

FORUM ON MEDICAL AND PUBLIC HEALTH PREPAREDNESS FOR CATASTROPHIC EVENTS

Preparedness and Response to a Rural Mass Casualty Incident

Workshop Summary

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Rapporteurs

Forum on Medical and Public Health Preparedness
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Willing is not enough; we must do.”*

—Goethe



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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process. We wish to thank the following individuals for their review of this report:

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1

Introduction¹

On January 6, 2008, about 3:15 p.m. Mountain Standard Time, a 2007 Motor Coach Industries 56-passenger motor coach with a driver and 52 passengers on board departed Telluride, Colorado, en route to Phoenix, Arizona, as part of a 17-motor coach charter. The motor coach passengers were returning from a 3-day ski trip. . . . About 8:02 p.m. . . . the motor coach departed the right side of the roadway . . . overturned . . . and came to rest on its wheels. . . . As a result of this accident, 9 passengers were fatally injured, and 43 passengers and the driver received injuries ranging from minor to serious. . . . Major safety issues identified by this accident investigation include [among other things] emergency medical notification and response with regard to large motor coaches traveling on rural roads.

—Excerpted from the 2009 NTSB accident report
on the “Mexican Hat incident”²

The 2008 bus crash in Utah known as the “Mexican Hat incident” brought to a head the need for an integrated infrastructure capable of responding to mass casualty incidents that occur in rural settings. Following

¹This workshop was organized by an independent planning committee whose role was limited to the identification of topics and speakers. This workshop summary was prepared by the rapporteurs as a factual summary of the presentations and discussions that took place at the workshop. Statements, recommendations, and opinions expressed are those of individual presenters and participants, and are not necessarily endorsed or verified by the Forum or the National Academies, and should not be construed as reflecting any group consensus.

²See Executive Summary of NTSB report posted at www.nts.gov/publictn/2009/HAR0901.htm.

its investigation of the crash, the National Transportation Safety Board (NTSB) recommended that the Federal Interagency Committee on Emergency Medical Services (FICEMS), “evaluate the system of emergency care response to large-scale-transportation-related rural accidents and, once that evaluation is completed, develop guidelines for emergency medical service response and provide those guidelines to the states” (NTSB, 2009).

In response to a request from FICEMS, and with funding support from the National Highway Traffic Safety Administration (NHTSA), the Institute of Medicine (IOM) Forum on Medical and Public Health Preparedness for Catastrophic Events convened a workshop on August 3 and 4, 2010, to examine the current capabilities and future opportunities to improve integrated mass casualty response in rural settings.

Specifically the objectives of the workshop were to

- Review the findings from the NTSB report of the 2008 Mexican Hat incident and discuss near- and long-term opportunities to improve response capabilities in rural settings.
- Explore existing standards, guidance, and innovative models and approaches in place for state and local jurisdictions.
- Examine integrated systems approaches to improve the capability of the emergency medical services (EMS) system to respond to large-scale rural incidents.
- Discuss opportunities to improve integration and coordination with public health systems to address challenges to national public health security, particularly in rural settings.

BACKGROUND

The vast majority of the land mass in the United States is rural, and much of that is classified as “frontier,” which is defined as counties having less than six people per square mile.³ Mass casualty incidents (MCIs) in rural areas are not uncommon, said workshop chair Robert Bass, executive director of the Maryland Institute for Emergency Medical Services Systems. A nationwide survey of rural hospital emergency departments conducted in 2006 found that more than one-third of those responding had been overwhelmed by what they classified as an MCI, at least once within the prior 2 years, and more than half reported activating their disaster plans within the prior 2 years (Manley et al., 2006). The hospitals cited a broad spectrum of incidents that led to activation of their disaster plans (see Box 1-1). While individual hospital systems are differentially affected by these events, the

³Throughout this workshop summary, *rural* will be used to capture both rural and frontier settings.

BOX 1-1
Most Common MCIs Experienced by Rural Hospitals

From most to least frequent:

- Vehicular crash
- Severe weather
- Bus crash
- Hazardous materials (Hazmat)
- Power failure
- Tornado or hurricane
- Multiple gunshot wounds
- Fire
- Heat
- Flood
- Explosions
- Airplane crash
- Other natural cause
- Lightning
- Train crash

SOURCE: Manley et al. (2006).

list demonstrates for state and federal policymakers the type of commonly occurring events that can overload a rural EMS system. Many rural health systems exceed their surge capacity and trigger an MCI event with an influx of only a handful, less than 10, patients. Contrast this, Bass said, to a major city such as Washington, DC, where having 10 patients at a single time is a daily event, and the capacity to surge and respond is much more robust.

Drew Dawson, director of the Office of Emergency Medical Services of NHTSA said that, although the impetus for the NTSB recommendation to FICEMS was the Mexican Hat incident, the workshop discussion of solutions and approaches should be from an all-hazards perspective.

Dawson charged speakers and participants to identify practical, creative, and actionable solutions to incrementally improve rural EMS mass casualty response, both in the short and long term. This includes identifying barriers and developing practical strategies, with as much specificity as possible, to work around those barriers.

Common Challenges

Rural and frontier areas face significant and unique challenges in responding to an MCI, which will be discussed in much greater detail

throughout this summary. In addition to the fact that only a handful of patients may overwhelm response capacity, transporting responders to the scene is a primary concern. Some areas still lack 9-1-1 service, and available service may be inaccessible owing to relatively limited access to landline phones and areas with limited or no cell phone service. Vast distances also delay response to the scene and transport of patients to care facilities. Once on the scene, rural EMS providers may have radios for communication, but there are numerous “dead areas,” particularly in mountainous regions and expansive land areas with limited communication towers. In addition, when multiple EMS teams respond, their radio systems are not necessarily compatible. Another ongoing challenge, Bass said, is the lack of broadband access in rural and frontier areas of the United States.

Coordination of response can also be a challenge. Vast distances and lack of coordinated federal funding impact effective planning, training, and exercises. Equally challenging, many participants repeatedly highlighted the absence of directed federal EMS grant mechanisms as a significant barrier. The resulting limited resources (personnel, supplies, funding, and technology) further limit the localities from being able to adequately plan for and respond to MCIs in rural and frontier areas of the United States. Many rural areas are medically underserved areas with regard to both prehospital and hospital services, facing day-to-day resource challenges including limited equipment, supplies, and healthcare personnel.

Richard Serino, deputy administrator of the Federal Emergency Management Administration (FEMA), addressed workshop participants briefly, emphasizing that disasters and mass casualty incidents happen everywhere and that the workshop discussions, while stemming from rural, transportation-related incidents, will not only be helpful to rural EMS, but to EMS in general.

Common Themes and Opportunities

Throughout the workshop, several participants identified a number of common themes and opportunities. Each of these will be discussed in greater detail throughout this report. As already mentioned MCIs in rural and frontier areas of the United States are common and will likely get more frequent in the coming decades as more people use mass transit (trains, buses, and planes) to traverse the vast expanse of rural and frontier areas of the country. The magnitude of these threats as well as the capability and capacity to respond is largely unmeasured. Due to the absence of metrics that can be used to assess risk and capabilities, governments, the public, and responders are frequently unaware of the potential gaps in their response systems until an MCI occurs. Broadly inclusive planning and exercises, strategic partnerships (including NGOs), state/federal coordination and sup-

port, the use of Incident Command, teamwork, innovation, and access to communications are factors that appear to improve the response to MCIs.

Communications technologies and the lack of interoperability within those systems were a central theme throughout this workshop. Technology plays several roles in rural emergency and disaster response and consequently serves as both an opportunity and a challenge. Better communications and patient tracking can be a tremendous asset to everyone involved in a disaster response. Interoperability with all responders, including across state lines, would be the ultimate resolution. Standardization for patient tracking systems would be another desirable outcome. Leveraging existing federal programs (e.g., NG-911, HHS, and DHS preparedness grants, National Broadband Plan) will also provide an opportunity to improve access to broadband technologies (public safety communications, telemedicine, and patient tracking) in rural and frontier areas of the United States.

Moving forward, many participants emphasized that grant guidance will need to be updated to facilitate the development of regionalization and the necessary partnerships—within government, local military bases, and the private sector—and establish the metrics necessary to assess capabilities. While some participants expressed concern about regionalization decreasing “local” control, as will be highlighted later in this report, regionalization facilitates partnerships and sharing of increased resources that result in greater flexibility to plan and respond at the local level. Workshop chair Robert Bass suggested that mechanisms to identify and share best practices in planning for and responding to MCIs will help federal, state, and local governments.

ORGANIZATION OF THE REPORT

The report that follows summarizes the presentations by the expert panelists and the open panel discussions that took place during the workshop. An overview of two rural MCIs, the 2008 Mexican Hat incident and the 2010 Albert Pike flood, are provided in Chapter 2.

Chapters 3 through 5 examine some of the specific challenges of responding to mass casualty incidents that occur in rural areas, as well as strategies and innovative approaches to improving response. Chapter 3 discusses the impact of limited 9-1-1 access and other communications challenges; Chapter 4 examines the unique challenges of rural prehospital response; and Chapter 5 considers the lack of resources and other issues facing rural healthcare systems. It also discusses strategies to address the challenges posed by coordination and integration across response platforms.

Metrics for assessing capabilities and guiding resource allocation are discussed in Chapter 6. Chapter 7 discusses opportunities for improving rural mass casualty response, including the roles of federal, state, and lo-

cal governments and the private sector. Concluding remarks by the panel chairs of each session are summarized in Chapter 8. The workshop agenda and biographical sketches of the panelists are available in the appendixes.

2

Case Examples: 2008 Mexican Hat, Utah, Incident and 2010 Albert Pike, Arkansas, Flood

As discussed in Chapter 1, this Institute of Medicine (IOM) workshop was convened at the request of the Federal Interagency Committee on Emergency Medical Services (FICEMS) to help inform their evaluation of the response of emergency medical services (EMS) to large-scale rural transportation accidents. Following its investigation of a bus accident near Mexican Hat, Utah, that occurred January 6, 2008, the National Transportation Safety Board (NTSB) recommended that FICEMS conduct such an evaluation, and develop EMS response guidelines for states. To set the stage for the IOM panel discussions, two case examples of rural mass casualty incidents were presented by those directly involved in the emergency services response. In addition to the accounts of the Utah bus accident, a nontransportation example is provided in the accounts of the response to the rapid and severe flooding of the Caddo and Little Missouri rivers near Albert Pike, Arkansas, in June 2010.

NTSB MEXICAN HAT INVESTIGATION

NTSB vice chairman Christopher Hart explained that as an independent accident investigator, the NTSB's primary goal is to issue recommendations designed to help prevent similar accidents in the future. These recommendations are based on the NTSB's determination of probable cause(s) and survival factors (e.g., occupant protection, roof strength, and seat belts), as well as its review of emergency response. While the NTSB does not have the authority to mandate action, Hart noted that the acceptance rate of NTSB recommendations is more than 80 percent.

Following its investigation of the Mexican Hat incident, the NTSB recommended that FICEMS address the need for funding to enhance the communication capabilities of rural areas and conduct a systematic review of EMS response to large rural accidents. The NTSB made recommendations to the Utah Bureau of EMS and Preparedness, calling for the development of a contingency plan for large rural accidents that are complicated by severe weather. Recommendations were also made to the Federal Highway Administration, the National Association of State EMS Officials, and the American Association of State Highway and Transportation Officials to develop a risk assessment process to identify those stretches of rural roads most vulnerable to accidents in order to focus communication enhancements and response plan development.

Hart emphasized that the challenge of vast open spaces goes beyond how long it takes for emergency vehicles and responders to reach the site. Physical distance can be a significant barrier to transporting emergent patients quickly and effectively after first responders have arrived. From the accident scene in Mexican Hat, the closest medical facility with a trauma unit was 117 miles away in Moab, Utah. Five of the victims were treated at this level IV trauma center. The closest level I trauma unit was 190 miles away in Flagstaff, Arizona, and two individuals were treated there. Twenty-five accident victims were treated 75 miles away in Monticello, Utah, in a facility without a trauma center; 10 were treated as far as 230 miles away at a level II trauma unit in Grand Junction, Colorado, and three were treated 360 miles away in Salt Lake City, Utah, at a level I trauma unit.

There are a variety of exacerbating circumstances that affect rural incidents, including lack of communications, bad weather, lack of roads (of particular concern for railroad or aviation crashes), and impact on the larger community (e.g., a crash resulting in a pipeline leak or other hazmat situation). Hart emphasized the importance of state and local governments considering potential aggravating circumstances when developing response plans.

In the future, he said, we can expect to see more tour buses on rural roads as people set out on more ski trips and other expeditions to see our beautiful country “up close and personal.”

THE 2008 MEXICAN HAT, UTAH, INCIDENT AND RESPONSE: LOCAL PERSPECTIVE

Linda Larson, EMS director for San Juan County, Utah, provided a local EMS perspective of the 2008 Mexican Hat incident. Currently an emergency medical technician (EMT)-intermediate with advanced life support (ALS) certification, Larson has been an EMS in Utah for 10 years, and was an incident commander at the scene. Though San Juan County is the

biggest county in Utah at 7,725 square miles, its population only measures 14,413, an average of 1.8 residents per square mile. Larson compared that to Washington, DC, which is 61.4 square miles with a population of 599,000, or 9,300 residents per square mile.

The Accident

On January 6, 2008, 17 tour buses traveled through San Juan County, Utah, on their way to Phoenix, Arizona, from a ski holiday in Telluride, Colorado. Normally, the convoy would have traveled through Colorado, but Lizard Pass on State Route 145 was closed due to snow, and the buses were diverted through San Juan County on Highway 191. It is believed, Larson said, that instead of making a necessary turn to stay on Highway 191, five of the busses kept driving straight and inadvertently ended up on Highway 163, which is a very narrow, winding road, without a shoulder. The fourth bus failed to negotiate a turn and rolled down a 41-foot embankment. The crash site was 10 miles north of Mexican Hat, 22 miles south of Bluff, and 80 miles from Monticello.

At the time of the crash, approximately 8:00 p.m., it was already dark, very cold, and raining. Larson played an audio clip of the 9-1-1 call made by one of the victims to EMS, shortly after the crash. Given the lack of cell phone coverage in that area, it is unknown how that call was connected. From the recording, workshop participants heard that the connection was poor and was ultimately lost before the dispatcher could obtain any information other than that there had been a crash. Another 9-1-1 call was successfully completed around 8:30 p.m. by a passerby.

The Response

The first ambulance was paged at 8:30 p.m., and four ambulances were en route by 8:45 p.m. The EMS team alerted the local hospital and the emergency manager, who sent the mass casualty trailer to the scene. The San Juan County EMS is voluntary, but has a fulltime interfacility transport vehicle that just happened to be in the area, about 20 minutes away. Both of the personnel on the transport were ALS certified.

The first ambulance on the scene arrived at 9:01 p.m. to what Larson described as a messy, surreal scene of strewn skis, poles, jackets, and suitcases. The bus had gone through a barbed wire fence and made a full 360 degree roll down the embankment, losing its roof in the process (Figure 2-1).

Forty-three EMTs responded, which Larson noted as fortunate rather than routine: normally only half that number are available to respond. Two highway patrol officers responded, both of whom had some EMT experi-



FIGURE 2-1 The fourth tour bus after a 360-degree roll 41 feet down an embankment.

SOURCE: Larson, 2010.

ence. Due to the lack of highway traffic, patrol officers assisted EMS in beginning to move patients away from the bus. Countywide, the sheriff and 3 deputies, 25 fire and rescue personnel, and 10 county employees from the administration office, driving county vans, were among the responders. In total, 15 ambulances serviced the scene, one from as far away as 250 miles.

When EMS arrived there were around 100 people down the embankment. Approximately 50 passengers from the fifth bus had gotten out to help, such that EMS had to distinguish between healthy and wounded tourists. Ultimately, it was decided to pair passengers from the fifth bus with victims from the fourth, so each victim had an advocate who stayed with them and monitored their status. Another fortunate coincidence came in the form of a passerby who happened to have a large spotlight in the back of his truck; he stayed to illuminate the scene.

The Utah EMS Strike Team was also activated, assisting San Juan County for 48 hours by responding to all other EMS calls (discussed in detail hereafter).

Injuries

Of the 53 people on the bus, there were 9 fatalities, 35 serious injuries, and 9 minor injuries. Of the serious injuries, about half were triaged red, the other half triaged yellow. Demonstrating the need to reassess triage grades throughout a mass casualty incident (MCI), one of the patients, initially triaged green, was found to have suffered a hip fracture after being evacuated to a “walking wounded” area. The majority of the seriously injured passengers sustained spinal, clavicle, rib, and extremity fractures. All of the passengers had been ejected from the bus except for the driver, and a passenger who was trapped between the seats.

Raising the issue of seatbelt use on buses, Larson noted that from 1998 to 2008, the NTSB investigated 33 motor crash accidents involving 256 passenger ejections. However, Larson pointed out that it is not possible to know how the injuries might have been different if the roof of the bus had not detached.

Transportation

Eight ambulances from San Juan County and four from the Navaho Nation were dispatched to the scene. Three ambulances from Grand County EMS and two from Southwest Memorial Hospital in Cortez, Colorado, were waiting at San Juan Hospital to assist with further transport. There were no helicopters able to reach the scene due to the weather. The flight team from St. Mary’s in Grand Junction, Colorado, instead drove down in an ambulance to assist with transport. As there were not enough ambulances, the decision was made to remove the seats from the three county vans and use them for patient transport. Larson recounted that though the vans did not have any medical equipment, the alternative was leaving the victims on the ground at the scene to succumb to hypothermia.

Seven people were pronounced dead at the scene. The remaining victims were initially transported to four hospitals and two clinics. Four air transport teams subsequently transported patients to other facilities. Two victims died en route to higher medical facilities. Only 7 out of the 52 passengers were released with minor injuries. Overall, victims were treated at 13 hospitals and medical centers in 4 different states (Figure 2-2).

Challenges and Successes

Larson listed some of the challenges facing EMS in responding to this incident, including the fact that the closest hospital was nearly 80 miles away. Limited radio communication and no cell phone service on the scene meant that communication with the local hospital consisted of a “runner”

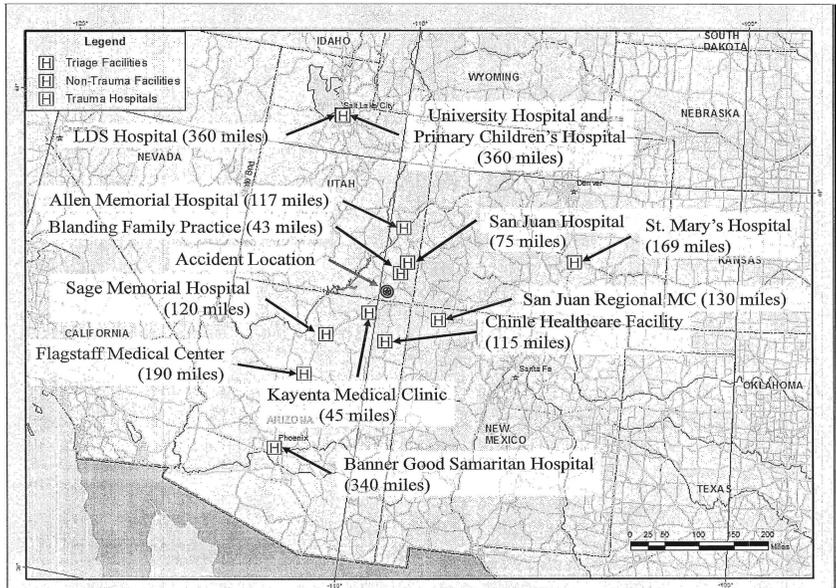


FIGURE 2-2 Victims from the Mexican Hat incident were treated at 13 facilities in 4 states.

SOURCE: Larson, 2010.

who traveled down the road in search of cell phone signal strong enough to connect with the hospital. After relaying information from the scene and receiving a response, the runner would then return to the scene to repeat the process. Coincidentally, Larson remembered that at the time of the Mexican Hat crash, there was an ongoing, heated debate about whether an increase in cell phone towers would decrease the area's inherent beauty. However, after the bus crash, a cell phone tower was installed in the area and painted brown so it blends in. Resources, including ambulances and equipment, were also limited (resulting in the use of the county vans), as was the number of ALS-certified individuals on scene to care for patients while they were waiting for ambulance transport.

Logistically, there were challenges with triage and patient tracking. Larson described the initial victim triage, using the red, yellow, green, and black labeling system, as successful. However, priority designations became muddled on approach to area hospitals as each ambulance crew felt that their patient was the medical priority. As in most MCIs, patient tracking posed challenges, and improvements are needed to better track patients and responders.

Weather acted to compound the resource and logistical challenges. Response was delayed as roads en route were closed due to snow and fog. At the scene, patient care was hampered by the rain and extreme cold. The bad weather also prevented air medical transport of victims from the scene, and delayed air transport from hospital to hospital.

Despite the challenges, Larson felt there were many things that went well. In the communications arena, the EMS dispatch did an excellent job. Hospitals were contacted early and monitored radio communications. EMS responders were well-coordinated and the “deputized” passengers from the fifth bus served as a critical resource. Though transportation was hampered by the weather, creative leveraging of the county vans, though medically unequipped, increased the number of victims able to reach area hospitals. The Grand County and Southwest Memorial ambulances were ready and waiting at local hospitals to transport arriving patients to critical care facilities. Finally, Larson reiterated that the Utah Bureau of EMS and the Southeastern Strike Team were instrumental, discussed in greater depth by Paul Patrick.

Lessons Learned

Understanding the gaps in their capability to respond to MCIs through the Mexican Hat incident, Larson emphasized important lessons learned for local EMS. Among them was the need for contingency plans should helicopters be unavailable due to adverse weather conditions. Issues of patient tracking and communications between the accident scene and hospitals (e.g., how to manage different services using different radio frequencies) were identified as areas requiring improvement. Where possible, Larson highlighted the need for plans to keep families together. Already noting progress, she said retrospective strategizing by all EMS personnel involved in the response had led to a revision of the triage protocol to avoid confusion regarding priority patients in the future.

