing process from local vendors easy with its existing relationships.

One area noted for improvement was the need for extra stretchers so all ambulances could be placed in service immediately. Johnson pointed out that most cities don't think they'll ever be called on to put all reserve ambulances in service simultaneously with active street units. He was fortunate to have a local stretcher representative who rushed multiple stretchers to him.

Reconfigured first response

In an all-ALS system, the rapid deployment of San Diego's 44 ALS engine companies gutted the city's first response capabilities. During one point in the battle to keep flames from advancing on the city, only one ALS engine company was available to serve the entire city.

To replace the extra paramedic and manpower resources lost by the removal of ALS engines from the system, EMS officials increased staffing on all city ambulances from two to three crew members and restricted fire unit first response to shootings, stabbings and cardiac arrests during the height of the fires.

BLS and ALS units were deployed to set up rehab assets at multiple fire sites, in addition to a multitude of ambulances mobilized by the county's private ambulance companies (see Priority Traffic, p. 22).

The medical tent is adjacent to the trailer dispensing over-the-counter medications.

The value of population-based health care

Jim Dunford, MD, the city's EMS medical director, is one of the country's most energetic and involved EMS physicians. He is proud of his EMS system and serves as an active participant on San Diego's incident management team.

Dunford was an instrumental force behind San Diego's initial use of the FirstWatch software system in October 2003. FirstWatch, a unique program from Stout Solutions, automatically scans 9-1-1 calls and dispatch data to detect unusual patterns of illness or injury that could indicate a biological attack, a chemical incident or a naturally occurring epidemic. Todd Stout, a former paramedic and son of Jack Stout, creator of System Status Management systems, developed the program.

FirstWatch scans data for suspicious trends on the basis of complaints selected by the EMS system. If the program identifies an unusual number of patients with selected symptoms, it alerts users, furnishing them with reports, line graphs, pie charts and maps of important trends occurring in their system.

In San Diego, the system routinely looks at such problems as abdominal pain, breathing difficulty, convulsions/seizures and unconscious (non-trauma) patients and does a one-year historical search for a baseline. If there's a significant increase (exceeding three standard deviations above the norm) in the types of calls selected, the FirstWatch system sets off an alarm, and officials can then review maps for clustering and begin research within five minutes of the triggering event.

During the massive wildfires, San Diego officials were alerted by the FirstWatch system to clusters of calls for respiratory distress that began to occur three days after the fires started.

On day #1 (Sunday), San Diego Mayor Dick Murphy addressed local media and requested that all city businesses voluntarily allow their employees to remain home on Monday due to smoke conditions and so that roadways would be kept clear for emergency apparatus. School officials also announced that all San Diego County schools would be closed on Monday.

When smoke continued to blanket the city on day #2 (Monday), the mayor made the same request, but this time due to air quality concerns. Once again, people stayed home and indoors, avoiding respiratory problems.

This kept a large population indoors and away from the city on Sunday and Monday, resulting in the EMS system having 40 fewer respiratory responses than a normal Sunday and 60 fewer respiratory calls than expected on a Monday.

On day #3 (Tuesday), as the fires began to be contained, residents began to venture outside and return to work. That's when the FirstWatch system indicated a 110% increase in the volume of respiratory responses being handled by EMS crews.

According to Johnson, respiratory calls, which normally comprise 12–15% of the city call volume, increased to 33%. A map generated by the FirstWatch system showed that the increased call volume was clustered in the midwestern section of the city, in the same direction smoke was traveling from the fires.

When Johnson became aware of the increased respiratory call volume clusters, steps were taken to re-deploy EMS units to the high cluster areas. Also, Dunford alerted county health officials to advise the public that individuals with asthma and other respiratory conditions could still be affected if they stayed outdoors for prolonged time periods.

The future of population-based health care

As more agencies use systems like FirstWatch, data will be linked to a centralized data network, allowing users to view important aggregate data and trends on a regional or national level. This data, available to government agencies for bioterrorism monitoring, can also be

linked to other data sets, such as lab results, emergency department data, school absentee data and over-the-counter drug sales, and used for numerous health-care crises.

Dunford is quick to point out that San Diego's early experience with the trending capabilities of the FirstWatch system during the wildfire disaster proved the system's value for more than just the detection of bioterrorism events. He's hopeful other communication centers in his county will become linked to the system to offer emergency managers an even bigger picture of incidents that could affect Southern California.

It's often said that many of the most important medical innovations come about as a result of wars and natural disasters. The ability to monitor plumes of smoke via satellites and increased call volume clusters from communications center data and software programs are two of the innovations that surfaced during the catastrophic fires in the San Diego region.

The personnel who fought through hell's fury to save countless lives and properties should receive some satisfaction in knowing that new tools to protect them and their loved ones were successfully tested during their battle with Mother Nature. JEMS

PHOTO A.J. HEIGHTMAN

The FirstWatch Trigger Alert summarizes problems in graphs and pie charts.