THE 2008 MEXICAN HAT, UTAH, INCIDENT AND RESPONSE: STATE AND REGIONAL PERSPECTIVES

Paul Patrick, director of the Bureau of EMS and Preparedness in the State of Utah Department of Health, explained that the state plays a supportive role in MCIs, letting incident command work as it is designed to work. A regional response is initiated as the aid of surrounding counties is sought. Because this accident occurred in the Four Corners area, surrounding counties fell into four states, Utah, Colorado, Arizona, and New Mexico.

The state’s auxiliary role takes the form of helping prepare local EMS

to respond, coordinating resources during an incident, and providing resources when local and regional resources are exhausted. State funding also contributes to hospitals and clinic equipment, and their personnel may be tasked with providing necessary training. Utah, in particular, has a toll-free number that is staffed by the Bureau of EMS and Preparedness 24 hours a day, 7 days a week, that anyone can call to notify the bureau of an incident. The benefit of this state-level preparation and planning was apparent in the Mexican Hat incident, Patrick said. Once the bureau received a notification of the incident it contacted EMS offices in the surrounding states to alert them that their assistance may be needed.

Strike Teams

Another resource that the state offers is the emergency services strike teams. A strike team consists of 12 members, including paramedics, EMTs, physicians, and nurses, situated throughout the state. The team is outfitted with trailers equipped to treat up to 100 patients if needed. Trained by the State of Utah Department of Health, Patrick explained that when activated, they are considered Department of Health employees. Thus, strike team members are paid for their training and for their time during a response, and are covered under the state's workmen's compensation policy.

Following an MCI such as the Mexican Hat incident, local responders are often fatigued, yet they still need to run an ambulance service for the community. In these cases a strike team from another area (so as not to further deplete local resources) is often activated to cover the routine EMS calls for a 48-hour period. After the Mexican Hat incident, the state strike team responded to calls in San Juan County, giving the local personnel a chance to debrief and refresh. In addition, the state department of health activated its critical incident stress management team to handle any potential psychological consequences of responding to the incident, providing clinical psychologists and peers, at no cost to local units. Patrick emphasized the importance of these state-coordinated services for maintaining the mental and behavioral health of volunteers and providers.

Strengths, Weaknesses, Opportunities, and Threats

In response to the NTSB, the Utah Bureau of Health conducted a strengths, weaknesses, opportunities, and threats assessment. Patrick highlighted six major threats from that analysis that affect EMS response to rural MCIs.

- Current economic situation: The national recession and pressure to balance state budgets has led to further reductions in grants and funding at the state agency and local levels.
- Availability of technology: Existing technologies should be equitably distributed to all areas throughout the states.
- Lack of data: There are not enough data to support decision making and policy development pertaining to EMS and trauma care.
- Public misconceptions: People often believe that responders will always be immediately available during an incident. It is important for state and local EMS to educate their citizens as to the capability of their team to respond to potential MCIs, in turn encouraging citizens to be trained as EMTs.
- Absence of best practices research specific to rural areas, rather than extrapolating from urban data.
- Lack of focus on inclusive, regionally coordinated prevention efforts.

THE 2010 ALBERT PIKE, ARKANSAS, FLOODING

An overview of a nontransportation rural MCI, and the response to it, was provided by Floyd “Bud” Dunson, deputy emergency manager for the Howard County (Arkansas) Emergency Management Agency, and EMT-Basic and volunteer fire chief of Mineral Springs Fire and Rescue.

The Flood

On June 11, 2010, at approximately 2:00 a.m., Dunson’s county pager alerted him that two fire departments from the northern end of Howard County were en route to respond to flooding in neighboring Albert Pike. In the Arkansan foothills of the Ouachita Mountains, Albert Pike is about 340 miles north of New Orleans and 175 miles east of Dallas. Flooding in Albert Pike is not unusual; the water has been known to rise two to three feet, then recede 30 minutes later. Procedure in Howard County dictates that if two or more fire departments leave the county for a call, a member of the emergency management team must also be deployed. At 7:00 a.m., Dunson’s boss sent him to Langley, Arkansas, a town consisting of a store and a house just five miles away from Albert Pike. Initial reports indicated there were people missing and several fatalities.

Dunson described the Albert Pike campground in Ouachita National Forest as semiprimitive campground sites for about 300 people, along with private cabins in a section of land owned by a large timber company within the national forest. Determining the exact number of people in the campground is normally very difficult. Registration is on the honor system

as campers place their name and fee in a box and take a ticket. The flood washed away the registration box, and with it, any record responders could use to establish how many people may have been camping at Albert Pike.

Crossing the Little Missouri River on U.S. Highway 70 on the way to Langly, Dunson expected the usual flooding but observed that the river was higher than he had ever seen. At a monitoring station eight miles downstream from the campground, the river was recorded to be 3.81 feet at 2:00 a.m., 20.57 feet by 4:30 a.m., and peaked at 23.39 feet an hour later. Analysis would show that the river rose 20 feet in three hours. The first 9-1-1 call was received at 2:30 a.m. As with the Mexican Hat incident, a lack of cell phone coverage and the absence of private homes, save one across the river from the campground, in the area obscured the identity of the caller.

Dunson described 20 flood fatalities with additional reports of fractures, severe lacerations, and, by those clinging to trees, severe “road rash” from being battered by debris that was rushing down the river.

Challenges for Responders

Eight ground ambulance companies responded, sending a total of 11 ambulances. One air ambulance also responded. Four of the ground units and the air unit were privately owned, for-profit corporations; one was a nonprofit subsidized company; and three were volunteer ambulances. Eight were ALS and the others were basic life support (BLS) units. There is no official record of the responders who were at the incident.

Communications

The first challenge, as with many MCIs, Dunson reiterated, was communication. There was no cell phone service, but an occasional text message could get through in certain areas. One technology that did work was ham radio, and as a ham radio operator, Dunson was able to set up radio relays to send outgoing messages. Another communication challenge was the inability of the ambulance crews to make full use of their radios. Ambulance crews in Arkansas generally work with two frequencies, one for dispatch and one to communicate with the hospital. Crews simply did not know which other radio channels could and should be used. Dunson provided a simple solution to this technological communications challenge: the National Interoperational Field Operating Guide lists the radio frequencies that can be used by any licensed public safety agency anywhere in the United States. Using simplex or direct channels, the ambulances can talk directly to each other over short ranges. The solution was to get all the ambulances on the same channel, so Dunson assigned one person to ensure each ambulance radio was turned to the statewide frequency. Dunson

added that communication barriers are not limited to technology barriers, but also involve reaching the appropriate audience to promote efficiency. For example, all responders need to know who the incident commander is, while only specific people need to be informed of when and where helicopters will be flying.

Coordination

Dunson mentioned coordination as another challenge. Dunson related the fact that no medical director was ever assigned to the scene, and EMS did not have the training that is needed in incident command. In addition, he posited that the extended time frame of the incident contributed to this challenge. The flood occurred at 2:00 a.m. Friday morning, with an ambulance remaining on the scene until Monday at noon, due to extended search and rescue efforts. Dunson listed limited access to the river and improper use of ambulances as other obstacles to efficient response efforts. When responding to an incident, an ambulance is not a hearsay, Dunson emphasized. During the open discussion, a participant honed in on the difference between mass fatality planning and mass casualty planning. EMS needs to participate in the development of integrated plans for not only mass casualty incidents but also incidents with mass fatalities.

Physical and Psychological Support for First Responders

As in the Mexican Hat incident, the well-being of the EMS personnel, both physically and emotionally, was also a concern. The heat indices each day were well over 100 degrees, with humidity approaching 90 percent. Dunson explained that a cooling space was set up, and people were assigned to provide cold water to responders, reminding them to rehydrate regularly. To assist responders with the psychological stresses of responding to the incident, the critical stress debriefing team were contacted and activated. Dunson noted that it can be very frustrating for responders to be brought into an incident, placed in staging, and then never be used. Often, individuals feel that they could have made a difference, saved a life, but they were prevented. This frustration leads some to quit emergency services. Thus, part of critical incident debriefing, he said, should be to counsel responders that even though they were brought in and not used, they nonetheless contributed to the effort, perhaps by freeing someone else to go into the field just through their presence. This is regrettably not often addressed, he said.

Absence of Metrics

The absence of standardized metrics to assess an area's EMS response capabilities to an MCI hampers emergency preparedness planning, Dunson added. As a temporary solution to identified metrics, he explained that he identified a county with nearly the same population and demographics and simply started contacting people in EMS and fire departments to inquire about their equipment and resources. In contrast, Utah, like other states, has embraced broadly inclusive planning strategies by bringing together leaders from the EMS community and sharing best practices. Dunson suggested that lessons may be learned from the U.S. military emergency response efforts in Iraq and Afghanistan, which deal with similar resource and logistical issues as many local rural environments. Patrick suggested that such comparative information could be useful, noting that his EMS medical director, who is also the state surgeon, works with the National Guard and recently returned from a 3-month tour of duty in Afghanistan. Patrick noted that it was his goal to increase civilian–military collaboration in an effort to learn from each other's successes.

THEMES IDENTIFIED BY WORKSHOP PARTICIPANTS

The Mexican Hat incident and the Albert Pike flooding were reviewed as case examples of rural MCIs, and the following challenges to EMS response emerged:

- Communications and notification
- Access and transportation to the scene
- Patient tracking
- Limited resources
- Limited ALS
- Availability of medical direction on scene
- Availability of regionalized trauma centers
- Psychological consequences to victims and responders
- Multistate response

In the Mexican Hat incident, in spite of these challenges, communication to and from the scene was excellent, due to a particularly competent dispatch. Responders worked as teams, implemented ICS, and made use of bystanders that were available. The state strike team was also a valuable resource. Following both MCIs, responders had positive experiences with the critical incident stress management teams. It was noted that a key component of the responses was the excellent leadership by both Larson in Mexican Hat and Dunson in Albert Pike.

In Mexican Hat, some of the lessons learned that were mentioned by the panelists involved in the response effort include the need for contingency plans when weather prohibits an air response, and the importance of trying to keep families together. The experience also led to revisions of the triage protocol and patient tracking procedures.

Ongoing threats to progress include the current economic situation and its impact on the availability of funding to support development and infrastructure; lack of technology, or lack of access to existing technologies; the lack of data to support EMS policy decision making; the need for research to support best practices; and the lack of focus on coordinated prevention.

3

9-1-1 Access and Communications

9-1-1 . . . you don't think about it until you need it, but when you need it, it had better work.

—Workshop participant

A common, primary challenge to rural emergency response exemplified by both the Mexican Hat and Albert Pike incidents is that of communication in general, and limited 9-1-1 access specifically. This section of the workshop summary explores these issues in more depth and examines potential strategies that integrate emergency communication and improve rural response (summarized in Box 3-1 and Box 3-2).

CHALLENGES

The communications challenge, as discussed by panelists in detail in the following sections, extends throughout the stages of a mass casualty incident (MCI) response and manifests in several venues. Common to all of them, however, is the challenge of interoperability. In her presentation, Dorothy Spears-Dean, the public safety communications coordinator of the Integrated Services Program for the Virginia Information Technologies Agency, clarified that compatible technology is only a part of interoperability. In the case of the Mexican Hat incident (see Chapter 2), for instance, it was necessary that all of the responding ambulances, coming from as far away as 250 miles, have technology that could easily communicate with each other; but technological coordination is a manifestation of successful interoperability on a regional and state level.

“[Interoperability] . . . is more fundamental than the technology. It boils down to the policy issue,” claims Spears-Dean. Interoperable policy, in turn, is created from strong local and regional policymaking coalitions. It requires coalition-building across traditional jurisdictions to ensure an en-

BOX 3-1

Suggested Challenges Facing 9-1-1 Centers

- Areas without any 9-1-1 service
- Areas without wireless coverage
- Ability to receive and respond to text and interactive video calls, and multimedia data
- Ability to locate callers, both:
 - Discerning the geographic location or street address of the caller
 - Responders finding the site of the incident (missing street signs, standardized 9-1-1 house numbers versus rural delivery addresses)
- Funding
 - Availability
 - Restrictions on the use of grant funding
- Recruiting and retaining qualified dispatchers
- Ability to provide emergency medical dispatch (prearrival instructions)
- Ability to provide backup and overflow capacity such that calls can be transferred between PSAPs
- Unfamiliarity with or fear of technology
- Systems redundancy in the same physical space (e.g., primary and backup phone trunks run along the same highway; may both be rendered inoperable at the same time)

BOX 3-2

Suggestions for Overcoming the Challenges

- In implementing Next Generation 9-1-1:
 - Central or state authorities can provide technological and operational guidance, and funding to localities based on individual needs and current capabilities.
 - Federal programs can provide best practices for communication projects.
- Granting agencies need to have a common vision that promotes interoperable standards and guidelines.
- States' roles:
 - Leverage centralized resources and existing communication assets.
 - Plan with the end in mind.
 - Assume a coordinating role, assist in promoting and supporting regional initiatives through public-private partnerships:
 - Proactive outreach to those that could share expertise and resources.
 - Form strategic alliances with those that could provide support.
 - Maintain a "brokering role" between local needs and federal opportunities.
 - Promote cross-jurisdiction interoperability of policy, technology, and funding.
 - Establish minimum capabilities and equal access to service for all states and all constituents, regardless of local communications platform.
 - Collaborate with local communities to reduce and address legal and regulatory barriers they might face in implementing Next Generation 9-1-1.

ture region plans for and responds to MCIs with the same strategies, expectations, and language plan. Inclusive pre-planning and practice exercises, engaging representatives of local 9-1-1 services to state administrators, are the only way to achieve this type of cooperation, says Spears-Dean. Policy interoperability should strive to be comprehensive, encompassing issues of technology, resource dispersion, and the dedication of funding in the context of an entire region's or state's ability to respond to an MCI.

The strategies offered by those in attendance, detailed below, aim to resolve challenges of inconsistent communications coverage and available technological expertise through creatively leveraging new and existing technology, and increasing policy interoperability with a leadership role for the states and federal government.

Inconsistencies in Cell Phone Service

Emergency medical services (EMS) awareness that an incident has occurred is the first link in the response chain, and for rural America, it is one of the most challenging obstacles to future improvement. The importance of cell phone service to emergency response is undisputed: one-third to one-half of all 9-1-1 calls are made from a wireless phone. Yet, noted Booz Allen Hamilton lead associate John Chiamonte, there are about 125 counties across the United States, primarily in the frontier areas, that do not currently provide enhanced 9-1-1 (E911) services. In these areas only basic 9-1-1 service is available, without location or caller phone number information; in some cases no 9-1-1 service is available. This issue of inadequate or unavailable 9-1-1 services is compounded by the absence of redundant communications systems. Often, even where redundancies exist, they are confined to the same physical space as the primary system, like primary and backup phone trucks located along the same stretch of highway. Limited effectiveness of the backup results from the fact that both primary and secondary systems can be inactivated simultaneously.

Wireless coverage is concentrated in populated areas. About 90 percent of the 3,135 counties in the United States have some sort of phase II wireless, which has the ability to locate a wireless caller using either handset-based global positioning system (GPS) information, or network-based triangulation services using cell phones, tower locations, and wireless signal strength.

There are about 6,100 9-1-1 centers or public safety answering points (PSAPs), across the United States. All of these centers are facing at least some issues associated with coverage, access, technology, funding, recruiting and retaining qualified staff, and the ability to provide emergency medical dispatch. Chiamonte noted that in rural areas these issues are magnified.

Paul Patrick, director of the Bureau of EMS and Preparedness in the State of Utah Department of Health spoke in this session as a representative of the National Association of State EMS Officials (NASEMSO). Patrick reiterated that it is not known how the first 9-1-1 call received from the Mexican Hat incident got through, who called, or from where. Without this critical information a dispatcher cannot start activating emergency resources. Patrick recalled Larson's comment that after the bus incident the contested cell phone tower was installed, and likened it to what happened with the railroad industry; how many times did an automobile-train accident have to occur before there was a crossing placed or a bridge built over the railroad tracks? How many Mexican Hat-type incidents will it take to enhance communications? These issues are not isolated in one state or even several, Patrick said. They are nationwide.

Available Technology, Unavailable Technical Know-How

Unfamiliarity with or fear of technology is a real issue. Patrick said that it was his understanding that the bus that crashed in Mexican Hat had a satellite notification system installed, but that it was apparently not operational. He went on to insist that regulations need to be established to ensure that not only is the necessary technology available, but that it is installed and operated properly.

Aaron Reinert, executive director of the Lakes Region EMS, a rural ambulance service in Minnesota about an hour north of Minneapolis-St. Paul, offered another startling example. While the absence of a dedicated and flexible federal grant mechanism for EMS was highlighted by many workshop participants as a significant barrier, Reinert's example illustrated the specific need to ensure that *existing* funds are compatible with both governmental and nongovernmental organizations. He described Minnesota's robust 800 megahertz communication system, an effective but expensive behemoth: a single portable radio costs \$2,500. For the most remote ambulance services, the equivalent model costs \$5,000 per ambulance. Under a federal grant, Reinert's county received 160 of these \$2,500 radios, theoretically enough to distribute one to each emergency responder. Yet none are used. Why? Reinert's EMS service, which responds to all of the county's 9-1-1 calls, is a nonprofit, non-governmental EMS organization, and it is therefore prevented by the grant guidelines from using any of the provided radios. So to this day, Reinert said, the radios sit in a closet unused.

Existing Alternatives to Traditional 9-1-1 Calls

Reinert's example demonstrated that leveraging existing resources to bolster EMS communications during an MCI might prove more reasonable,

in the short term, than seeking new funding sources in this global climate of recession. As communications technology advances, many people are now communicating solely by e-mail and texting, and in some cases they assume they can text 9-1-1. Patrick proposed a rigorous demonstration project to assess the value and effectiveness of programs that identify alternative methods to communicate with 9-1-1 emergency services. This type of program, he said, would prove worthwhile for the general public and the EMS community alike. If the system had been capable, in theory a text to a 9-1-1 center in San Juan County, with its short-burst message, might have gotten through when a completed cell phone connection could not. Yet, a participant cautioned that reliance on commercial cell phone technology, via calls or text messages, might be misguided: service infrastructure cannot be guaranteed by local governments, it does not assure EMS priority in an MCI, and the existing capacity is likely to be overwhelmed during an MCI, causing a cessation of all service.

Rick Jones, Operations Issues Director for the National Emergency Number Association (NENA), noted that video emergency medical dispatch is on the horizon as well, yet only about half of the 9-1-1 centers in this country are capable of performing emergency medical dispatch at all (i.e., providing medical information and prearrival instructions over the phone to the caller). Johns Isfort, director of Business Development and Physician Services at Marcum and Wallace Memorial Hospital in Kentucky, characterized 9-1-1 dispatch services as undependable in providing responders with any prearrival instructions. He explained that in Kentucky, all fulltime personnel for communications centers are required to attend a 4-week training course covering public safety, communications, police, fire, EMS, and parts of the incident command system, the criminal justice information system, and emergency medical dispatch. However, employees who are not full time are not required to attend this, and as there is a long waiting list for this course, often the personnel staffing the communications centers in rural areas have not had any formal training.

In addition to the potential to text message 9-1-1, Reinert noted the potential benefits of broadband communications such as voice over Internet Protocol (VoIP) and popular, no-cost Internet applications such as Skype. (Currently Skype does not support calls to emergency numbers.) Ambulances could be equipped with broadband for communications, data collection, and remote patient care technology (e.g., telemedicine). Broadband could also provide a platform for automatic vehicle location. Reinert noted that this would not necessarily be expensive. One would need a basic unit, which costs about \$2,500, a data card, and service for about \$20 a month. Anywhere that an ambulance traveled, it would have an Internet connection (assuming there is broadband in that area, which is an obstacle in its

own right). The task is to ensure that there is broadband in the most rural parts of the nation.

Moving forward, Reinert encouraged a review of the data available through databases such as the National EMS Information System (NEM-SIS) and the development of metrics that can be used to help direct exiting resources to the right places.

A Role for the Federal Government

Governments, federal, state, and local, also have a role in facilitating technology development and use. Technology is an answer, DeTienne said, but it is not the only answer. Technology can be a foundation for metrics, training and education, integration of systems, and regionalization.

Throughout the workshop, many participants emphasized telecommunications, as a component of rural MCI response, is in desperate need of improvement to ensure reliability; such improvements will potentially benefit both public and private partnerships.

A role for government is to help remove barriers to diverse partnerships, for example by updating 9-1-1 laws originally written for traditional telecommunications systems to allow for implementation of Next Generation 9-1-1. Jones pointed out that regardless of who manages 9-1-1 at the local level, be it by law enforcement, fire, EMS, emergency management, or a combination, it is important to actively include the 9-1-1 authority in any state and regional planning efforts. Because 9-1-1 is diverse across states and territories, Jones recommended contacting state chapters of National Emergency Number Association and the Association of Public Safety Communications Officials, to help identify the people who represent and can speak for, local 9-1-1 administrators.

Telemedicine is another component of telecommunications that, coupled with broadband, is a powerful tool for rural and frontier first responders and EMS. Jones also drew attention to the 2-1-1, 5-1-1, 7-1-1, and 8-1-1 systems that are now available in many areas. These systems route to services such as poison control or mental health/suicide hotlines, or travel and traffic information. These other “N-1-1” numbers are staffed by trained people that can serve as valuable resources during an MCI.

Jones suggested that commercial vehicles ought to be equipped with software and technology that enables onboard communications devices to automatically search across platforms for emergency communications. For example, a vehicle would search for cell phone signals, then available radio frequencies, satellite, Wi-Fi, and so on, until it made a successful connection. Associate chief medical officer at the Office of Health Affairs at DHS Mike Zanker asserted that the technology for communication in remote areas exists, but it is underutilized because of a lack of incentives

for the private sector to bring these technologies to rural and frontier areas. Regarding the issue of bringing privately held technology to rural response units, Zanker admits that perhaps a government middleman might be useful to standardize, and perhaps even subsidize, such technology exchanges.

IMPROVING RESPONSE

Jenny Hansen, CEO of Strategic Partnerships Incorporated, provides contract services to governments for large-scale public safety telecommunications projects. “We live where we live, and we enjoy it,” she said. Rural residents do not want to replicate New York City, but they should not have to settle for the status quo just because they live in rural areas.

Hansen has been working to establish minimum capabilities and equal access for everyone across Montana, putting together a public safety services bureau and taking inventory of what resources exist, and to whom they belong, in the state. No one can afford a complete replacement of communications equipment, she noted. Legacy equipment, to a certain degree, has to move forward into the future and not to obsolescence.

Collaboration Means Better Communication

Based on her 30 years experience in public safety communications, Hansen observed that the technology is there and basic funding is available. The challenge is to find the right collaborative relationships, both public and private. It is about the politics, the people, and the willingness to break down some of the walls that have been in place for so many years.

Hansen commented that in Montana, success in improving communications was wrought from introducing neighboring organizations and entities to each other and then pursuing various levels of public-private partnerships, taking an inventory of resources at every level. Start with the end result in mind she suggested. Make sure, for example, that resources spent on infrastructure prepare for the future instead of trying to treat the past. As an example of a partnership, Hansen cited a relationship brokered between the Burlington Northern and Santa Fe railroads. The railroad has a lot of real estate, and a lot of infrastructure including Wi-Fi, and both were amenable to working out an agreement to share that infrastructure. Integral to the agreement was a categorization of the roles and responsibilities of each organization in planning for and responding to what-if scenarios. The critical infrastructure within a jurisdiction is going to be different from the neighboring county, and the neighboring state. As such, Hansen said a regional concept is needed, especially when considering funding mechanisms that are targeted for specific purposes.

Preparing for Next Generation 9-1-1: Local Versus State and Federal Stakeholders

The current 9-1-1 system is designed around 20th-century telephone technology that is not capable of transmitting data, text, images, or video. Efforts are underway to establish the Next Generation 9-1-1 system that will define the systems architecture needed to enable digital multimedia 9-1-1 communications. Jones stressed that it is extremely important for EMS to be actively involved in the implementation of Next Generation 9-1-1. Associations are collaborating at the national level, but there needs to be more regional discussion within states and across borders. He emphasized how important it is for rural communities to work together to ensure their needs are met during the development and implementation of Next Generation 9-1-1. As Public Safety Communications Coordinator for the Integrated Services Program of the Virginia Information Technologies Agency, Dorothy Spears-Dean is the state 9-1-1 director and the manager for all state-managed radio assets in Virginia. She sees herself as a broker between local needs and federal opportunities.

Spears-Dean emphasized the importance of states developing a strategic plan to leverage centralized resources and existing communication assets. It will be expensive to move to Next Generation 9-1-1, and successful planning involves both proactive outreach to those that could share expertise and resources, and strategic alliances with those that could provide funding. Similarly, a participant noted that local communities should balance the priorities of investing in Next Generation 9-1-1 and augmenting traditional land mobile radio systems. One participant suggested that this can be accomplished by focusing on interoperability, national standards coordination, and by effectively integrating broadband to be able to bring technological advances to the field.

Before communications technology can be addressed, representatives from all stakeholders must come to the table to address interoperability, with regard to funding, and legal and regulatory policy. It is important that jurisdictions, cities, and counties develop coordinated and integrated 9-1-1 policies. Localities will determine the standards that work for their local populations, she said, but service needs to be ubiquitous. Localities will look to the state for guidance and support, and to the federal government for a consistent voice on best practices. Federal funding of demonstration projects in rural communities would help ensure that the needs of rural communities are fully considered.

THEMES IDENTIFIED BY WORKSHOP PARTICIPANTS

Access to 9-1-1, whether by landline or wireless phone, is not universal. John Chiaramonte suggested there are a number of technological solutions that exist today, and others that are in development, that could improve EMS response to rural MCIs. Examples include but are not limited to satellite phones with GPS and portable locator beacons using satellite technology. Today, around 90 percent of the U.S. population carries a cell phone. For areas that do have wireless service, phase II wireless and mobile phones with GPS chips can provide the geographic location of the caller better than systems basing location information on the cell tower that picked up the call. To ensure technological compatibility, it was noted that phase II enhanced 9-1-1 needs to be universal across the more than 6,000 PSAPs and 9-1-1 centers across the United States.

Several participants pointed out that the ability to share communications infrastructure between private and public entities needs to be considered, as well as the use of devices that can locate and operate across cellular, Wi-Fi, and satellite networks, depending on what is available at the time of need. Technological advancements, like Next Generation 9-1-1, have the potential to bring multiple resources together across large areas, provide backup and overflow capabilities for PSAPs, and support 9-1-1 access for deaf, hearing impaired, and special needs individuals. Next Generation 9-1-1 will also have the ability to share images and video. Yet participants observed the need for rural communities to strike a balance between investing in such Next Generation 9-1-1 technology, and improving the use of traditional land mobile radio systems. One participant suggested that this can be accomplished by focusing on interoperability, national standards coordination, and by effectively integrating broadband to be able to bring technological advances to the field.

Beyond technology and hardware, Spears-Dean held that the human component of communications requires both collaboration and cooperation among public and private stakeholders. As the link to police, fire, EMS, and emergency management, the 9-1-1 system is the first “first responder” on the scene. The local 9-1-1 authority or PSAP representatives should therefore be included in planning and exercises. In addition, public expectation can similarly be managed through education and participation in demonstrations and exercises. Workshop chair Robert Bass reiterated that EMS and 9-1-1 should be considered an essential government service, and funded and supported accordingly.

4

Challenges Facing the Prehospital System

Discussed in Chapters 2 and 3, raising the alarm that a potentially catastrophic event has occurred is just the first step in the prehospital system. The following sections examine the participants' discussion of the effect of specific resource deficiencies facing rural communities, underdeveloped communication between responding authorities, and the effect of inconsistent professional education on preparedness and response strategies preceding victims' arrival at a hospital. Attendees offered strategies to combat these obstacles to improve local and regional coordination, while remaining mindful of current fiscal constraints. (Summarized in Boxes 4-1 and 4-2.)

DISCERNING AND ADDRESSING LOCAL CHALLENGES

Norm Dinerman, medical director of LifeFlight of Maine began by citing *Democracy in America* in which Alexis de Toqueville described how geography is destiny. If geography is destiny, Dinerman asked, is it determinative of the outcome of health care?

A primary challenge facing the prehospital system is the acquisition, allocation, application, and coordination of assets and resources. This includes recruitment, retention, training, and education of emergency medical services (EMS) human resources. Another challenge for response planning in rural America is risk analysis, which assesses the likelihood of the occurrence and subsequent consequences of an event, and then defines the metrics or markers on which a successful preparedness strategy hinges. Other challenges include

- Communications,
- Funding,
- Leadership (someone who can work their way through the political process to secure the necessary support and resources),
- Physician participation or lack thereof (e.g., in medical direction at the scene or hospital),
- Sustaining commitment to disaster preparedness and planning (which is most intense following a disaster, and wanes over time),
- Political and cultural landscapes (where disaster preparedness fits as a priority),
- Existing statutes, and
- Contingency planning.

Dinerman also described the “rural-urban paradox” of prehospital care: the most highly trained responders are in urban America where the transport times to hospitals are short and the need for in-depth prehospital

BOX 4-1

Challenges Facing the Prehospital System

- Absence of dedicated federal funding mechanisms
- Communications capabilities
- Weather impact on mobilization and deployment of resources
- Acquisition and mobilization of supplies and assets
- EMS human resources
 - Integration into healthcare delivery system
 - Recruitment and retention of personnel
 - Transitioning to paid staff to offset decreasing incentive to volunteer
 - Training and education (time, expense, availability of personnel)
 - Leadership
 - Physician participation (e.g., medical direction at the scene and hospital)
- Trauma transport
 - Hospital availability and access (reaching care within the “golden hour”)
 - Personnel and equipment out of service for other calls during extended travel time
- Risk assessment
 - Assessing likelihood and consequences of incidents
 - Defining the metrics or markers of success of preparedness
- Political and cultural landscapes—Where does disaster preparedness fit?
- Rural-urban paradox of prehospital care
- Technologic idolatry (i.e., the belief that a technology-based approach is inherently better than one that is low- or no-tech)

BOX 4-2

Suggestions for Overcoming the Challenges

EMS Human Resources

- Equip and staff to completely meet the daily call volume of emergency calls and patient transports.
- Maintain a cadre of part-timers as regular staff (provides surge capacity and trained candidates for full-time vacancies).
- Recruit new EMTs from undergraduate programs and professional schools such as colleges of nursing, medicine, public health, pharmacy, and dentistry.
- Establish a community paramedic program to fill existing gaps in health care.

Financial, Tangible, and Talent Resources

- Educate EMS volunteers on how to find and apply for federal and other grant funding.
- Look for ways to use nontraditional resources, and for new ways to use traditional resources:
 - Develop expanded roles for community members (ham radio operators, civil air patrol and flying clubs).
 - Identify community assets and resources that can be called upon (e.g., extra generators, faith-based or other community groups that can serve as callers for a phone tree).

Planning and Practice

- Participate in regional preparedness planning.
- Strive to have equipment and personnel interoperability across jurisdictions that provide mutual aid.
- Practice and constantly update MCI plans.
- Adopt best practices from other industries (e.g., vehicle tracking, crash notification, automatic weather reporting, preferred travel corridors).
- Look for creative approaches to enhancing care, such as telemedicine (discussed in detail in Chapter 7).
- Optimize air medical capability and safety (e.g., designated landing zones, fuel and support services, automatic weather reporting, night vision goggles).

Suggestions Specifically for States

- Establish command and control systems that integrate local, state, and federal emergency response using a common operating structure.
- Develop safe, secure, and redundant communication systems that can function without the commercial power grid or commercial communication networks.
- Define the authority to quickly alter standards of care and scope of practice.
- Determine the necessary knowledge skills and abilities needed for large-scale response and provide training when appropriate using just-in-time strategies.
- Stockpile and provide the necessary surge assets including personnel, communications equipment, durable medical equipment, and medical supplies.
- Establish a quality improvement process that reviews the system based on actual or exercised response.

care is limited, while in rural America, responders must sustain patient management for miles and hours, and may need to address complex medical issues that require specialized training they may not have.

Behavioral paradigms add to these challenges, Dinerman said. Altruism is a great motivating factor for prehospital care providers in all of rural America, as are the values of community service and heroism. Rural America also has a strong sense of independence and is proud of its resourcefulness. The incorporation of this mindset into strategies to improve preparedness is discussed in the following sections.

Applying What Works: Identifying Best Practices

Dinerman recognized the importance of identifying “best practices” through experience, but he drew participant attention to the equally important task of adapting best practices from other industries, such as vehicle tracking, crash notification, weather reporting, or “preferred corridors” for tour buses (comparable to a ground-based “flight plan”). He similarly emphasized nimbleness and agility, both politically and operationally, in sharing identified metrics for contemporary risk management methodology and contemporary scaled disaster response, in the form of available strike forces. There are a myriad of disaster preparedness models and approaches to contemporary preparedness education, Dinerman explained, such as those used by the Federal Emergency Management Agency (FEMA), the National Aeronautics and Space Agency (NASA), and the military, that can prove valuable as guides. EMS statutes should be principled, reciprocal, and situationally flexible, Dinerman said. He added that to optimize air medical capability and safety, night vision goggles and local air traffic control should be used. Sophistication must exist at all levels of response, and there must be a focus on local provider needs.

Many strategies were discussed that leverage creativity and inclusive planning to address these challenges. Myra Wood, director of Vital Link Ambulance in Arkansas, related how Vital Link avoided an interruption in service despite the destruction of its dispatch headquarters on February 6, 2008, by an EF-4 tornado that touched down in Atkins, Arkansas. Wood explained that the ability to survive an unexpected event, that itself killed 23 people along its 123-mile trajectory, was a direct result of preplanned surge capacity. Vital Link is an active participant in regional preparedness planning and practices and continuously updates its mass casualty incident (MCI) plans. Vital Link maintains extra ambulances and employs almost as many part-time staff as full-time staff, from which it draws crucial increases in personnel during an MCI, as full-time staff.

While Vital Link was able to creatively integrate surge capacity with its traditional organizational infrastructure, panelist Aimee Binning, a member

of the board of directors of the National Association of Emergency Medical Technicians (NAEMT) and owner of CVC Training, Inc., drew participants' attention to untraditional sources of surge capacity during an MCI. CVC Training provides first aid and CPR training to first responders in Sublette County, Wyoming. Spanning 3.2 million acres, portions of three mountain ranges, and 7,900 residents, Sublette County also contains a large natural gas field, which adds between 3,000 and 5,000 people to the county's workday population. In May of 2000, 382 students and 45 adults required triage after a hazardous gas leak was suspected at an excavation site near a local school. Binning described resourcing personnel from all local venues: EMS was in charge of the triage, law enforcement handled traffic and crowd control, and the county emergency manager was in charge of publicity and communications. Local radio stations assisted by disseminating information of the incident to parents, the majority of whom worked on rural ranches and would otherwise have been unaware of the situation or known where to collect their children. Churches were used as triage facilities and a local, large swim club served as a secure location for individuals deemed nonsymptomatic.

While community teamwork proved effective to combat the threat, funding and staging challenges persisted. Sublette County does apply for federal grants, but Binning noted that volunteer staff are generally not familiar with the grant process. Binning advocated educating EMS volunteers about finding and applying for appropriate grants. While both Wood and Binning demonstrated the difference creativity in leveraging community resources can make during MCIs, Binning cited the problem of limited and decentralized EMS funding as an inescapable traditional obstacle.

Both Binning's and Wood's experiences during respective MCIs spoke to Dinerman's previous point on the challenge of behavioral paradigms. Their common solution was to expend considerable funds in favor of staff dependability: all staff at Vital Link and Sublette County have been transitioned from unpaid volunteers to both paid volunteers and full-time EMT employees.

RETHINKING AND RETASKING AVAILABLE RESOURCES

Gloria Tavenner Dow, a firefighter-paramedic for the Gwinnett County Department of Fire and Emergency Services in Lawrenceville, Georgia, described her system-focused planning approach that incorporates nontraditional EMS system components, nontraditional use of traditional components, and planning for barriers. Dow advised participants to think about available resources in a very broad sense, beyond their traditional roles or capabilities. She emphasized the need to plan. In considering resources and system components, for example, she advised participants to think not only

of the transport vehicle, but of the expertise of the providers associated with the vehicle and the equipment that they bring. When the weather is bad or aircraft cannot be used for some reason, the air medical team can still assist at the scene, as was done during the Mexican Hat incident response. But there needs to be planning for how best to bring and utilize those air medical resources to the scene in the absence of the aircraft. There are also specialty care components of the prehospital setting that should be included in planning exercises. Pediatric hospitals and regional trauma centers, for example, likely have specialty care assets and expertise to share, perhaps through remote medical direction technology during the incident or a specialty team that can come to the scene.

Communications and Incident Command Systems

Robust and redundant communications systems are crucial to an incident command system (ICS) in the prehospital phase of an MCI response. An incident command system is a tool box that expands a department's capacity to respond to an incident, Dow explained. It aims to create a common language, define roles and responsibilities, and develop a preparedness and response plan among all potential responders. Thus, it can adapt standardized strategies to meet the specific needs of an MCI response. A strong prehospital communications strategy is the cornerstone of a reliable ICS, a fact that should be taken into account when attempting to strengthen and adapt ICS strategies. Although many rural communities will not have the capacity of a robust mobile communications unit, existing resources can be better used to coordinate the flow of resources to the incident, facilitate information sharing between first responders, and survey hospitals' availability to accept patients. For instance, most critical care systems have a communications component that could operate as a point of contact within the communications incident management system as needed. However, where there are gaps, existing communications assets should be creatively leveraged to support and strengthen ICS, Dow commented.

Alternatives to Telephone and Radio Communications

Because real-time communication can drastically increase response efficiency, it is important to identify alternatives to telephone and radio communications, contested Glenn Mitchell, chief medical officer of the Sisters of Mercy Health System. Glenn Gaines, deputy U.S. fire administrator for FEMA, reminded participants of the strategy in which an EMT or paramedic is stationed on a landline at a nearby house and someone on site uses a talk-around channel direct to the paramedic. It is not ideal, he admitted, but it is a plausible alternative to transmit situation statuses. Roy Alson,

medical director of disaster services for the North Carolina Office of EMS, directed attention to a valuable tool when Internet access is available: the web-enabled emergency management communications system, WebEOC. He pointed to WebEOC as a potential tool to improve situational awareness during an MCI. He suggested the need for health systems to become more facile in utilizing Internet-based tools to help manage large-scale incidents, adding that his hospital is converting to VoIP (Voice over Internet Protocol), but existing land lines are being left in place so there is a redundant system. Systems like WebEOC could serve as repositories of real-time information, allowing a continually dynamic MCI response. Yet despite the discussions' focus on improved technology, Ken Knipper reiterated the value of local ham radio operators as a resource, as well as traditional cellular service, which can be mobilized in the form of a mobile cellular tower, to disaster sites.

Utilizing Resources to the Fullest Potential

Dow also encouraged participants to consider all of the different ways medical support resources could be used. If there is a trauma team available, is it possible to activate just a component of it? Perhaps a trailer usually used to transport patients on a portable ECMO (extracorporeal membrane oxygenation) machine could instead be used as a surgical suite, if the ECMO equipment was left behind. When conducting preplanning with local critical care services, Dow urged participants to think about interoperability, compatible supplies, and cross-jurisdictional agreements. She cites, as an example, a mutual aid agreement in which an EMS agency agreed to support the staff of a one-bed emergency room with advanced life support ambulance personnel during MCIs that would otherwise overwhelm the small emergency room.

In developing innovative MCI response partnerships, members of the community must not be forgotten. First responders have numerous responsibilities during an MCI, from communications and triage to shutting down roads and directing helicopter landings. Dow suggested, for example, that local service groups such as the civil air patrol or the local flying club could be trained to take over landing zone command during MCIs.

Similarly, the first helicopter to arrive will often have three qualified people on board; therefore, one could be assigned as a triage officer, one as a medical officer, and the pilot as the ground officer for the landing zone. This helicopter could eventually be used to transport the last patient from the scene. Rather than viewing this retasking negatively, because the helicopter is not immediately used to transport a patient, Dow pointed out that the delay could be a better allocation of expertise; in preparing patients for transport by other air medical personnel, the overall response

efficiency could be increased. Dow also pointed out that an aircraft coming in to pick up a 200-pound patient has about a 200-pound capacity to bring something or someone with it, such as a Hazmat expert, a trauma surgeon, or someone with another specific skill that could aid the response effort. Thus, communications incident management systems and thorough planning are all the more crucial.

THE HUMAN RESOURCE

Barbara Quiram, director of the USA Center for Rural Public Health Preparedness at the School of Rural Public Health, Texas A&M Health Science Center, noted that nearly 190 of the 254 counties in Texas are rural. People in rural America wear many different hats, which can be both a strength and a weakness, she said. An individual who is the emergency management coordinator may be the fire chief and also the mayor. Which role do they play at any given point in time during an emergency? Roles need to be clarified from the beginning of an incident.

Strengthening the Personnel Pipeline

Recruiting and retaining first responders, Quiram noted, is a major challenge. Rural communities often find themselves in the frustrating position of having made a large financial investment in hiring and training responders, only to have them recruited away by a neighboring community or an urban center. How do we develop the pipeline of practitioners and responders? One option is to recruit at undergraduate programs and professional schools, such as colleges of nursing, medicine, public health, pharmacy, and dentistry. These individuals likely have training in the life sciences and may be interested in working part time for EMS.

Continuing education also poses unique challenges to rural communities that can not afford to have staff absent for extended periods of time. Therefore the Center for Rural Public Health and Preparedness and other programs are developing distance education programs using interactive video conferencing and online course work, both as continuing education and for graduate credit. For instance, the center produces thousands of CD-ROMs every year with complete programs that are eligible for continuing education credits.

Quiram encouraged participants to convene all of the stakeholders, including the faith-based community, healthcare providers, funeral home associations, extended care organizations, school nurses and principals, and others who may never have engaged each other on MCI response issues, and discern the community's preparedness level and improvements they can make together. Response is local, Quiram concluded, so communities must

come together to identify the assets and resources they have and need to ensure they will be able to respond and recover.

Value-Added Community Paramedicine

In contextualizing the takeaway message from his panel, Nels Sanddal, President of the Critical Illness and Trauma Foundation, began with the importance of expanding the roles, but not the scope of practice, of rural paramedics to ensure continued community prioritization of rural EMS. Without the daily case load of urban EMS, rural paramedics can take on greater public health responsibilities to improve the systems' ability to handle day-to-day care. The importance of maintaining such daily efficiency to adequate surge capacity will be discussed in greater detail in Chapter 5; however, a community can meet its MCI preparedness requirements by establishing a workforce of people with emergency skills to provide a service every day to meet rural health requirements.

Gary Wingrove, director of Government Relations and Strategic Affairs for Mayo Clinic Medical Transport, drew participant attention to a successful example of EMS integration into the broader healthcare system in Nova Scotia, Canada. After the lone physician on a small island retired, the only way for its inhabitants to receive even routine care was to visit the closest hospital, a 45-minute ferry ride away. In response, the local ambulance providers, recently consolidated to improve response time, suggested paramedics staff the clinic, providing a range of services including at-home visits to manage the chronically ill. Over the five years following the establishment of the Nova Scotia community paramedic system on the island, there was a 40 percent reduction in emergency room visits. Wingrove noted that this decrease was significant not only to residents, who had to travel much less, but to local hospitals on the mainland.

Standardizing and Strengthening Paramedical Education: Community Paramedic Programs

To better standardize paramedic education, Nebraska, Minnesota, Nova Scotia (Canada), and Brisbane (Australia), formed the Community Healthcare and Emergency Cooperative. Its goal is to homogenize existing educational programs to make one, comprehensive curriculum available to ambulance services throughout the countries (CHEC, 2009). Pilot educational programs have been conducted in Minnesota, Colorado, and Wisconsin.

The first part of the curriculum takes about 100 hours and involves the paramedics learning social service skills, conducting assessments of their community to identify where the gaps are, and developing care strategies.

This is followed by 15 to 146 hours of clinical skills development, depending on the individual (CHEC, 2009). The curriculum orients community paramedics to their breadth of public health responsibilities. It expands their purview beyond acute emergency response to serve patients at all entry points to care, roles many rural community paramedics say they already fill in their clinician-short environments, said Wingrove. Taught as distinct modules, the course builds on the specific experience and knowledge level of paramedics, lending it the flexibility to adapt to each community. Wingrove noted that though the programs are tailored to rural environments, the same principles could apply in an urban setting. The program is meant to be set up for designated underserved areas, and should be approved by the community. Funding arrangements should similarly be addressed locally.

Wingrove noted the program is provided free of charge to any accredited college or university in the world. It is not provided directly to ambulance services or other entities however, because the model is intended to continually evolve and improve, a process best fostered by an academic environment.

One of the major benefits of the community paramedic program is that it keeps rural and remote health issues on the radar of policy makers and community leaders. It also addresses health issues specific to rural populations. However, Wingrove cautioned participants to remember that paramedics are surrogates, not independent care practitioners, and it is essential that there be oversight by a physician or other care provider.

Six State-Adapted Strategies: The North Dakota Example

Tim Wiedrich, chief of the Emergency Preparedness and Response Section of the North Dakota Department of Health shared six specific strategies that North Dakota has employed to enhance response. These are not necessarily applicable nationally, he said, but they are the best fit for the state. The strategies are built around integrated command centers, standardized communications, flexible authority to alter the scope of practice, targeted training, maintained supply caches in anticipation of a surge response, and established quality improvement mechanisms.

The first strategy was the establishment of an incident command and control system that integrates local, state, and federal emergency response using a common operating structure. The state emergency operations center establishes communications and incident command with local centers (including the local public health, hospital, and EMS emergency operations centers), which then link to the incident command at the scene. This creates the ability to share information and needs assessments with the entire state simultaneously.

The second strategy was the construction of a safe, secure, and redun-

dant communications system that can function without the commercial power grid or commercial communication networks. There are 32 radio communications towers spread throughout the entire state, each connected to centralized dispatch point in Bismarck. For the redundant system, a fiber-optic network was laid out throughout the state in a figure eight. This affords the ability to link technologies such as video conferencing, management information systems, and patient tracking across all hospitals. Every hospital and public health unit in the state, and about 250 other sites ranging from local government to the K–12 and university education systems, are connected to this network. The fiber-optic network is self-healing and redundant, able to function despite failures in the power grid or commercial communication networks.

The third component was to establish the framework and authority to enter crisis standards of care in order to ensure fair and equitable patient care during situations of scarce resources. During large-scale emergencies it is often not possible to stay within predefined standards of care and scopes of practice (IOM, 2010). Wiedrich noted that this concept is somewhat controversial. However, transparency has been used to manage public expectations. Officials, for instance, attempt to explain the realistic difference between receiving life-saving medical care in emergency settings and the traditional best-available, office-based care to which people have become accustomed.

The fourth strategy, Wiedrich explained, was to determine the necessary knowledge, skills, and abilities needed for a large-scale response, and to provide training when appropriate using just-in-time strategies. This approach favored targeted training, as opposed to an attempt to persist at a constant state of readiness, exemplified by a pervasive and overarching education program. Wiedrich explained that a wide variety of formats have been put into place for delivering just-in-time training, including live and archived web and video conferences. In addition, the military's use of modeling and simulation for scenario training has started to be used by civilian universities, for both EMS and physician training.

North Dakota's fifth strategy was to amass the necessary surge assets, including personnel, communications equipment, durable medical equipment, and medical supplies. Wiedrich explained that there is a state medical cache of about 3,000 pallets of supplies (roughly 30 full semi trucks) housed in a 20,000 square foot warehouse. Regional EMS surge equipment, such as backboards, bandaging, and other necessary materials beyond normal EMS supplies, has been placed throughout the state. There are prehospital stabilization and staging kits, medical shelter kits, and tactical communications kits, ready to be mobilized. Finally, there are 2 ambulance buses that can each hold 16 patients. Everything except the buses was funded through either hospital preparedness funding from Health and Human Services or

CDC preparedness funding. The ambulance buses were purchased with utility DHS grants. It was noted that the absence of EMS-dedicated federal grant funding has created multiple challenges, discussed in detail hereafter.

The sixth and final strategy was to establish a quality improvement process that reviews the system based on actual or exercised response, gauging successes and identifying areas in need of improvement. As a condition of provided contracts and funding, the state is required to provide feedback to the quality improvement process through the submission of after-action reports.

THEMES IDENTIFIED BY WORKSHOP PARTICIPANTS

Participants noted that the environmental challenges facing the prehospital care component of response to an MCI in a rural area include geography, long distances, and weather. The prehospital system is also affected by communication gaps and a lack of resources in rural areas, including equipment, funding, and personnel. Participants discussed the “rural-urban paradox” of prehospital care: the most highly skilled and highest-level providers are generally in urban areas where there are short transport times to care facilities, while in rural areas, with long transport times and limited health care resources, there are fewer providers that can address complex care issues en route. Panelists described a need for multidisciplinary involvement in both planning and response beyond EMS and hospitals. It could include law enforcement, public utilities, and others they suggested. It was noted that there are political and cultural challenges to disaster planning. However several participants stated that while “geography is destiny,” it is not determinative, and there are creative approaches to addressing its challenges.

The primary response is local, and states should play a supportive role, such as by coordinating resources or replenishing supplies. Strategic partnerships between local agencies and the state are needed to develop infrastructure such as safe, secure, and redundant statewide communication systems. Training in advance is important for overall preparedness, but there is also a role for just-in-time training (e.g., via live and archived web and video conferences).

One approach to filling gaps in health care is the concept of community paramedicine. Community paramedics have expanded roles (but not expanded scopes). They might assume a broader public health or healthcare function within their rural communities, such as by staffing a local clinic in the absence of a physician, or providing home-based chronic disease management (e.g., for patients with congestive heart failure or diabetes). Many of these activities could be preformed by a basic EMT with appropriate medical oversight, helping to reduce hospital recidivism.

An underlying theme of the discussion was that for a service to be able to step up in the face of an MCI or other disaster, it must first be able to provide adequate care on a daily basis for routine emergency calls and transports. Some participants also emphasized the importance of planning.

Another model discussed was a county-supported, tax-supported rural EMS agency that pays EMTs for responding to calls. It was suggested that pay varies according to certification and whether the responder was on call or at the station, or responded from home.

Participants raised concerns about the general fragility of the current rural EMS infrastructure. Many rural EMS agencies struggle to meet the basic community needs. Collapse of one component of the prehospital system, suggested workshop chair Robert Bass, will affect others in the community, such as the local rural hospital, and will place more stress on neighboring agencies. Limited resources as well as limited coordination between and within jurisdictions limits a prehospital system's capacity to respond. As described previously in the chapter, several participants suggested that improved collaboration and alignment of resources will strengthen rural EMS.

5

Coordination and Integration Across Response Platforms

Throughout the workshop participants discussed the challenges rural healthcare systems face because of resource realities and the impact these challenges have on responding to a mass casualty incident (MCI). Participants suggested strategies to address the challenges (summarized in Boxes 5-1 and 5-2). Chief among this discussion was the topic of regionalization and its ability to both harness and hamper rural response in times of emergency. MCIs, especially those in rural settings, often require the support of surrounding resources. Ensuring coordination across response platforms and health systems is critical, but it also poses significant hurdles. Thus, the following sections not only characterize these challenges but relate models of success. The benefits of establishing an effective systemwide incident command structure are addressed as a potent mechanism for response systems' integration (a summary of strategies discussed is provided in Box 5-3).

REGIONALIZATION

Regionalization, as used in this summary, refers to the establishment of healthcare coalitions that extend beyond immediate local responders and providers to include those of neighboring localities, regional public health entities, and other private and public organizations that may contribute to MCI preparedness and response (Courtney et al., 2009). Regionalization seeks to respond to the potential for, or occurrence of, an MCI whose resource requirements for emergency medical services (EMS) personnel, equipment, and hospital capacity exceed that of any one hospital or EMS service. Thus, the coalition is meant to serve as a centralized communica-

BOX 5-1
Participant-Identified Challenges Facing
Rural Healthcare Systems

Potential problems with a regional approach to response

- Geographic barriers (e.g., mountains)
- Infrastructure (e.g., lack of roads connecting areas in the region)
- Disparities across the region in funding, weather, population density, and seasonality (i.e., seasonal influx of tourists)
- Fear among departments that regionalization will result in something being taken from them (e.g., control, resources)

Planning and response hurdles

- Level of staffing does not allow personnel to take time away from day-to-day responsibilities
- Costs associated with training, lack of funding for travel to training
- Emphasis on cost containment in health care affects surge capacity (e.g., lack of beds)
- People working in rural healthcare and EMS wear multiple hats, cover multiple responsibilities
- Lack of integration with emergency management and public health
- A pervasive attitude in communities that “it is not going to happen to us” negatively impacts the ability to gather all of the stakeholders for proactive planning
- “Defensive medicine” (costs associated with conduct of unnecessary advanced imaging or other expensive procedures on patients with minimal or vague complaints)

tion and information network that can provide standardized, real-time information to all involved in an MCI response. The ultimate goal of regionalization is to improve patient outcomes through the best, most efficient use of collective resources. Regionalization should strengthen, rather than detract from, individual EMS preparedness as it provides a framework for immediate and streamlined assistance should a locality be overwhelmed.

Regional coalitions can be informal cooperatives or structured, formal hierarchies. Participants suggested that regional coalitions are successful in improving integration and collaboration by what they view as common priorities and goals, rather than how they specifically accomplish them. Panelists discussed models within a broad spectrum, from EMS systems and volunteer first response agencies aggregated under one umbrella with a single director for an entire county, to loose coalitions that revolve around the coordination of a few prominent organization directors. Workshop participants highlighted that especially in rural settings, a one-size-fits-all regional model is not feasible. Emblematic of this concept was the initial vocalization by some participants that in rural areas, small incidents can be

BOX 5-2
Suggestions for Overcoming the Challenges

- Develop an MCI model that could be realistically applied in rural areas with limited resources.
- Develop a planning and preparedness process for EMS departments that mirrors the Assistant Secretary for Preparedness and Response hospital preparedness program.
- Create regions using common sense and local input:
 - Identify and respect naturally occurring barriers and dividing lines.
- Provide equipment and education to regions to facilitate proper triage and treatment.
- Hold regional meetings and financially support participation by EMS departments.
- Use similar radio communications across the region.
- Ensure adequate day-to-day response capability.
- Maintain local hospital-based or clinic-based resources in rural areas.
- Make acceptance of (facility-appropriate) trauma patients a condition of licensure or funding for all accredited healthcare facilities in the region.
- Develop regional guidelines to aid facility decision making on patient transfer.
- Establish regional communication and triage centers (where triage and patient destination decisions are made by an impartial third party).
- Institute a regional quality improvement process to assess effectiveness postresponse.
- Make telemedicine a requirement for all level I and level II trauma centers.
- Provide hospital ERs with county pagers so they can follow the status of incidents.
- Foster an understanding that small incidents can be major in a rural area.
- Consider children and special needs populations when planning for MCI response.

major. Others provided examples from their own experiences that ranged from multiple skiing injuries from a seasonal tourist population in rural Colorado to the trend of illegal, migrant workers to travel 40 people to a vehicle, with the potential to overwhelm any rural Arizona emergency room with a single vehicle crash.

Regionalization Is About Relationships

Not only does regionalization improve overall response to incidents it also offers to expand the relationships individual clinical centers have with other local providers. An example of these types of partnerships is the Colorado Foothills Regional Emergency Medical and Trauma Advisory Committee (RETAC), which is directed by Timothy Bohlender, medical

BOX 5-3
Suggestions to Improve Coordination and
Integration Across Response Platforms

Collaboration

- Face-to-face meetings to establish personal connections
- Regular conversations/meeting
- Partnerships, MOUs
- Regional exercises involving all stakeholders
- States should play a supportive role
 - Provide education, facilitate planning, establish communications
 - Mobilize and deploy resources and coordinate outside help

Resources

- Expand recruitment into demographics with the required skill sets that may not have been previously considered (e.g., doctors and nurses may volunteer during their off hours).
- Identify resources in the community (people, equipment, vehicles, communications systems).
- Survey people for certifications/education/experience they may have beyond their primary jobs.
- Assign staff whose jobs are nonessential in a disaster to other supportive roles.
- Explore integrating trauma surgeons into the larger system (e.g., a pre-registered, pre-credentialed, rapidly mobilized force of surgeons bringing surgery to the scene).
- Seek federal, state, and private grant opportunities to fund equipment purchases and education:
 - Assistance to Firefighters Grants program
 - Staffing for Adequate Fire and Emergency Response (SAFER) grant
 - Rural Fire Assistance Program
 - State EMS grants
 - Insurance company grants (Fireman's Fund, Allstate Foundation, etc.)

Planning and Exercises

- Plan and implement as many drills and exercises as possible.
- Integrate the public in preparedness exercises that are interesting and fun.
- Include special needs populations in planning and exercises.
- A leadership succession plan should be part of incident management planning.
- Explore and establish backup communications strategies ahead of time.

Education

- Community education prior to an event can save lives
- Include interested high school students

director at St. Anthony Granby Medical Center in Grand County. The RETAC has been critical in coordinating preparedness and response in five adjacent Colorado counties. It does this by formalizing relationships between medical centers and EMS, and between trauma centers, including children's hospitals. The RETAC has also helped coordinate air transport and specialty ambulance providers.

However Aimee Binning, a member of the board of directors of the National Association of Emergency Medical Technicians (NAEMT) and owner of CVC Training, Inc., cautioned that broadening the scope of MCI response relationships through regionalization should not compete with strengthening local, nontraditional relationships. Using her own experience, Binning explained that while regionalization can provide greater response capacity over the course of an MCI, long distances between neighboring resources increases the time it will take these additional resources, however well-prepared, to arrive at the scene. Therefore it is crucial to engage local corporations and their personnel in response planning to ensure all available community resources are quickly mobilized to provide coverage in the gap before regional resources can be recruited.

Communications Challenges

When establishing regional coalitions, boundaries must be defined based on tangible barriers that may not always correlate to county or state boundaries. For example, local industries and available resources all impact potential partnerships and should be considered when establishing coalitions, commented Bohlender. To maximize the value of rural regional coalitions, as well as waylay fears of centralization, the issues of communication must be addressed when establishing and maintaining coalitions.

Robust communication systems that integrate and facilitate information sharing between EMS and local providers are critical when developing and maintaining coalitions as well as during incident response. As already described, unreliability of cell towers, or the lack thereof, pose a significant obstacle. The establishment of a central phone number for communication and agreements to notify each other early in the course of an incident have been successful improvements in the Kansas Major Emergency Response Group (MERGe) described by Randy Easter, EMS director for McPherson EMS and Safety Office for Memorial Hospital. Jerry Johnston, the immediate past president of the National Association of Emergency Medical Technicians (NAEMT) and EMS director of Henry County Health Center in Iowa, offered another successful strategy used in Henry County. With one dispatch tone, everyone who carries a pager in the county receives all of the dispatch information simultaneously. Johnston and Easter both said that their local hospitals and other facilities have county alphanumeric

paggers and can follow the whereabouts of the ambulances. This improves situational awareness and provides the hospital the opportunity to prepare for incoming patients, without having to exclusively communicate with the first responders in the field who are providing care. Whether informal or formal, bolstering communication systems can help to assuage individual fears that regionalization equates to inefficient centralization.

INTEGRATING TRAUMA SURGEONS

Leonard Weireter, Jr., is the Arthur and Marie Kirk Family Professor of Surgery at Eastern Virginia Medical School, medical director of the Shock Trauma Center at Sentara Norfolk General Hospital, and current chair of the Disaster Preparation Committee for the American College of Surgeons, Committee on Trauma. Weireter said that the College of Surgeons recognizes there is a huge void in knowledge among its members about disaster preparedness. Surgeons work at the definitive care end of the spectrum, and the mindset is generally one of waiting for patients to be delivered. There are nearly 1,200 counties in the United States without a general surgeon. The long distance traversed to reach a surgeon presents the major problem of time lost from the previously discussed “golden hour” (see Chapter 4). The College of Surgeons has been grappling with how to better integrate trauma surgeons into the larger system. Studies indicate that about 20 percent of the casualties in a mass casualty incident are critically injured; the quandary is figuring out who they are, and getting them to definitive care.

Strategies to Integrate Trauma Surgeons

Finding the right solution is challenging. In Iraq and Afghanistan, the military brings surgery to the patient, stabilizing them with limited, rapid operative care, then transporting them to higher-level care. The average time from battlefield injury to immediate surgical care is slightly less than 30 minutes. If the patient survives the first level of care, their overall chance of survival is about 97 percent. While participants have heretofore mentioned military models as potential examples for rural policy makers to follow, in the case of trauma surgery, there is a key difference. The establishment of forward military operating bases means personnel and materials are pre-positioned in short proximity to a *known* high-risk environment. Yet in rural traumas, predicting where an event will occur over a vast distance is often impossible.

Several issues need to be addressed to make integration work. One is whether it is feasible to establish a force of surgeons that could be rapidly mobilized. A participant suggested that the first step would be a voluntary pre-registration and pre-credential process for surgeons willing to be part

of such a force. If that proved a reasonable option, the next issue to address is from where to pull the surgical resources. In an urban environment it is relatively easy to find surgeons in emergency medicine, but in rural America it is much harder. Regionalization of resources may be the solution such that an event in a given location mandates a response from the 100-mile surrounding area. But how can rural emergency planners deal with the issue of training these surgical specialists to respond on very short notice?

Weireter suggested that unlike in the comparison of prepositioned surgical resources, perhaps the issue of training a rapid-response surgical force might benefit from a military model. When military units change over, the arriving and departing units patrol together, the veteran unit walks point and the incoming unit follows to learn and understand the environment and its challenges. Then they transition, and the new unit walks point as the veteran unit follows. The surgical world needs to learn how to walk point in a rural incident from fire departments and EMS, Weireter said, to bring our surgical resources to the rural environment. Demonstration projects are needed to examine difference models to test strategies and establish best practices.

ADDRESSING INTEGRATION CHALLENGES THROUGH INCREASED RECRUITMENT AND EDUCATION

Leadership Through Transition

While the merits of consistent and updated education were a theme across the presentations, several participants noted the importance that trained individuals ensure their leadership can be replicated when they are no longer actively engaged (due to retirement or relocation). Roy Alson, medical director of Forsyth County EMS and medical director of Disaster Services for the North Carolina Office of EMS, again turned to the military model for potential solutions. In the military, subordinates are specifically trained to lead should the situation arise. Gaines drew attention to the fact that the Incident Command System (ICS), the National Incident Management System, and other command and control operations are built on delegation of authority and defining specific roles within a hierarchical organizational plan, and therefore are a natural aid of succession planning. He agreed with Alson that it is the responsibility of a leader to incorporate continuous leadership training into any preparedness strategy. Dan Hanfling posited the need for ways to incentivize this type of planning.

Bolstering Local Fire Departments

There are numerous challenges facing this country's primary emergency responders: the volunteer fire system. Money is tight, and donations are down. Glenn Gaines, deputy U.S. fire administrator at the Federal Emergency Management Agency (FEMA) pointed out that approximately 70 to 75 percent of fire services in the United States are volunteer, and about 60 percent of those are in small communities of less than 2,500 residents. Standards are being increased, and there is constant pressure to bring medical care to the scene faster and more efficiently. At the same time, Gaines said, fire departments are losing members, in part because of the economy. Volunteers are now working part-time jobs or seeking overtime and are no longer available.

MCI in rural areas are high-risk, low-frequency events. Gaines listed several challenges to operations preparedness, including the absence of skill sets in MCI management, sophisticated equipment, training and skills in triage, advanced trauma care skills and training, and certification and skill sets to implement standing orders when communications channel are poor or lacking. In addition there is a need for improved liaison with local trauma centers or hospital ERs, as there is a lack of routine MCI exercises involving all stakeholders.

To begin to address these challenges, Gaines encouraged expanding recruitment into demographics that already possess the required skill sets. People who are dedicated to the care of others, such as nurses, physician assistants, and physicians, may be interested in giving back to the community beyond their office hours. The goal of the recruitment effort is to raise prehospital skills, and expand standing orders by incorporating personnel qualified to implement them.

The key is education, and Gaines suggested rural fire services seek grants such as those from the Assistance to Firefighters Grant program, the Rural Fire Assistance Program, the Fireman's Fund, state and regional EMS or medical councils, and local community and state colleges. For volunteer fire departments especially, Allstate and other insurance companies offer specific grants to assist in obtaining equipment. Another approach is to leverage regional peer skills and equipment, consider joint equipment purchases with other local squads, and conduct regional training and exercises. Local physicians and emergency departments could also serve as training resources. Gaines emphasized that broad and creative thinking, in the context of systems integration, were essential to securing new opportunities at the federal, state, and regional levels, as well as in the public, nonprofit, and private sectors.

Education, Training, and Coordination: The MERGe Example

One participant suggested that building relationships between EMS and medical providers to ensure a cooperative approach to preparedness is necessary, but not sufficient. Incident command and cooperation during an emergency is often the difference between life and death. Where education and training opportunities are limited, many suggested that insights could be gained from analyzing and discussing previous examples of coordinated response efforts. It was suggested that mechanisms need to be established to bring together all stakeholders involved in emergency response to help ensure improved future capabilities.

Randy Easter, EMS director for McPherson EMS and safety officer for Memorial Hospital in McPherson, Kansas, provided an overview of MERGe, the Major Emergency Response Group in Kansas EMS Region III. Easter explained that responders around the region had developed informal agreements over the years to provide assistance to each other, but EMS directors within Region III saw the need to “develop, facilitate, and maintain a system of preparation, response, and recovery for major emergency medical events effecting licensed ambulance service in EMS Region III.” Easter described how they started meeting informally, as a group of friends, to define the issues that were important to their services and counties. Scenarios reviewed included hospital evacuations, mass transit accidents, floods, explosions, and tornados. They established a central phone number for communication and agreed to notify each other early in the course of an event. The duty officer at the central number would clarify the response location and needs, and advise of the resources responding.

The focus of MERGe is planning, education, and response. The team has a clear philosophy about their role as EMS advisors: “MERGe will not take ownership for you or from you; MERGe is *not* designed to take over, rather it is designed to help out; MERGe is *not* an ambulance resource, it is an expertise and management resource that at times can bring ambulances.”

Overall, Easter emphasized that rural EMS departments and their local hospitals need to be integrated with regard to disaster planning processes and MCI strategies. Coordinated funding of both EMS and hospital preparedness activities is vital. Easter recommended holding regional EMS meetings, and financially supporting rural departments for travel to and participation in the meetings. As many local and regional responders are already working within limited budgets, some participants also suggested dedicating specific funds to acquire and stockpile excess equipment and supplies to be easily accessible during an MCI response.

STATE-LEVEL SUPPORT

Rural communities often integrate across fire, police, EMS, emergency management, and public health services. They understand that disaster response is the “ultimate team sport,” remarked Roy Alson. The challenge is coordinating response at all levels. For example, it can be difficult to get hospitals that are competing for market share to collaborate.

Alson noted that although rural areas may have limited resources, manpower, and equipment deficit, they do not always request help from the states. Therefore state agencies should be particularly cognizant of ways in which they can support the mission of local EMS by providing training, planning, or establishing communications. For example, Alson pointed out that the state of North Carolina established the North Carolina State Medical Response System to develop an all-hazards medical response to disasters.

Like Utah’s Bureau of EMS and Preparedness, whose role in coordinating regional response to the Mexican Hat incident was discussed in Chapter 2, North Carolina is one of many states that requires each county to have an EMS system plan that covers MCIs. Each system is also required to have a medical director and a trauma triage plan that designates a trauma center to which they will transport patients whose injuries exceed the capability of the community hospital. As part of that, ambulance strike teams, which Mexican Hat responders considered crucial in retrospect to both their incident response as well as the provision of EMS to nonrelated emergencies, have been established across the state of North Carolina in three regions to provide not only additional units to respond to the scene, but also units to backfill community EMS so they can continue regular operations.

For North Carolina, the state office of EMS is the lead in the regional medical plan, with public health agencies as key partners. The approach has been to support disaster preparedness at a regional level. The state is developing a regional disaster medical plan for each trauma region. One of the tools the state maintains for emergency management is the State Medical Asset Resource Tracking Tool (SMARTT), an online system in which hospitals update their bed status on a daily basis, and agencies update their equipment and supplies status on a regular basis. In disaster situations the system can operate in real time, providing resource updates to the incident commander.

However Alson emphasized that the state role is not to directly administer MCI response, but to support the community and the region by mobilizing and deploying resources and coordinating outside help. Other programs the state is working on include a mass fatalities response system and a regional burn plan. The state supports several interoperable com-

munications systems including a statewide 800 MHz radio network tied in with the highway patrol, a state medical radio network that provides communication with hospitals and agencies, and satellite phones for all deployable assets. North Carolina also has uniform statewide EMS protocols, which ensure standardization of care and effective oversight, and a statewide triage guideline using a one-tag system across the entire state.

SPURRING REGIONAL COLLABORATION AND PLANNING

Jennifer Hamerlinck, a public health nurse and director of the Emergency Management Agency in Mercer County, Illinois, observed that there are two scenarios that create a demand for integration: prospectively in the form of regionally funded disaster planning sessions or retrospectively from “lessons learned” during an emergency response.

Regional Preplanning Sessions

Conducted by the Centers for Disease Control and Prevention (CDC), Hamerlinck’s Mercer County was selected as the regional community lead for the Community Partnerships for Pandemic Influenza Planning Project. Funded through the Illinois Department of Health, the project conducted a series of five tabletop exercises focused on engaging a number of different sectors and agencies to examine essential healthcare services, legal and ethical implications, shared services and resources, communication and triage, home health care, and campus response at universities. Together, project participants collaborated to plan for necessary essential services during a pandemic influenza outbreak. Action items identified at the workshops were the need for a regional taskforce, memoranda of understanding, expanded partnerships, and education, as well as the need to incorporate untraditional local resources like faith-based groups, school superintendents, and private physicians. The five exercises boasted over 250 participants from the region, with approximately 60–100 attendees at each exercise representing the Emergency Management Agency, EMS, hospitals, physicians, public health, local officials, law enforcement, coroners, and others.

One of the tools developed from the project that Hamerlinck found particularly useful was a “determining essential services spreadsheet” that allows an agency to determine the number of essential and nonessential staff on any given day by incorporating staffing and patient census variables. This tool could cross over into any response planning by changing the labels, Hamerlinck said.

Dedicated federal grant funds proved essential to integrating emergency response efforts in Montana as well, described the emergency services coordinator for Chouteau County, Linda Williams. In 2004, a Homeland Se-

curity grant allowed the rural, regional, and state response communities to learn from exercises simulating terrorist-caused MCIs. Williams related that while the exercise in and of itself was valuable, more so was the nonthreatening and cooperative environment in which it was conducted. The 167 participants from county, state, and federal agencies in six counties were able to identify the gaps and opportunities for synergy in their response system. Lessons from the seamlessly administered bicentennial commemoration of the Lewis and Clarke trek, which saw 50,000 attendants, held between Montana and 15 other U.S. sites proved crucial three years later in 2005, when faced with unexpected flooding. Williams emphasized that the positive experience with integrated planning her region had witnessed provoked further grant applications.

Though prior strategizing improved actual response, Hamerlinck and Williams admitted, they still learned important lessons from gaps in integration during real disaster situations. In June of 2008, flooding in the city of Keithsburg (population 700) resulted in Mercer County being designated a federal disaster area. Hamerlinck noted that from a host of other disaster responses, like those necessitated by ice storms, tornadoes, and extended power outages, the county developed integrated plans for shelter preparedness, culminating in MOUs with nine county shelters. Because agency responses were led from around the region and state, a unified ICS was deemed critical to the efficient evacuation and provision of shelter, food, security, and flood-stemming efforts. Having to integrate such a widespread response provided valuable tools to coordinate across geographic boundaries, disciplines, and sectors.

Including Is Empowering: Building Trust from Administrators to the General Public

Locally Driven Integration

Integration means more than coordination. True collaboration between responders, Hamerlinck stressed, involves building relationships. In Mercer County, Illinois, she credited face-to-face meetings, regular conversations, MOUs, and conducting joint exercises with building trust and perpetuating mutually productive partnerships among those tasked with disaster response. Repetition really does work to build skills, confidence, and trust, she said, and everyone brings a different asset to the table.

But administrators are just part of a response that spans EMS and law enforcement personnel and community leaders. No one wants to feel “nonessential,” Hamerlinck noted. During a disaster it is inevitable not everyone’s primary job may be essential to the disaster response, yet there may be other nontraditional roles to fill. Ensuring that personnel are fully

utilized, Hamerlinck encouraged sectorwide interviews of anyone potentially involved in disaster response. For example, Hamerlinck discovered that one of the local pastors was a certified mental health counselor. That is a valuable resource in a county that does not have a mental health provider.

In 2008, Williams and Chouteau County, Montana, went one step further to empower the entire community through inclusion in preparedness planning. The county's "Operation June Bug," was a three-day exercise involving the public in multiple events including a point of dispensing scenario "treating" 250 people; an MCI to test hospital surge capacity; and a "survivor challenge" that tested sheltering components of the emergency operations plan by asking volunteers to camp in the city park for 3 days. There was even a scavenger hunt that taught participants where to collect contents for survival kits from local businesses. A website was set up, and all of the events were shown on YouTube™, generating 1,000 hits.

Similarly, in 2009, Chouteau County specifically targeted youth participation in planning for an agricultural-based MCI. Students from the high schools were given 5 weeks of orientation in ICS and the roles of emergency response agencies. The students drew diagrams of the fairgrounds and animal shelters, and put together animal decontamination protocols and fact sheets for zoonotic diseases. At the end of 5 weeks they participated in an avian influenza exercise where they played the role of emergency responders. Williams noted that the students took the exercise very seriously, in part because H1N1 was in the news at the time. She found the community buy-in and increased awareness of disaster planning invaluable to integrating response efforts across the population.

CDC Healthcare Preparedness Activity

Similar to local outreach endeavors, the federal government also strives to improve MCI preparedness through broad inclusion, mentioned several participants. The Centers for Disease Control and Prevention's Division of Healthcare Quality Promotion (DHQP), in partnership with the Oak Ridge Institute for Science and Education (ORISE) seeks to develop universally adaptable guidance and toolkits based on the expertise and experience of regional coalitions. Workshop chair Robert Bass, Executive Director of the Maryland Institute for Emergency Medical Services Systems, explained that the ongoing work of this joint CDC-ORISE effort engages a wide range of stakeholders at all levels of response, including clinical EMS staff, local public health departments, pharmacists, school districts, long-term nursing care facilities, faith-based organizations, and other private and public organizations. He said the CDC's Healthcare Preparedness Activity (HPA) focuses on best practices solutions to coordinate response efforts in the areas of patient management, resource identification, successful leadership

strategies for regional coalitions, and the role of alternative care systems in cases when traditional surge capacity is exhausted. From this work, the HPA has developed numerous materials for local communities that address the needs of special populations (e.g., pediatrics), concerns of individual provider groups (e.g., primary care physicians and emergency responders), and integrated communications and information sharing strategies (CDC, 2009a). Thus, building trust among MCI responders is the work of local, regional, state, and federal efforts.

Native American Reservations:

Coordination and Collaboration Overcome Amplified Obstacles

The National Highway Traffic Safety Administration (NHTSA) has rated the county around Window Rock and Fort Defiance, Arizona, as having the highest rate of single vehicle rollover accidents in the nation. Working the night shift in a small hospital on the reservation, with one nurse and one technician, it takes very few victims to overwhelm the system, notes Glenn Mitchell, especially when someone has to drive 15 miles to wake up the surgeon and bring them back to the hospital. Though currently chief medical officer of the Sisters of Mercy Health System, with hospitals in Arkansas, Oklahoma, Kansas, and Missouri, Mitchell speaks from experience with the Indian Health Service at Fort Defiance, Arizona.

Mitchell explained that the basic problems of responding to casualties in a rural environment are compounded on a reservation. The largest area in the United States without cell phone coverage is the Navajo reservation in Northern Arizona. Tribal boundaries, law enforcement jurisdictions on and off the reservation, difficulties between tribal and federal officials, and a lack of adequate resources for any EMS-related planning, education, or even daily mission execution plague reservation communities. Native American reservations are also home to amplified societal problems like pervasive alcoholism, diabetes, poverty, and the delivery of inadequate medical care.

Yet despite these considerable hurdles, Mitchell related how the planning and execution of a mass vaccination/pandemic emergency preparedness exercise employed integration to meet its metrics of success. An intergovernmental, multiagency taskforce convened in Window Rock with the goal of developing a broad mechanism to respond to a pandemic crisis across the 27,000 square miles of the Navaho Nation and adjoining lands in Arizona and New Mexico. Comprehensively inclusive, the planning group was composed of participants from tribal, county, state, and federal agencies; the New Mexico and Arizona state governments; the county governments in the adjoining Apache and McKinley Counties; and nonprofit groups like school boards, public safety agencies, and the Boy Scouts. Inclusion came not only in the form of an invitation to attend, but an opportunity for each

organization to detail its barriers to and goals for participation to the taskforce. Mitchell credits this participant buy-in with the taskforce's success.

Effectively removing cross-jurisdictional barriers, participants worked via conference call and in person to organize 15 vaccination sites, ensuring a broad mechanism to respond to a pandemic crisis or biological event. The CDC's Strategic National Stockpile was used, and the unified incident command post setup followed National Incident Management System's ICS structure. Texas A&M University photo-documented the exercise and recorded all of the metrics. Volunteers were critical, Mitchell said, including people from the school boards, community faith-based organizations, Navajo veterans associations, Rotary, Kiwanis, Medical Corps Reserve, and others.

On the day of the exercise, using seasonal flu vaccine as the proxy, 22,611 Navajo citizens (over 10 percent of the reservation) were immunized in less than 5 hours. The DHHS secretary's office took part via a direct video feed to the unified command post. Approximately 500 patients per hour were processed at each of the points of dispensing. There were no adverse events, and 86 percent of the patients rated their satisfaction with the event as a 4 or 5, on a 5-point scale.

Though deemed a success, communications and improved access for special needs residents were identified as areas for future progress. This project demonstrated that despite long-held community divisions, effective cooperation is an attainable goal.

IMPROVING RURAL RESPONSE BY MAINTAINING SURGE CAPACITY

As a trauma surgeon, Winchell concurred with others that the single best approach to ensuring a good mass casualty response is to have a very good day-to-day response. There is no surge capacity if the system is already beyond capacity, and people cannot be expected to respond quickly and under extreme pressure, if they don't have the capacity to respond routinely.

The efforts of EMS are wasted if they don't have access to an appropriate destination for the patient, Winchell said. The majority of patients, even in an MCI, will not require the resources of the highest-level trauma center. Most could be treated quite well without being transported out of the region (and such transport comes at potentially significant cost to their social support systems and to the EMS transportation systems). Those patients that do urgently need the highest-level trauma care are not likely to survive if they are more than an hour away from the trauma center.

The key, Winchell said, is maintaining local hospital-based or clinic-based resources in rural areas. Whether it is a single car accident or a

multicasualty incident, more lives will be saved if the local resources are maintained. The challenge is that hospital-based health care is being pushed the other way. Many small hospitals abdicate responsibility for trauma care; it is expensive to maintain and many providers are not available during off hours. Larger urban hospitals need to take a supportive approach and work with rural hospitals on training programs and system-based components to enable them to be prepared. There are a lot of resources in local hospitals that can be mobilized. Larger hospitals also need to assure rural hospitals that when the patient needs to be transferred, they are ready to take care of them.

For those that still resist accepting trauma patients, a stronger approach is making acceptance of trauma patients a condition of licensure or funding for all accredited healthcare facilities in the region. North Dakota and other states have rules, regulations, or statutes that require healthcare facilities to participate in trauma care at a facility-appropriate level. Not every facility will be a level I center, Winchell said, but all are going to have basic responsibilities and will know what to do when a trauma patient appears at the door. Across the board, that sometimes means adjusting privileges and responsibilities. If a clinic cannot be staffed with a doctor, perhaps it can employ a nurse practitioner or a community paramedic, but it must find some way to keep that facility available.

Understanding Available Resources

The second key, Winchell said, is making sure that facilities are used in a way that is commensurate with their capabilities; keeping those patients that they can treat, and transferring those that should be transferred. There may be a need for regional guidelines to aid facility decision making on who stays and who goes. One innovative solution is regional communication and triage centers. An impartial third party, who knows what resources each hospital has, helps to make the triage decision and determines where the patient will be sent. But maintaining a working knowledge of a region's resources available in an emergency response should not be limited to just medical resources. For instance, Ken Knipper related an incident in which a worker who had fallen into a water tank he was cleaning, required a crane for extraction. Fortunately, in Kentucky, they had compiled an equipment resource information list and knew exactly where to get a crane. Another incident involving a tractor on a hillside required a wrecker. Because they had a prior agreement set up, when the local wrecker service heard the call, he automatically headed to the scene. Whether rural or urban, incidents will happen for which you simply do not have the resources, Knipper said. Therefore mutual aid agreements and regional planning are necessary.

TELEMEDICINE

Telemedicine has the potential to support regionalization and facilitate the sharing of cognitive resources with local hospitals, allowing patients to be treated locally, avoiding the added costs of transportation, while allowing them to stay close to family support systems. In addition, the technology has the potential to positively impact many of the challenges to rural MCI response that were identified throughout the workshop, noted several panelists. Some participants believed that telemedicine communications between first responders at the incident scene and hospitals could facilitate triage and transportation decisions; telemedicine technology aboard ambulances might counterbalance the long travel time between the scene and the hospital to positively affect patient outcomes; common technology platforms could assist communication of best practices between rural emergency responders and caregivers across regional jurisdictions; and telemedicine technology might even ease the burden of providers to measure and record outcomes and quicken metrics development by aggregating the data automatically and centrally. While some participants heralded the potential of such advances, others remained concerned about issues of funding, feasibility, and ethics not yet resolved. As highlighted during discussions, currently there are more impediments to implementation than solutions, e.g. of cost, reimbursement, frequency of use, credentialing, and others.

The Arizona Example

To illustrate the potential of telemedicine for rural health systems, Rifat Latifi, director of the Southern Arizona Teletrauma and Telepresence Program, and vice chair of International Relations in the Department of Surgery at the University of Arizona, presented the case of an 18-month-old female who arrived at Southeast Arizona Medical Center in Douglass, Arizona, 3 hours after a motor vehicle crash. Complicating the treatment of her severe injuries, including severe head trauma, was the fact that it was a new ER physician's first day on the job. Via the telemedicine link, Latifi was able to review the patient's X-rays and direct care remotely from University Medical Center. With a series of interventions, some proposed remotely by Latifi, the child was stabilized, and ultimately recovered.

This case was actually the first use of the new telemedicine system, and there were many practical lessons learned, Latifi noted, such as the need for earpieces rather than speakerphones, to allow for private consultation between the surgeons.

In addition to the interhospital telemedicine and telepresence network, Latifi said the "ER Link" program has 17 of the ambulances, from the Tucson Fire Department, that are equipped with video and audio equipment to connect with the hospital.

Latifi contended that the “golden hour” in trauma medicine is really a “desperation hour.” But this can change, he said. Latifi reported that the Arizona teletrauma program offers a constant virtual trauma presence; it allows for early trauma intervention, and thus both a decrease in morbidity and mortality, and an increase in patient and provider satisfaction (Latifi et al., 2009). The program also helps prevent unnecessary air or ambulance transfers of patients, creating the potential for significant cost savings. Several participants expressed the hope that telemedicine will be a requirement for all level I and level II trauma centers, perhaps becoming as basic as having a phone. In the future, improved technologies will enable wireless transmission of data, and secure Internet connections may allow access from anywhere. Latifi asserted that distance education and community involvement are important components to reaping the current and future benefits of telemedicine.

Credentialing, Malpractice Coverage, and Telemedicine

Latifi and Robert Winchell, director of the Division of Trauma at Maine Medical Center, addressed credentialing, malpractice coverage, and billing for telemedicine as important aspects of formally integrating regional resources. In Winchell’s Maine, like Latifi’s Arizona, there is a reciprocal credentialing system in place. There is an agreement document that states that the teletrauma consultant is a trauma surgeon with credentials and privileges at hospital X, and those credentials are accepted at hospital Y. Hospitals are billed for the telemedicine consultation. Trauma surgeons are credentialed on a courtesy basis at each of the hospitals with which they perform telemedicine. They do not bill for the service because the telemedicine program is supported as a system resource by input from each of the hospitals within the healthcare system. Every several years, recredentialing is done in association with the health systemwide recredentialing. Moreover, neither could name an appropriately documented episode of care via telemedicine that had been the subject of a malpractice suit in recent memory, leading other participants to suggest that telemedicine could in fact reduce the malpractice rate in these small hospitals.

A participant noted that in Northern Virginia, they use an electronic intensive care unit (eICU) program where physicians help manage critical care patients across the health system, and are therefore credentialed systemwide. They are now using funding from the office of the Assistant Secretary for Preparedness and Response to extend the eICU program outside of the Inova health system, to include two rural hospital partners that are part of the trauma system. They are developing a memorandum of understanding (MOU) that during a mass casualty event when the trauma surgeon’s services are required, there will be blanket liability coverage.

The preceding descriptions of the telemedicine systems in Southern Arizona, Maine, and Virginia demonstrate the benefits of employing telemedicine in response to rural MCIs; however, the widespread implementation of the technology remains in a nascent stage, remarked a participant. Many issues still remain to be determined by individual communities: streamlined funding sources; documentation requirements; provider comfort with the technology and the need for training; cost and provision of technology maintenance; integration with existing technology; and ethical implications of use. Telemedicine should not distract from the need for an increase in well-trained, emergency medicine physicians in rural communities, noted one participant. In response, several suggested demonstration projects as appropriate venues for EMS, regional, and state officials to explore these issues in the future.

THEMES IDENTIFIED BY WORKSHOP PARTICIPANTS

In addition to the challenges previously cited (geographic barriers, long distances, weather, communications, infrastructure, education, training, funding), rural healthcare systems are facing a general fear of regionalization among departments and concerns about what they will potentially lose or have to give up in the process. Several participants noted that regionalization is not centralization. Regionalization involves the building of relationships in advance of a disaster, and cooperative, coordinated planning and education. A participant reiterated the point that the best approach to ensuring a competent mass casualty response is to have a stable, capable day-to-day response.

A recurrent theme in the discussions of coordination and integration across platforms was the importance of leadership, and specifically, training for and implementing the ICS. A unified incident command is the key to coordinating across geographic boundaries, disciplines, and sectors (and could be the link to regionalization).

Another topic of discussion was what the trauma system of the future needs to look like and how trauma surgeons could be better integrated into the current system. A participant noted that not everyone needs to be sent to the top-level trauma center.

Establishing connections and building personal relationships prior to a disaster fosters collaboration during an MCI. People whose primary jobs are nonessential in a disaster can be deployed to fill nontraditional roles. There are also likely to be people within the community who have relevant skills and certifications beyond the scope of their primary job. Essential identification of the available community resources (e.g., people, equipment, vehicles, communications systems) and coordination of regional drills

and exercises are driven by administrators from the local to the federal level.

Finally, panelists Hamerlinck and Williams stated that state and federal support is needed to promote and achieve cross-jurisdictional integration. Grants and incentives can be directed toward education, training, planning, or establishing communications. States can also support the community and the region by mobilizing and deploying resources and coordinating outside help during an MCI.

6

Establishing Metrics to Assess Risk and Capabilities

Developed by public and private public health organizations alike, potential metrics to identify high-risk areas for a mass casualty incident (MCI) in rural settings, transportation or otherwise, are unparalleled in the insights they could provide preparedness planners. Questions of how these metrics are developed and who develops them, as well as current sources of measurement information, are discussed below as potentially central components of an integrated health response. (A summary of suggested tools and resources is provided in Box 6-1.)

ASSESSMENT MODELS

Dia Gainor, session chair and director of the Idaho State Emergency Medical Services (EMS), detailed two ongoing projects by the National Association of State EMS Officials (NASEMSO) designed to develop mechanisms to assess risk along rural roadways. Such data are currently lacking and are essential to planning activities, Gainor commented.

The Model Inventory of Emergency Care Elements (MIECE) seeks to answer the question, “If a mass casualty incident happened on this stretch of highway, what resources could be expected to be available?” (Martin, 2010). The goal is to develop a method of expressing and comparing risk based on resources. Though not yet adopted by states, MIECE plans to collect data regarding ground and helicopter EMS services, and hospital locations and trauma center designations, among other resources, for each segment of highway, allowing public health officials to anticipate and correct system weaknesses before an MCI occurs. The data collection

BOX 6-1
Suggested Resources That Could Be Leveraged
for Assessment of Transportation-Related
Road Risks and Response Capabilities

Tools

- NASEMSO Model Inventory of Emergency Care Elements (MIECE)
 - A method of expressing and comparing risk based on resources
- NASEMSO Event Response Readiness Assessment (ERRA)
 - Self-assessment tool to identify opportunities for improvement and advanced planning for MCIs
- The CDC's development of metrics to assess achievement of Public Health Emergency Preparedness (PHEP) Cooperative Agreements
- AASHTO Highway Safety Manual
 - Provides models for predicting the impact of infrastructure changes
- AAA Foundation for Traffic Safety U.S. Road Assessment Program
 - Data on crashes, fatalities, and serious injury are being used to develop risk maps of roadways
- U.S. Joint Forces Command, Joint Concept Technology Demonstrations (JCTD)
 - Military approach to rapid assessment and implementation of concepts and technology solutions for joint warfare (including medical support)
- NHTSA Data-Driven Approaches to Crime and Traffic Safety
 - Crime and traffic crash data are studied to determine the most effective deployment of law enforcement resources

Data Sources

- Fully integrated, statewide trauma systems that include data-rich, systemwide trauma registries (e.g., Centura Health Trauma System which represents the largest health care system in Colorado and aggregates rural MCI and patient outcomes data)
- Healthcare Cost and Utilization Project (HCUP) database
 - Includes health statistics and information on hospital inpatient and emergency department utilization
- Regional or state dispatch data systems
 - Contain event logs and location information across fire departments, EMS, and law enforcement

necessary to populate MIECE will better identify metrics associated with MCI preparedness and response, as well as the channels by which and the personnel to whom that data are available. The primary user of this information would be the state EMS offices. Gainor noted that the data are not intended to create automatic solutions (i.e., for an area where there is not a high count of helicopters, that does not mean that more helicopters is the answer); the information is meant to provide better information to decision makers to develop the policies and plans needed to mitigate the associated risk.

A related NASEMSO project is the Event Response Readiness Assessment (ERRA), which allows localities, regions, and states to self-assess their emergency response capacity benchmarked to specific indicators including, but not limited to: the ability to implement incident command systems (ICS) with national guidelines; the extent of regional and state, public and private, integration in a broad response plan; and multidisciplinary participation in mass casualty exercises (Martin, 2010).

The commonality of ERRA's metrics allows counties to compare themselves to their neighbors, intending greater system integration and stakeholder collaboration as a result. The self-assessment nature of the tool lends universality to its implementation, while its online interactive workshops can provide greater guidance and context to local strategies aimed at improving MCI response.

DATA SOURCES FOR DEVELOPING METRICS TO ASSESS RISKS AND CAPABILITIES

What Departments of Transportation Cannot, and Can, Measure

In 2009 there were about 34,000 highway fatalities, said Kelly Hardy, safety program manager with American Association of State Highway and Transportation Officials (AASHTO). One of the goals of AASHTO is for all state departments of transportation (DOTs) to work to reduce highway fatalities by half in the next 20 years. This cannot be accomplished simply by making roadway improvements, she said.

Data collection on fatal accidents is a challenge. Approximately 60 percent of those fatalities occurred on rural roads, and around half of these on roads that are not owned or maintained by the state DOT. The cities, counties, townships, and other jurisdictions that take care of these roads collect their own crash data, and know what these roads look like and what kind of improvements might need to be made.

One issue for data collection is location-specific coding of crashes; where exactly are these crashes occurring and what does that road look like where that crash happened? An issue specifically related to MCIs is traffic volume. Another question is how often specific types of vehicles travel on that road (e.g., buses, cars).

Hardy referred participants to the highway safety manual that was recently published by AASHTO following 10 years of research by the Transportation Research Board of the National Academies and the Federal Highway Administration (AASHTO, 2010). The manual provides models for predicting the impact of infrastructure changes, for example, how would the installation of rumble strips or a traffic signal at an unsignalized intersection affect crashes in that area?

A national program, though not a part of the federal DOT, AAA Foundation for Traffic Safety's U.S. Road Assessment Program, compiles data on crashes, fatalities, and serious injury to develop risk maps of roadways. A participant mentioned the program to bolster the suggestion that partners for metrics modeling should be sought outside of the public sector as well.

The Knowledge-Skills-Abilities Triad

By definition, an MCI is something that goes beyond the existing resource capacity. Baseline resources are helpful to know, but what matters is the resources that can be brought in when an individual system is extended beyond its capacity. The issue is how can surge capacity be managed from the data system. Greg Mears suggested that the "knowledge, skills, and abilities" approach to assessing a candidate for a job can be applied to surge capacity; knowledge is what they know about the scenario and how they can bring a resource to you; skills are what they have been trained to do, which may be technically oriented; abilities is often based on resources and equipment.

Mears, medical director for the North Carolina office of EMS, explained that in North Carolina systems are pieced together, such as by matching individuals that know something relevant, but have no equipment to be able to apply that skill, with equipment and resources from somewhere else, to create functional units. In a rural area, the ability to piece together components into a whole in a timely fashion is just as important as identifying a whole component. This is something that data systems can help with. For a regionalized approach, it is important to identify where those resources are. Again, communication is key.

Mears pointed out that the dispatch center is one location where a significant amount of information can exist. Through event logs and location information, an understanding of the service area can emerge and may provide some indication of where events are more likely to occur. Mass casualty events are not necessarily unusual, he said. They are often common events on a very large scale. Mears recommended looking for areas where vehicle crashes commonly happen and anticipating how an incident could grow out of proportion if the right conditions came together. EMS data systems and healthcare systems are helpful sources of data from an evaluation perspective, but there is not much information they can provide that is relevant during the active response to the incident.

The SMARTT¹ online system in North Carolina is one approach to managing the "knowledge, skills, and abilities" available across the system,

¹State Medical Asset Resource Tracking Tool, described by Alson in Chapter 6.

Mears said. Through text messaging and other communications, resources can be very quickly located and then coordinated through the system.

Mears recommended the development of regional or state dispatch data systems. The information technology exists for a dispatch registry to operate in real time, he said. Such a system would provide baseline activity information across fire, EMS, and law enforcement, as well as some predictive measures of where there is a risk of events.

Developing Rural-Centric Metrics

Sally Phillips, former director of the Public Health Emergency Preparedness Program at the Agency for Healthcare Research and Quality (AHRQ)² reviewed some of the unique aspects of incidents in rural states and rural communities that need to be factored into the development of metrics: weather; distance; frequency of incidents; communications gaps; and capabilities and capacities such as transportation, personnel, and facilities. She emphasized that these aspects of MCI response and their impact on patient outcomes differ significantly between rural and urban areas such that the most effective rural MCI planning must be based on rural metrics measurement.

When developing metrics, the first step is to determine the requirements and components of what is to be measured. With regard to mass casualty care, for example, a key component is EMS providers and their relative competency, capabilities, and headcount. Measurable competencies and capabilities could include education, training, and exercise frequency; field skill expansion; medical supervision on site or through telemedicine; after-action debriefing and quality improvement; and safety and security issues for providers (e.g., provisions to ensure physical safety, mental health).

Other components of mass casualty care that could be measured include access to trauma care, whether onsite, after transport, or via telemedicine; triage and treatment protocols; alternative treatment facilities for triage and stabilizing those awaiting transport; and capability and capacity for treating children and special needs populations.

Planning and concept of operations (CONOPS) revisions and improvements is another area that could be measured when considering risk. Measurable components could include the adequacy of transportation assets (e.g., quantity, status, safety); effective use of strike teams and citizen volunteers; ICS knowledge and implementation; and communication knowledge and skills.

Community resiliency is also an important component. The victims on

²Sally Phillips currently serves as the deputy director of the Health Threats Resilience Division in the office of Health Affairs, DHS.

site, who may have to wait 45 minutes until the first ambulance arrives, are really the first responders and often render some of the initial care. What are the capabilities and capacities of victims? Can the public be better prepared through education?

In addition to laying out some of the potential metrics for MCI capabilities and response, Phillips offered some rural low-cost solutions to enhance survivability. The first of which was ensuring communications capabilities and driver qualifications of transport vehicles. Also, storing blankets under each bus seat and additional survival supplies on board (e.g., food, water, flashlights) could prove very useful in an emergency. Similarly, the location of basic medical supplies should be made known to all passengers. On the provider side, efforts similar to those discussed previously in Chapters 3 through 5 were suggested: hold skills workshops, just-in-time training, trauma sabbaticals, and staff exchanges to ensure medical staff is prepared to deal with emergencies.

Phillips directed participants to several databases that, while admittedly are focused on the outcome of EMS interventions, could nonetheless prove useful in developing metrics:

- The Healthcare Cost and Utilization Project (HCUP) database (<http://hcupnet.ahrq.gov>)
- Nationwide Inpatient Sample (NIS)
- Nationwide Emergency Department Sample (NEDS)
- State Inpatient Databases (SID)
- State Emergency Department Databases (SEDD)
- State Ambulatory Surgery Databases (SASD)³

Several AHRQ publications were also mentioned by participants as useful to the challenge of measurement development including AHRQ publications *Recommendations for a National Mass Patient and Evacuee Movement, Regulating, and Tracking System* (2009a); *Mass Evacuation Transportation Model* (2008); *Hospital Available Beds for Emergencies and Disasters. A Sustainable Bed Availability Reporting System* (2009b); and the Cantrill et al., publication *Disaster Alternate Care Facilities: Report and Interactive Tools* (2009).

³HCUP: <http://hcupnet.ahrq.gov>. NIS: <http://www.hcup-us.ahrq.gov/db/nation/nis/nisdbdocumentation.jsp>. NEDS: <http://www.hcup-us.ahrq.gov/nedsoverview.jsp>. SID: <http://www.hcup-us.ahrq.gov/sidoverview.jsp>. SEDD: <http://www.hcup-us.ahrq.gov/seddooverview.jsp>. SASD: <http://www.hcup-us.ahrq.gov/sasdooverview.jsp>.

TRAUMA SYSTEM DATA AND METRICS

Charles Mains, trauma medical director for Centura Health Trauma System and medical director at Saint Anthony Central Hospital in Denver, Colorado, began with a brief review of the consequences of shock, reminding participants that multiorgan failure and death may occur several weeks after the initial traumatic insult. Optimal patient outcomes depend on an integrated system of care from prehospital to rehabilitation, he said.

In an effort to develop a fully integrated statewide trauma system, Centura has 19 facilities, 14 of which are designated trauma centers, and all of which are not-for-profit. Combined, they log 300,000 emergency room (ER) visits and 8,000 trauma admissions per year. Centura also provides medical direction to 130 prehospital agencies and averages 4,000 medical flight missions per year, which are dispatched through a centralized flight operations center. When flights are grounded, there are four critical care ground units that can travel to the scene. There are four different modes of communication between the trauma centers and the affiliated facilities. Centura also maintains a centralized trauma registry that currently has data from about 32,000 patients over the past 4 years. Mains said that this makes the Centura system ideally suited to study the metrics of trauma care across a broad region.

Mains explained that the fully integrated system of care incorporates quality processes, best practices, and national benchmarks, as well as an extensive outreach and education program. The system has destination guidelines, patient tracking through a unified medical record system, and coordination with the state trauma system. There is radiology interconnectivity via the Internet so that in-house trauma radiologists can read films in any of the rural facilities and decide which hospital in the system is most appropriate for patients' triage. Using the one-call system, patients are directed to the facility with the resources that best meet their medical needs (which is not always the top-ranked care facility).

For trauma system metrics, the Centura system is benchmarking against national trauma data. They assess individual facility and system risk-adjusted mortality versus injury severity score (ISS) versus probability of survival. They also study preventable death, inappropriate double transport, and transport time to definitive care. Flattening of the second and third peaks in the trimodal death curve (i.e., deaths occurring hours to weeks after the initial trauma) is a sign of the maturity of a trauma system, Mains said. If both the EMS and the initial hospital are effective at resuscitation, there will be fewer respiratory distress and multiorgan failure deaths in the intensive care units (ICU). Great field capabilities are wasted if the hospital is not prepared to perform critical care at the level needed. Centura's quality initiatives focus on efforts that can make a significant im-

pact on the care of trauma patients, such as resuscitation guidelines, severe head injury guidelines, and geriatric protocols.

Coordinated care, adequate transportation, and planning of facility scope of practice all contribute to improving the outcome of trauma patients in rural areas, Mains concluded. A list of discussed metrics can be found in Box 6-2.

BOX 6-2 Suggested Metrics

Planning and Concept Metrics

- Rural and frontier-specific patient care and outcomes data (most current data are based on urban and suburban transport times and facility capabilities that do not necessarily translate to a rural setting)
- Frequency of incidents
- Time to fill ICS roles
- Extent of integration (public/private, local/regional) in broad response planning
- Multidisciplinary participation in mass casualty exercises
- Access to trauma care (onsite, after transport, telemedicine)
- Triage and treatment protocols
- Alternative treatment facilities for triage and stabilizing those awaiting transport
- Ability to treat special needs populations (e.g., pediatric)
- Quantity, status, and safety of transportation assets
- Effective use of strike teams

Metrics Collected by Geographic Location

- Ground and helicopter EMS services
- Hospital locations and trauma center designations
- Available resources (equipment and personnel)

EMS Personnel-Specific Metrics

- Education, training, exercise frequency, field skill expansion, medical supervision onsite/through telemedicine, after-action debriefing, quality improvement, safety and security issues

Transportation-MCI-Specific Metrics

- Location-specific coding of transportation crashes (including road descriptions)
- Traffic volume by segment of roadway
- Traffic volume by type of vehicle
- Weather

Patient-Centered Metrics

- Risk-adjusted mortality, injury severity score, probability of survival by treatment center/region
- Number of preventable deaths
- Number of inappropriate double transports
- Transport time to definitive care

SYSTEMATIC APPROACHES TO METRICS DEVELOPMENT

The CDC and a Civilian Model

Craig Thomas, chief of the Outcome Monitoring and Evaluation Branch in the Division of State and Local Readiness at the CDC provided an overview of metrics development at the CDC. The Division of State and Local Readiness administers the Public Health Emergency Preparedness (PHEP) Cooperative Agreement, which since 2001 has awarded over \$8 billion to 62 state, territorial, and local grantees. At approximately \$1 billion per year, this is one of the largest federal investments at the CDC, Thomas noted, and the CDC must develop metrics for assessing the degree to which the program is achieving its goals.

In a mass casualty response, the capabilities that the CDC sees as critical include incident management, crisis and emergency risk communication, countermeasures and mitigation (e.g., mass care, fatality management, responder safety and health), and surge management (e.g., medical surge, medical supply management, volunteer management).

Thomas highlighted several challenges to developing meaningful measures, especially for rural settings, starting with the fact that the integration of public health into EMS is relatively recent. In general, public health focuses more on continuous events (e.g., infectious disease outbreaks) than on discrete or acute emergency events (e.g., building collapse). In addition, measurement is hampered by the fact that roles and responsibilities are not always defined, especially for cross-jurisdictional incidents. And while not every service meets the necessary capabilities in the same way (nor is CDC prescribing a specific method to conduct a particular capability) some performance parameters need to be defined. An understaffed workforce is a pervasive issue in public health, more so recently with the economic downturn, and there is variation in core competencies for public health workers. Scarce resources have resulted in insufficient systems, equipment, and supplies. Maintaining and updating existing systems and equipment can be a challenge. Together, Thomas posited that these add up to a limited ability to operate in emergencies.

Steps in Developing Public Health Emergency Preparedness (PHEP) Measures

For its systematic approach to developing PHEP measures, the CDC first defines and describes the program, then applies evaluation tools and methods (e.g., process mapping, logic models) to generate activities that could be measured. As there is no solid evidence base, measures must be based on expert knowledge, experience, and published literature. The next

step is to develop data reporting and analysis plans, including how data will be collected, submitted, managed, analyzed, and reported. Thomas said that the CDC builds evaluation capacity into the grant awards as it must be able to report back to Congress to justify continued funding of the program. As a result of the Pandemic and All-Hazards Preparedness Act, there are legislative mandates that require benchmarks be met. Failure to meet any benchmarks will result in funding cuts, a challenge of primary concern to awardees, Thomas said.

Defining Measure Parameters

In selecting points to measure, the CDC must consider what is core to public health versus what is under the control of EMS or healthcare delivery. There is also need for measures between and among systems, to gain a better understanding of where they fit and how they work together. Measures must be scalable. The system is designed to collect data on routine events that, Thomas explained, serve as proxies for how the public health system might function in public health emergency response. Finally, potential bottlenecks that affect timely delivery of services are identified.

Many of the measures are time based, assuming that time is a proxy for quality of response. One could measure, for example, time to notify preidentified staff to fill public health agency incident management roles, or time to complete a draft of an after-action report/improvement plan. Other parameters, such as quality of the response and whether the right decisions were made, are more difficult to measure. There are not much data to guide such measures, but the CDC is addressing this as the program moves forward, Thomas said.

The Department of Homeland Security and the Joint Combat Casualty Care System

The core science and technology mission of the Department of Homeland Security (DHS) is to strengthen America's security and resiliency by providing innovative science and technology solutions for the Homeland Security enterprise, explained James Grove, regional director of the Interagency and First Responder Programs Division in the DHS Office of Science and Technology. One of the approaches to achieving this mission is a First Responder Capstone Integrated Product Team (IPT) established in 2009. After identifying needs-based input from first responders, the program makes investments in technologies and solutions that could potentially fill the gaps identified.

Grove highlighted several methods of evaluating concepts and metrics. Usually, in an emergency management community, he explained, the process of fixing problems starts with developing concepts. Then standard

operating procedures are written, and a tabletop exercise might be conducted before moving the concept into a field environment to see if it works. However, when so much time has already been invested, most of the energy is spent on making sure the concept works, and training to ensure it is successful. There is no room for experimentation. Grove suggested that there is an opportunity to leverage the United States Joint Forces Command's Joint Concept Technology Demonstrations (JCTD). This approach could potentially be used to address development and metrics for rural EMS response.

One JCTD evaluated the Joint Combat Casualty Care System, and Grove pointed out several parallels between some of the desired capabilities of the combat care system and rural EMS: efficient management of low-density, high-demand field medical personnel and evacuation assets; application of medical care to the most critical casualties while monitoring and remotely caring for others; and facilitated critical medical care to forces in denied or remote areas unreachable by evacuation assets in the short term. There are metrics that will be developed for the war fighter paramedic. The JCTD approach to development and metrics is worth looking at, Grove suggested. Some of the technologies that have come out of the JCTD may be useful for EMS in a rural environment, such as a handheld Motorola device that responds to voice commands.

A participant suggested that not just a military model, but those from the Data-Driven Approaches to Crime and Traffic Safety that is funded through the National Highway Traffic Safety Administration (NHTSA) and the Department of Justice, might similarly prove an adept comparison. The program studies crime and traffic crash data to determine the most effective deployment of law enforcement resources.

THEMES IDENTIFIED BY WORKSHOP PARTICIPANTS

A primary challenge for assessment of preparedness capabilities and risk is a lack of an identifiable evidence base upon which to develop measures and establish metrics. Also where it does exist, available data are based on urban and suburban conditions which do not necessarily translate to rural and frontier settings. Participants discussed a variety of existing tools and research projects that that could be leveraged for assessment of transportation-related road risks, for example, roadway risk maps; models for predicting the impact of infrastructure changes; a method of expressing and comparing risk based on resources; and approaches to rapidly assess new concepts and technologies. Examples of data sources that might be useful in developing metrics were suggested. A variety of questions will need to be addressed, such as whether there are physical resources that could be measured as proxies for response capacity of an emergency care system, and how exercises, planning, integration, collaboration with nontraditional partners, and other activities should factor into assessments.

7

Improving Rural Mass Casualty Response in the United States

“There is not one healthcare discipline that is solely and completely responsible for preparing and responding to mass casualty incidents (MCIs), nor is there one government entity that is solely responsible for helping to support these activities,” said session chair Jon Krohmer of the Office of Health Affairs in the Department of Homeland Security (DHS). In describing preparedness and response to rural MCIs, the theme of the absence of a centralized and dedicated federal office to support emergency medical services (EMS), and the impact this has on rural preparedness and response efforts recurred throughout the discussion. Several participants highlighted the importance of leveraging partnerships between the government and the private sector to improve the capacity and effectiveness of responding to large-scale rural incidents, and these partnerships are needed to strengthen workforce, education and training, and technology.

ADDRESSING THE ISSUE OF FUNDING

A major theme throughout the workshop was the absence of dedicated and coordinated funding for integrated rural MCI planning and response, commented workshop chair Robert Bass. EMS is critical to supporting the response to any MCI, rural or urban. There are numerous needs for the EMS community to ensure they are an equal partner in the health systems capacity to respond to an MCI. While the National Highway Traffic Safety Administration (NHTSA), DHS’ Office of Health Affairs, and the Assistant Secretary for Preparedness and Response (ASPR) all play important roles, there is currently no federal agency that has specific responsibility

in setting national policy for EMS. Instead there is a patchwork of available resources, commented Bass, that do not meet the complete needs of the health care sector due to an absence of directed federal guidance and policy. This absence of a specific federal advocate results in an inability of EMS, at both the federal and state level, to attain the same priority as other components of the health system in terms of having the necessary guidance and resources to prepare for and respond to an MCI. In addition, although EMS is a critical component of the emergency response system other first responder communities, such as police and fire, receive a significantly larger portion of federal grant dollars compared to EMS. This was highlighted in 2007 congressional testimony by the Department of Homeland Security to the House Appropriations Committee: less than 4 percent of DHS grants to state and local agencies is directed towards EMS functions (DHS to Committees on Appropriations, 2007).

Granting agencies such as the DHS, ASPR, NHTSA, the Health Resources and Services Administration (HRSA), the Federal Emergency Management Agency (FEMA), and others need to review their grant guidance and how funding is directed and distributed to ensure appropriate resources are provided to EMS and for rural MCI planning. Strong federal direction of this kind can help ensure EMS is a fully integrated component of the emergency response system. This could have the affect of stabilizing EMS funding within federal and state budgets so that it is less vulnerable to economic stability trends (receiving more funding in “boom” years, and seeing that funding drastically cut during recessions). To this end it is important to similarly include public and private healthcare insurers in discussions of sustained funding. Specific suggestions for integrating the funding provided by the Medicare and Medicaid payer, the Centers for Medicare and Medicaid Services (CMS), are discussed below.

When engaging an entity on the issue of funding, noted associate chief medical officer at the Office of Health Affairs at DHS Mike Zanker, emphasis should not only be given to urban centers. In addition to the need for rural EMS to respond to an MCI in their community, in the event of a major urban incident urban communities will be reliant on their rural neighbors to help support response efforts, especially if the urban center is incapacitated.

HRSA Rural Health Grants

Eileen Holloran, a public health analyst in the Office of Rural Health Policy at HRSA described four current grant programs that support im-

BOX 7-1**Applicable HRSA Office of Rural Health Policy Grant Programs****Rural Health Network Planning Grant**

- Funds 1 year of planning at \$85K to bring organizations together to work on common goals, includes funding for consultants
- Start date March 2011 (applications due Oct. 2010)

Rural Health Network Development Grant

- Funding for 3 years at \$180K/year for network development
- Start date May 2011 (applications due Sept. 2010)

Rural Health Care Services Outreach Grant

- Funding for 3 years at \$150K year 1, \$125K year 2, \$100K year 3 to support healthcare service delivery
- Start date May 2012 (RFP available Sept. 2011)

Rural Access to Emergency Devices

- Funding of \$100K for up to 3 years to purchase and place devices and provide training for their use
- Start date August 2011 (RFP available Dec. 2010)

provement of rural mass casualty response (Box 7-1).¹ The purpose of the grants is to foster collaboration among rural health providers. The main eligibility requirement for the first three programs (Planning, Development, Outreach) is that primary applicants must be rural and not-for-profit. The applicant's headquarters must be rural, Holloran clarified, they cannot simply be the rural subsidiary of an urban entity. They can, however, partner with urban and for-profit organizations. The subject of the application can be any health-related goal. In the Outreach program, for example, HRSA has funded projects ranging from mental health to transportation to rural addressing.

¹Following the workshop, Health and Human Services (HHS) Secretary Sebelius on August 23, 2010, announced the awarding of over \$32 million in funding to support rural health priorities. The FY2010 funds are administered by the Office of Rural Health Policy at HRSA and span seven programs: Rural Hospital Flexibility Program, Rural Health Workforce Development Grant Awards, Telehealth Network Grant Program, Telehealth Resource Center Grant Program, Flex Rural Veterans Health Access Program, Frontier Community Health Integration Demonstration Program, and the Rural Training Track Technical Assistance Demonstration Program. See the press release at <http://www.hhs.gov/news/press/2010pres/08/20100823a.html>.

Benefits and Limitations of Medicare Reimbursements

Mercedes Benitez-McCrary, director of the Division of Emergency Preparedness at the Centers for Medicare & Medicaid Services (CMS), said that this central Medicare/Medicaid agency is attempting to respond to the gap through the establishment of collaborative partnerships and open lines of communication with the rural medical community. The Medicare program is identifying resources that could better serve the needs of beneficiaries, and one of those is transportation. Benitez-McCrary clarified some of the aspects of Medicare coverage for reimbursing transportation costs. Transportation, whether in a rural setting or not, must meet the requirements of the law.² For example, Medicare does not pay for multiple trips, and the beneficiary must be on board for each leg of the ambulance journey. Benitez-McCrary further explained that while ambulances can provide treatment, they will not be paid by Medicare unless the patient is in the ambulance. There must be a medical necessity for the use of an ambulance, and transportation must be to an approved destination (i.e., the beneficiary cannot use the ambulance for personal transport to an appointment). Ambulance transport must also meet “medical reasonableness” requirements. In that regard, Medicare has defined the situations that qualify for air transportation (e.g., cardiogenic shock, severe burns, conditions requiring hyperbaric oxygen, multiple severe life-threatening injuries). Some workshop participants suggested that these constraints present a major policy issue for sustainability of EMS systems, particularly critical care transport.

Medicare requirements are not flexible. Only when there is a declaration of a disaster or emergency by the President and a public health emergency declaration by the HHS secretary, can temporary waivers or modifications to requirements be made.³ Once an “1135 Waiver” is authorized, healthcare providers submit requests to file Medicare claims under that waiver (i.e., it is not a blanket or group waiver, requests are individually considered). Some examples of requirements that might be waived in a declared disaster include the need for preapproval of care, or the requirement that doctors hold a license in the state where they are giving care. Waivers terminate after 60 to 90 days.

Funding Sources Dedicated to Transportation Improvements

One funding program specific to rural roads is the High-Risk Rural Road Program. These are federal funds administered by state departments of transportation (DOTs) specifically for improvements to high-risk rural

²See CMS Publication 100-02, *The Medicare Benefit Policy Manual*, Chapter 10.

³See section 319 of the Public Health Services Act and section 1135 of the Social Security Act.

roads. A related funding opportunity is the Highway Safety Improvement Program (HSIP), which is umbrella funding under which the High-Risk Rural Roads Program is funded. All public roads are eligible for HSIP funds. States are required to have Strategic Highway Safety Plans (SHSP) developed by the state DOT to qualify. Kelly Hardy, safety program manager for the American Association of State Highway and Transportation Officials (AASHTO), noted if a state can certify that its infrastructure needs per its SHSP have been met for that year, they can redirect 10 percent of the state's HSIP funds to other public safety projects. Therefore she suggested that there may be an opportunity to direct those funds to support EMS needs. She also noted that there is an opportunity for involvement of EMS as states evaluate their progress in implementing their SHSPs and update their plans. In most cases, EMS has not been at the table for development of these plans.

Inequalities in Funding and the Impact of Cost Containment

The absence of a consistent federal EMS funding source was specifically noted as a major obstacle by Ken Knipper, director of the State National Volunteer Fire Council in Kentucky and a retired emergency manager. EMS receives some fire grant money, some HRSA funding, some Medicare reimbursements, but no dedicated singular source exists. This lack of reliable funding has led to a concomitant absence of fellowship funds in rural areas noted session chair Dia Gainor. She explained that fellowship programs are generally in cities with disaster medical assistance teams (DMATs). In rural states without DMATs or other disaster-centered groups for the fellowship programs to affiliate with, there is really no home for them. Overall there is a dearth of new doctors going into the emergency medicine specialty. Winchell added that these kinds of programs are part of preparedness and thus vital to an MCI response.

Questions were raised about how the current emphasis on cost containment in health care affects the surge capacity component of emergency preparedness. There is enormous pressure on hospitals to avoid additional capacity because of the associated additional costs. If a hospital is not 100 percent full, they look to close the additional beds. This leaves the recovery room, hallways, or wherever else as the surge capacity. Many hospitals also have a backlog of surgical cases that further limit potential surge capacity. Knipper added that insurance companies are starting to deny some claims for what they deem are unnecessary transportation charges (e.g., helicopter transport of a patient with minimal injuries who is treated and released), under the banner of cost containment. These factors together can produce a cultural opposition to preparedness strategies among hospital and EMS

administrators. Therefore, it is very important that the preparedness and EMS communities actively engage health care providers and insurers.

THE ROLE OF GOVERNMENT

James DeTienne, supervisor of EMS and Trauma Systems in the Montana Department of Public Health and Human Services, said that the role of government in response to rural MCIs encompasses leadership, workforce, training, and technology. A balance needs to be struck between providing structured support and maintaining command sovereignty with local leaders.

Leadership

While all responses are ultimately local, leadership from federal and state governments is urgently needed in rural response and EMS, DeTienne said. From the federal perspective, this means adjudicating across interstate, regional, and national jurisdictions to provide broad guidance to communities. Similarly, states must assume responsibility for ensuring the needs of local emergency responders and health care providers are measured and adequately met. A leadership role for government at all levels is to facilitate a realistic public perception of what emergency services are available and what they are capable of doing with their current resources.

Drew Dawson, director of the Office of Emergency Medical Services at the NHTSA, further detailed potential roles the federal government could play productively. The responsibility of the federal government, first and foremost, Dawson said, is communication and collaboration with all stakeholders in the system. There needs to be a coordinated federal vision of where rural emergency medical services should be. That vision must be developed in concert with state and local areas, and with federal leadership. One participant suggested that this vision might best come to fruition by strengthening EMS within the federal government, recognizing that EMS is a critical component of the everyday health system and disaster response. This strengthened role could in part be tasked with elevating the priority of EMS preparedness, guiding better allocation of grants and alignment of grants with federal policy, and removing barriers to communicating best practices solutions across state and regional jurisdictions.

In fact, Dawson commented that the federal government is in a key position to develop and share best practices, by sponsoring forums such as this IOM workshop and others that bring rural communities together with state and local partners. He suggested that there is also a need for federal support of additional research into rural emergency medical services, not just with respect to patient care, but with respect to systems. Development

of common metrics that could predict the success of emergency response in rural communities is another area with which the federal government can assist. There is a need for increased consistency of metrics on a nationwide basis to be able to identify needs and manage resources effectively.

Dawson said that an important leadership role for the federal government is to conduct and facilitate an assessment, based on solid data, of where we are in the nation with respect to emergency medical services. Such an assessment should identify if there are barriers nationally to improving rural emergency medical services and rural mass casualty care, and what can be done to eliminate such barriers. Dawson noted that addressing some of these challenges may require changes in policy or changes in laws or rules.

Workforce

An emergency care system encompasses many components, not just EMS. DeTienne cited a NHTSA report on rural workforce that found that the absence of data makes workforce characterization impossible (NHTSA, 2008). One of the first charges to government is to collect the necessary data to characterize the current workforce. Without this baseline it will be difficult to apply any metrics and assess the impact of new strategies. Community paramedicine is another workforce issue where the EMS system has evolved out of necessity. Also, as discussed in Chapter 5, an all volunteer responder system is not sustainable, and there needs to be serious discussion of transitioning to paid systems.

In response to presentations by panelists, a participant suggested that the federal government, through the Department of Defense (DoD), determine the feasibility of training experienced combat medics returning from active duty as rural EMTs and paramedics to address the aforementioned gaps in personnel resources. Another participant underscored the importance of military aid to the extent possible during an MCI, as the military already has personnel specially trained to fill gaps in rural provider care. Benitez-McCrary's concurred, noting that wounded pets in need of care during the aftermath of Hurricane Katrina, a significant issue, could have been best treated by the U.S. Army's dedicated Veterinary Corps. Often traveling with the troops, a participant noted their work as an essential component of Army response to natural disasters.

Education

There are many opportunities for government to be involved with training, DeTienne said. EMS needs specific education in incident command systems (ICS). However, DeTienne described an ICS course he was aware

of that was simply the course for firefighters, retitled for EMS, ensuring most of the scenarios did not adequately describe EMS-centered response. Therefore, the use of dedicated education by the professional field cannot be understated in its importance to preparing responders to deal with an MCI. In addition, time lost at a job is a significant consideration for volunteers, who make up a large part of rural responders (described in Chapter 4). Government needs to find ways to use distance learning and technology to provide ICS training to EMS. DeTienne also reiterated the point that the workforce and infrastructure must be able to adequately handle the everyday emergency response if it is to ever be able to handle mass casualties. Dawson brought the point further to bear insisting that invention, evaluation, and deployment of new technologies is another area where the federal government can play an important role.

Zanker concurred, commenting that as important as technology is, without the proper training it is of limited use (the government's role in technology was discussed in Chapter 3). Zanker advocated funding programs that broaden the basic skills of responders who are not paramedics, such that their training in combination with guided instructions from onboard telemedicine technologies, for instance, could increase a whole response unit's ability to save lives quickly. As stated by participants in previous chapters, skill retention should be considered a crucial aspect of any authority's education responsibilities.

THEMES IDENTIFIED BY WORKSHOP PARTICIPANTS

Participants discussed the roles of local, state, and federal governments, the private sector, and other organizations in improving rural MCI response capabilities. In the noted absence of a single dedicated federal agency, the responsibility falls to a coordinated effort across multiple agencies, all sectors, and involving all stakeholders.

Addressing the pervasive communications challenges is a priority, posited workshop chair Robert Bass. A variety of telecommunications technologies and initiatives were discussed, such as Next Generation 9-1-1, satellite communications, broadband, and telemedicine. Several participants suggested that a way to bring these technologies to rural and frontier areas and increase connectivity is needed. Incentivizing and engaging the private sector were suggested as possible approaches.

Although funding is essential, and a variety of available grants and funding sources were discussed, funding is not the only issue and is not exclusively the responsibility of agencies of the federal government. Bass emphasized that a coordinated federal vision for the role of EMS in rural environments should be developed, aligning funding and activities at the federal level across the various agencies (e.g., HHS, DOT, DHS).

Some participants said that coordinated and consolidated federal guidance is needed for EMS and rural preparedness. This would help facilitate increased resources at the local and state levels for rural EMS. The federal government also has a role in facilitating the sharing of best practices, supporting research and data collection (e.g., for technology development, accurate characterization of the workforce), increasing awareness and coordination, and the development of consistent, nationwide metrics and assessment strategies.

8

Needs and Opportunities

The challenges facing response to mass casualty incidents (MCIs) in rural settings reflect the broader challenges of national policy for rural health care in general. As highlighted throughout the workshop, MCIs in rural settings are not rare and, due to limited resource availability, health systems can quickly be overwhelmed. Therefore it is critically important that rural communities be provided the necessary guidance and resources to prepare and respond to an incident, commented workshop chair Robert Bass. Outcome measures and the ability to acquire the necessary data are needed to evaluate the magnitude of threats and to guide planning. An assessment must take into account both the risk of an incident occurring, and the capability and capacity to mount an effective emergency response. Complicating such an assessment is the lack of defined metrics.

Despite their geographic, topographic, and demographic differences, rural and frontier areas all face similar barriers in planning for and responding to MCIs noted Bass. But funding for technology, supplies, and preparedness activities (e.g., training, travel to training, planning and coordination meetings, exercises) is limited. As there is no dedicated direct federal funding for emergency medical services (EMS), support is often cobbled together from various grants, local and state support, and Medicare reimbursements (for which there are many restrictions). Panelist Aimee Binning, a member of the board of directors of the National Association of Emergency Medical Technicians (NAEMT) and owner of CVC Training, Inc., commented that many EMS organizations are entirely staffed by volunteers, which is not a sustainable model. In addition, several participants observed that rural areas must often contend with limited or nonexistent infrastructure, espe-

cially with regard to communications (e.g., lack of 9-1-1 access, cell phone service, 800 MHz two-way radio, broadband, satellite).

Workshop participants also highlighted that federal grants programs are not guided by any coherent, unified policy. Moreover, distribution of funds remains discretionary at the state level, where it is subject to the whims and political vagaries of state governments. Because most of the funding is not dedicated, it must be applied for by EMS in competition with other responder agencies and security interests.

Workshop participants offered a broad range of suggestions and strategies for improving response to rural MCIs going forward, including (but not limited to):

- Ensure an adequate day-to-day response capability at a minimum;
- Conduct broadly inclusive planning and exercises;
- Train in and consistently use the incident command system;
- Identify and share best practices across services and sectors (e.g., military battlefield trauma care, private industry communications capabilities, distance education);
- Develop demonstration projects to assess the capability and feasibility of using telemedicine technology as a potential means to improve emergency medicine services in rural communities;
- Establish formal mutual aid agreements and cross-jurisdictional coordination;
- Strengthen the standing of EMS in the federal government and ensure coordinated and dedicated EMS funding;
- Develop realistic regionalization strategies with local input;
- Develop strategic partnerships (public/private/nonprofit) to achieve goals; and
- Leverage existing federal programs and grants to bring enhanced communications (including Next Generation 9-1-1, broadband, and telemedicine) to rural areas.

Relationships were a thematic hallmark of participants' discussion over the course of the workshop. Filtering its way into multiple discussions were the importance of individual and federal leadership, and mechanisms to build trust among local, state, and regional coalition partners that can survive transitions in that leadership. Alluding to participants' discussion during the panel on rural health systems "regionalization is not centralization," several participants concluded that through attitudes of inclusion, in which notions of a zero-sum power structure have little or no place, improvements in rural preparedness for and response to mass casualty incidents from all causes can steadily achieve the goal of mitigating and better treating injuries, and saving more lives.

A

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B

Workshop Agenda

Day 1

Tuesday, August 3, 2010
Keck Center, Room 100
National Academy of Sciences
500 Fifth Street, NW
Washington, DC

Workshop Objectives

The workshop discussions will provide participants an opportunity to examine the current capabilities and future opportunities to improve integrated mass casualty response in rural settings (note “rural” will be used to capture both rural and frontier settings). Specifically, the workshop will feature invited presentations and discussions that will

- Review the findings from the NTSB report (NTSB/HAR-09/01) of the 2008 Mexican Hat incident and discuss near- and long-term opportunities to improve response capabilities in rural settings.
- Explore existing standards, guidance, and innovative models and approaches in place for state and local jurisdictions.
- Examine integrated systems approaches to improve the capability of the emergency medical services (EMS) system to respond to large-scale rural incidents.
- Discuss opportunities to improve the integration and coordination with public health systems to address challenges to national public health security, particularly in rural settings.

8:00 a.m. Welcome, Introductions, and Workshop Objectives

ROBERT BASS, *Workshop Chair*
Executive Director
Maryland Institute for Emergency Medical Services Systems

8:10 a.m. Charge to Workshop Speakers and Participants

DREW DAWSON
Director
Office of Emergency Medical Services
National Highway Traffic Safety Administration

SESSION I:

WORKSHOP CONTEXT: 2008 MEXICAN HAT INCIDENT

Session Objective: Provide a brief overview of the 2008 Mexican Hat, Utah, incident. Consider unique and common barriers to rural response that were highlighted by the 2008 Mexican Hat incident. Review the findings from the NTSB report (NTSB/HAR-09/01).

8:25 a.m. Session Objectives and Introduction

JOLENE WHITNEY, *Session Chair*
Deputy Director
Emergency Medical Services and Preparedness
Utah Department of Health

8:35 a.m. Findings from the NTSB Report (NTSB/HAR-09/01) and Other Relevant Investigations

CHRISTOPHER HART
Vice Chairman
National Transportation Safety Board

8:50 a.m. Overview of the 2008 Mexican Hat, Utah, Incident and Response: Local Perspective

LINDA LARSON
Director
EMS
San Juan County, Utah

9:05 a.m. Overview of the 2008 Mexican Hat, Utah, Incident and Response: State and Regional Perspective

PAUL PATRICK
Director
Bureau of EMS and Preparedness
State of Utah Department of Health

9:20 a.m. Overview of Incident Response and Associated Challenges During the 2010 Caddo and Little Missouri Rivers, Arkansas, Flooding

FLOYD DUNSON
Deputy Emergency Manager
Howard County Emergency Management Agency
Mineral Springs Fire and Rescue

9:30 a.m. Discussion with Attendees

JOLENE WHITNEY, *Session Chair*
Deputy Director
Emergency Medical Services and Preparedness
Utah Department of Health

10:00 a.m. BREAK

**SESSION II:
DEFINING THE CHALLENGES OF RESPONSE IN RURAL AREAS;
EXPLORING STRATEGIES FOR IMPROVING RESPONSE**

Session Objective: Examine the specific challenges of responding to mass casualty incidents that occur in rural areas. Discuss specific challenges as they relate to 9-1-1 access and communications, the prehospital system, the healthcare system, and integration and coordination across response platforms. Examine local, state, and regional model systems that have been used to improve response to rural incidents. Explore strategies that have been tested in exercises as well as lessons learned from responding to real incidents.

- 10:15 a.m. Panel Discussion: 9-1-1 Access and Communications, the Challenges
- Explore the impact limited 9-1-1 access has on emergency response in rural settings. Examine systematic strategies to overcome limited 9-1-1 access and improve rural response coordination. Identify and discuss opportunities to improve emergency response through improved integrated emergency communication.

JOHN CHIARAMONTE, *Panel Chair*
Lead Associate
Booz Allen Hamilton

PAUL PATRICK
Director
Bureau of EMS and Preparedness
State of Utah Department of Health

AARRON REINERT
Executive Director
Lakes Region EMS

JOHN ISFORT
Director
Business Development & Physician Services
Marcum & Wallace Memorial Hospital
Paramedic
Madison County Emergency Medical Services

- 10:50 a.m. Discussion with Panelists and Attendees

JOHN CHIARAMONTE, *Panel Chair*
Lead Associate
Booz Allen Hamilton

- 11:20 a.m. Panel Discussion: 9-1-1 Access and Communications, Innovative Models and Approaches to Improve Response

JOHN CHIARAMONTE, *Panel Chair*
Lead Associate
Booz Allen Hamilton

JENNY HANSEN
CEO
Strategic Partnerships

RICK JONES
Operations Issues Director
National Emergency Number Associations

DOROTHY SPEARS-DEAN
Public Safety Communications Coordinator
Integrated Services Program

11:50 a.m. Discussion with Panelists and Attendees

JOHN CHIARAMONTE, *Panel Chair*
Lead Associate
Booz Allen Hamilton

12:15 p.m. LUNCH

1:00 p.m. Panel Discussion: The Prehospital System, the Challenges

- Examine the unique challenges facing prehospital response in rural settings. Identify and discuss strategies to improve coordinated response. Recognizing current fiscal constraints. What support can be provided to improve rural response? Explore opportunities to improve regional response in rural settings.

JON KROHMER, *Panel Chair*
Office of Health Affairs
Department of Homeland Security

GLORIA TAVENNER DOW
Gwinnett County Department of Fire and Emergency
Services
Lawrenceville, Georgia

NORM DINERMAN
Medical Director
LifeFlight of Maine

BARBARA QUIRAM
Director
USA Center for Rural Public Health Preparedness
School of Rural Public Health Texas A&M Health Sciences
Center

TIM WIEDRICH
Chief
Emergency Preparedness and Response
North Dakota Department of Health

1:30 p.m. Discussion with Attendees

JON KROHMER, *Panel Chair*
Office of Health Affairs
Department of Homeland Security

2:00 p.m. Panel Discussion: The Prehospital System, Innovative
Models and Approaches to Improve Response

NELS SANDDAL, *Panel Chair*
President
Critical Illness and Trauma Foundation

GARY WINGROVE
Director
Government Relations & Strategic Affairs
Mayo Clinic Medical Transport

MYRA WOOD
Director
Vital Link Ambulance in Arkansas

AIMEE BINNING
CVC Training
Director, Region III
NAEMT

2:30 p.m. Discussion with Panelists and Attendees

NELS SANDDAL, *Panel Chair*
President
Critical Illness and Trauma Foundation

3:00 p.m. BREAK

3:15 p.m. Panel Discussion: The Rural Healthcare Systems: Challenges Due to Resource Realities and the Need for Regionalization

JERRY JOHNSTON, *Panel Chair*
Immediate Past President, NAEMT
EMS Director
Henry County Health Center, Mt. Pleasant, Iowa

TIMOTHY BOHLENDER
Medical Director
St. Anthony Granby Medical Center

DEBBIE VON SEGGERN-JOHNSON
EMS/Trauma Coordinator
University of Nebraska Medical Center
Henry County Health Center, Mt. Pleasant, Iowa

RANDY EASTER
EMS Director and Safety Officer
McPherson EMS

3:45 p.m. Discussion with Panelists and Attendees

JERRY JOHNSTON, *Panel Chair*
Immediate Past President, NAEMT
EMS Director
Henry County Health Center, Mt. Pleasant, Iowa

4:15 p.m. Panel Discussion: The Rural Healthcare System, Innovative Models and Approaches to Improve Response

DIA GAINOR, *Panel Chair*
Director
Idaho State Emergency Medical Services

ROBERT WINCHELL
Director
Division of Trauma
Maine Medical Center

KEN KNIPPER
Director
State National Volunteer Fire Council, Kentucky

RIFAT LATIFI
Professor of Surgery
Director Southern Arizona Teletrauma and Telepresence
Program
Vice Chair, International Relations
Department of Surgery, University of Arizona

4:45 p.m. Discussion with Panelists and Attendees

DIA GAINOR, *Panel Chair*
Director
Idaho State Emergency Medical Services

5:30 p.m. ADJOURN

Day 2
Wednesday, August 4, 2010
Keck Center, Room 100
National Academy of Sciences
500 Fifth Street, NW
Washington, DC

8:30 a.m. Welcome

ROBERT BASS, *Workshop Chair*
Executive Director
Maryland Institute for Emergency Medical Services Systems

**SESSION III:
COORDINATION AND INTEGRATION
ACROSS THE RESPONSE PLATFORMS**

Session Objective: Examine the key components of an integrated health system. Explore the unique challenges associated with ensuring integration in a rural setting. Discuss benefits of establishing effective incident command structure that fully integrates the health response system.

8:40 a.m. Panel Discussion: Coordination and Integration Across Response Platforms

DAN HANFLING, *Panel Chair*
IOM Crisis Standards of Care Committee Vice-Chair
Special Advisor
Emergency Preparedness and Response
Inova Health System

LEONARD J. WEIRETER, JR.
Arthur and Marie Kirk Family Professor of Surgery
Eastern Virginia Medical School
Medical Director
Shock Trauma Center
Sentara Norfolk General Hospital

GLENN GAINES
Deputy U.S. Fire Administrator
Federal Emergency Management Agency

JENNIFER HAMERLINCK
Director
Emergency Management Agency
Mercer County, Illinois

GLENN MITCHELL
Chief Medical Officer
Sisters of Mercy Health System

ROY ALSON
Medical Director, Forsyth County EMS
Medical Director, Disaster Services
North Carolina Office of EMS

LINDA WILLIAMS
Emergency Services Coordinator
Chouteau County, Montana

9:35 a.m. Discussion with Panelists and Attendees

DAN HANFLING, *Panel Chair*
IOM Crisis Standards of Care Committee Vice-Chair
Special Advisor
Emergency Preparedness and Response
Inova Health System

**SESSION IV:
ESTABLISHING METRICS TO ASSESS RISK ALONG RURAL ROADS**

Session Objective: Review common elements that define public health risk along rural roads. Identify and discuss potential metrics that can be used to assess risk. Identify and discuss metrics that can be used to determine what areas are at risk. Examine how both baseline and surge capacity can be assessed in rural areas. Explore gaps that need to be addressed to establish improved metrics that can assess the capabilities of an integrated health response system.

10:05 a.m. Session Objectives and Introduction

DIA GAINOR, *Panel Chair*
Director
Idaho State Emergency Medical Services

10:15 a.m. Panel Discussion: Common Elements and Associated Metrics

CHARLES MAINS
Trauma Director
St. Anthony Central Hospital, Denver, Colorado

CRAIG THOMAS
Chief, Outcome Monitoring and Evaluation Branch
Division of State and Local Readiness
Centers for Disease Control and Prevention

GREGORY MEARS
Associate Professor of Emergency Medicine
University of North Carolina Medical School
Medical Director
North Carolina Office of EMS

KELLY HARDY
Safety Program Manager
American Association of State Highway and Transportation
Officials

SALLY PHILLIPS
Director
Public Health Emergency Preparedness Program, AHRQ

JAMES GROVES
Interagency and First Responder Programs
Office of Science and Technology
Department of Homeland Security

- 11:15 a.m. Discussion with Panelists and Attendees
- What are some common guiding principles that will guide the users of resources and assets?

DIA GAINOR, *Panel Chair*
Director
Idaho State Emergency Medical Services

11:45 a.m. LUNCH

**SESSION V:
IMPROVING RURAL MASS CASUALTY RESPONSE IN THE
UNITED STATES—THE WAY AHEAD**

Session Objective: Review current security plans and examine the resources available, as well as those that are needed, to ensure appropriate safety and security of assets and individuals during the dispensing of medical countermeasures.

12:15 p.m. Session Objectives and Introduction

JON KROHMER, *Session Chair*
Office of Health Affairs
Department of Homeland Security

12:25 p.m. Panel Discussion: The Way Forward

BETHANY CUMMINGS
Physician/EMS Physician
Immediate Past Chair
Rural Domestic Preparedness Consortium and Emergency

MERCEDES BENITEZ-MCCRARY
Director of the Division of Emergency Preparedness
Centers for Medicare & Medicaid Services

EILEEN HOLLORAN
Public Health Analyst
Office of Rural Health Policy
Health Resources and Services Administration

RICK JONES
Operations Issues Director
National Emergency Number Association

MIKE ZANKER
Associate Chief Medical Officer (Acting)
Office of Health Affairs
Department of Homeland Security

JAMES DETIENNE
Supervisor
EMS & Trauma Systems
Montana Department of Public Health & Human Services

DREW DAWSON
Director
Office of Emergency Medical Services
National Highway Traffic Safety Administration

- 1:30 p.m. Discussion with Panelists and Attendees
- Given the limited financial resources, what can and should be done by the relevant stakeholders to improve preparedness and response in rural settings?

JON KROHMER, *Session Chair*
Office of Health Affairs
Department of Homeland Security

**SESSION VI:
GENERAL DISCUSSION WITH WORKSHOP
PARTICIPANTS AND ATTENDEES**

Session Objective: Discuss what opportunities and constraints exist to improving medical surge capacity in rural settings. Review opportunities and challenges identified during the workshop. Identify and discuss the most promising near-term opportunities for improving integration of emergency care in rural settings.

2:15 p.m. Panel Discussion: Synopsis of Workshop Discussions

ROBERT BASS, *Panel Chair*
Executive Director
Maryland Institute for Emergency Medical Services Systems

JOLENE WHITNEY
Deputy Director
Emergency Medical Services and Preparedness
Utah Department of Health

JOHN CHIARAMONTE
Lead Associate
Booz Allen Hamilton

JON KROHMER
Office of Health Affairs
Department of Homeland Security

DIA GAINOR
Director
Idaho State Emergency Medical Services

NELS SANDDAL
President
Critical Illness and Trauma Foundation

JERRY JOHNSTON
Immediate Past President, NAEMT
EMS Director
Henry County Health Center, Mt. Pleasant, Iowa

DAN HANFLING
IOM Crisis Standards of Care Committee Vice-Chair
Special Advisor
Emergency Preparedness and Response
Inova Health System

- 2:45 p.m. Discussion with Panelists and Attendees
- What new ideas have surfaced in this workshop that should be explored further?
 - What action steps are required to integrate these strategies into the current public health system?
 - What resources and further infrastructure investments will be necessary in the short and long term?

3:00 p.m. Closing Remarks: The Path Forward

ROBERT BASS, *Workshop Chair*
Executive Director
Maryland Institute for Emergency Medical Services Systems

3:15 p.m. ADJOURN

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Biographical Sketches of Invited Speakers and Panelists

Robert Bass (*Workshop Chair*), was the past president of the National Association of State EMS Officials and currently works as the executive director of Maryland Institute for Emergency Medical Services Systems. Dr. Bass received his undergraduate and medical degree with honors from the University of North Carolina at Chapel Hill in 1972 and 1975 respectively. Prior to completing his undergraduate education, he was employed as a police officer in Chapel Hill, North Carolina, and served as a volunteer member of the South Orange Rescue Squad. Dr. Bass completed an internship and residency in the United States Navy and is board certified in emergency medicine and is a Life Fellow of the American College of Emergency Physicians. He has served as a medical director for emergency medical services (EMS) systems in Charleston, South Carolina; Houston, Texas; Norfolk, Virginia; and Washington, DC. Since 1994, he has been the executive director of the Maryland Institute for EMS Systems, the state agency responsible for the oversight of Maryland's EMS and trauma system. He is a clinical associate professor of emergency medicine at the University of Maryland in Baltimore. Dr. Bass is the past president of the National Association of State EMS Officials and the National Association of EMS Physicians, and he is the past chair of the EMS Committee of the American College of Emergency Physicians. He was a member of the Institute of Medicine Committee on the Future of Emergency Care in the United States Health System. Additionally, he currently serves as chair of the Atlantic EMS Council and is a member of the Board of Directors of the American Trauma Society.

Roy Alson began his EMT career in the 1970s as a responder. As a medical director in North Carolina EMS, he manages 800 firefighters, EMTs, and rescue personnel, as well as more than 20 agencies. He is an associate professor of emergency medicine at the Wake Forest University Baptist Medical Center, a regional level I trauma center and burn center. He received a bachelor's degree from the University of Virginia, and a Ph.D. and an M.D. from Bowman Gray School of Medicine of Wake Forest University. He completed a residency in emergency medicine at Allegheny General Hospital in Pittsburgh. He is certified by the American Board of Emergency Medicine, and is a Fellow of ACEP and the American Academy of Emergency Medicine. He currently serves as medical director for Forsyth County EMS in North Carolina. He is the former commander and deputy commander of Disaster Medical Assistance Team (DMAT) NC-1 and has led the team's response to numerous disasters at the state and national levels, including Hurricanes Andrew and Katrina. He currently serves as the medical director for the NC Office of EMS State Medical Response system. He serves on numerous committees and councils in various leadership roles, is active in nonprofit organizations, and is a contributing author to many texts.

CDR Mercedes Benitez-McCrary is deputy director of the Emergency Preparedness & Response Operations at the Centers for Medicare & Medicaid Services. CDR Benitez-McCrary is a member of the U.S. Public Health Service Corp as a regular corps, active-duty officer. She began her undergraduate studies in speech and language pathology at New York University (NYU) and completed her studies at George Washington University in Washington, DC, in 1978. She possesses undergraduate and graduate degrees from George Washington University in speech and language pathology and is board certified in speech and language pathology. Currently Commander Benitez-McCrary is an active-duty officer in the seventh branch of the uniformed services—the Commissioned Corp of the United States Public Health Service. She is stationed at DHHS/CMS (Medicare), OOM EPRO, as deputy director of emergency preparedness and response operations. Past duty assignments include: CMS; CDR Benitez-McCrary served as special assistant to the office of the 17th Surgeon General VADM Richard H. Carmona, member of the faculty, at Howard University College of Medicine, and chief of staff/executive assistant to the president of the University of Medicine and Dentistry of New Jersey. CDR Benitez-McCrary has completed and published research in health literacy, health disparity, aphasia, and special needs patients after a disaster, and the bilingual fluency patient implications for treatment and care. The commander has served as a member of the Hispanic Health Initiative of 1993 chaired by the Honorable Antonia Novello, the U.S. surgeon general. This initiative produced an agenda for action to prevent disease and injury and promote, educate, and

repair the health of Hispanic Americans throughout the United States and its commonwealth properties.

Aimee Binning is a region III director for NAEMT and serves as the membership chair for the association and secretary for the NAEMT Foundation. Aimee often advocates for rural and frontier EMS at the state and national level and participates in various events. Aimee is also completing her 10th year for Sublette County EMS as an EMT-I. She has served in many capacities for this frontier department including education coordinator, volunteer EMT and full-time EMT, along with special events coordinator and treasurer. Aimee began her career as a FF/EMT for South Ogden in Utah in 1994. Aimee volunteers her time as an educator at the college and small departments around the state of Wyoming.

Timothy Bohlender is the medical director of Granby Medical Center (GMC). He received his medical training from the University of Colorado, graduating in 1984. He performed his residency training at St. Joseph Hospital in Denver, earning a specialty in family medicine. Dr. Bohlender began practicing medicine in Grand County in 1986 at 7Mile Medical Clinic. After opening his own private practice in Denver for 4 years, Dr. Bohlender soon found himself working back in Grand County at Timberline Medical Center from 1992 to 1996 as the director of family practice and emergency medicine. After working at Timberline, he spent a short time at a family practice in Golden, and then returned to Grand County in 1997 when he began working at the current Granby Medical Center (GMC). He began as a staff physician, working primarily in family practice, but also spending a considerable amount of time seeing patients in the emergency department as well. In 2001, Dr. Bohlender became the medical director of family practice, and in 2007 he was appointed the medical director of GMC, covering both the family practice and the emergency department. Since then, he has been instrumental in improving services at GMC to include the installation of a new CT scanner, implementation of diagnostic ultrasound testing, and the construction of a new wing to the facility among many other things. In addition, Dr. Bohlender has helped establish joint protocols and improved working relationships with local EMS, lead by Chief Ray Jennings. Grand County covers over 1,800 square miles and has around 16,000 full-time residents, averaging about 7 people per square mile. The population in the county can swell to well over 60,000 during the height of tourist season in winter and summer. Granby Medical Center is centrally located in Grand County and is the primary provider of emergency services as a level IV trauma center. There is a small community hospital in the county as well, but most patients that require extensive emergency care are transported to Denver, well over 100 miles away, to St. Anthony's Hospital, the closest

level I trauma center. Due to Granby Medical's rural location and transportation options that depend greatly on weather factors, the cooperative efforts between GMC, county EMS, Flight for Life, Front Range hospitals, as well as the state Department of Transportation (DOT) is necessary to provide adequate transport options. Nearly 25 years experience in rural medicine has given Dr. Bohlender a great understanding of the medical needs in rural communities and the relationships that are necessary in order to provide these rural locations and its patients with the best possible medical care.

John Chiamonte is a lead associate at Booz Allen Hamilton, is the program manager leading the delivery of operational and technical support for the National 9-1-1 Program Office for the U.S. Department of Transportation (USDOT) and National Highway Traffic Safety Administration (NHTSA). Previously, John was the program manager for the USDOT's Next Generation 9-1-1 (NG9-1-1) Initiative, responsible for developing the project deliverables, including the concept of operations, requirements analysis, architecture, and the benefit-cost analyses. In 2008, John successfully led a team that implemented an NG9-1-1 proof of concept (POC) demonstration involving software developers and technical and functional experts to test key functional and technical requirements. John's professional experience includes key positions in both the public and private sectors. Holding multiple operational and leadership positions with a volunteer ambulance and paramedic service in New York State, he has a strong background in public safety operations and delivery of advanced emergency medical care. Additionally, John was a public safety dispatcher for the Rochester, New York, Office of Emergency Communications and helped implement a replacement computer-aided dispatch (CAD) system. Prior to joining Booz Allen, Mr. Chiamonte was a senior project manager delivering public safety software applications to 9-1-1 centers. He has been key to the success of many public safety IT implementations, both as the end user and a vendor and throughout the entire implementation process. He is a subject matter expert on CAD and 9-1-1 systems and operations and is a certified project management professional (PMP).

Drew Dawson is the director of the Office of Emergency Medical Services (OEMS) at the National Highway Traffic Safety Administration (NHTSA) in the U.S. Department of Transportation. The National 9-1-1 program is also located at the NHTSA Office of EMS. Dawson became Montana's State EMS Director in 1976, a position he held for over 20 years. From 1999 to 2003, Drew served as chief of the Health Systems Bureau in the Montana Department of Public Health and Human Services. Drew also served many years as an EMT in a small, rural service. After serving over

30 years with Montana State government, Dawson became the director of NHTSA's Emergency Medical Services Program in 2003. Dawson has also served as president of the National Association of State EMS Officials and as chairman of the Board of Directors of the National Registry of Emergency Medical Technicians.

James DeTienne is currently supervisor of Montana's EMS and Trauma Systems Section. He has over 35 years background in rural EMS of which 25 years has been spent working with state-level systems development in rural EMS, trauma system, and injury prevention. In his current position he works with regionalized care, information management, and development of model system care, which have been core goals of his program. For example, he has worked with Montana's development of a rural, voluntary, inclusive trauma system, which is a prime example of rural, regionalized, inclusive system development. Additionally, as chair of the NASEMSO Rural EMS Committee and co-chair of the NASEMSO/NOSORH Joint Committee on Rural Emergency Care, Jim brings the rural perspective to development of emergency care systems.

Norm Dinerman is the medical director of the Access Management System, and the medical director of the Critical Care Transport Medicine System at Eastern Maine Medical Center. In these positions, he provides medical oversight of the system for transfer of patients to Eastern Maine Medical Center, as well as the statewide LifeFlight of Maine air and ground critical care transport teams and the MedComm Communications Center. He is an active participant in national, local, and statewide activities that bear upon the "perihospital" care of patients. He continues to practice clinically as an emergency medicine physician in the Department of Emergency Medicine at Eastern Maine Medical Center. Dr. Dinerman served as the chief of the Emergency Medicine Service at Eastern Maine Medical Center for 18 years, completing his tenure in this position on October 31, 2006. From June 1992 to June 1996 he served as the state EMS medical director for Maine. From March 1979 until October 1988 he served as the associate director, Department of Emergency Medicine, Denver General Hospital, Denver, Colorado, as well as the director and physician advisor for the Paramedic Division for the Denver Department of Health and Hospitals, and physician advisor to the Denver Fire Department. During the same period he served as the agency disaster coordinator for the Denver Department of Health and Hospitals. He is a former member of the National Association of EMS Physicians where he served as the chairman of the Legal Affairs Committee. He has served as a member of the EMS Technical Assistance Team for the National Highway Transportation Safety Administration on multiple occasions. He lectured as a charter faculty member of the National

EMS Medical Directors' Course and Practicum for more than 12 years. Dr. Dinerman is a native of New York City and received his undergraduate education at Columbia University and his medical degree from Yale University. He completed his internship and residency in internal medicine at the University of Colorado Health Sciences Center, Denver, Colorado. He is board certified in internal medicine and emergency medicine. He is the author of a number of articles on prehospital care and disaster medicine and has lectured extensively on these subjects. He has a deep and abiding interest in the academic, operational, and particularly, the political aspects of EMS systems in America.

Gloria Tavenner Dow is a firefighter, paramedic, and instructor with Gwinnett County Department of Fire and Emergency Services, one of the busiest departments in Georgia. She is a flight and critical care paramedic and past president of the International Association of Flight Paramedics. Active in local, regional, and national education projects, Gloria's privileged to have learned from providers and patients in Texas, Alaska, Kansas, New York, and Georgia.

Floyd (Budd) Dunson is the deputy coordinator of the Howard County Arkansas Office of Emergency Services and Fire. Here he developed and leads the county's medical first responder program. Mr. Dunson is the chief of the Mineral Springs Volunteer Fire and Rescue Department, which is the lead department for hazmat decontamination in the county. He is also one of the founding members of Howard County Search and Rescue. He is also a NREMT and a past recipient of the Star of Life. He serves as a special advisor to the Arkansas Emergency Management Association Board of Directors. Budd graduated from Central Baptist College in 1979 with a degree in religious education and has never stopped trying to learn. He is an instructor I for the Arkansas Fire Academy, a ham radio operator, a member of Midway Baptist Church, and a proud volunteer of his community.

Randy Easter is the director of Emergency Medical Services and safety officer at Memorial Hospital in McPherson, Kansas. He has been active in local, regional, and state medical response planning. He has more than 30 years of service in this field and has recently, with the help of other EMS directors throughout the state, formed MERGe—a major emergency medical response group. This group was formed to help with major disasters or events that required additional assistance from surrounding rural areas. It is currently being modeled by hospitals and law enforcement throughout the state of Kansas. He has been involved with the Kansas State Hospital Association and the South Central Kansas Regional Hospital Prepared-

ness Group. At the local level he is chair of the local emergency planning committee.

Glenn Gaines is acting United States fire administrator for the Federal Emergency Management Agency (FEMA) at the Department of Homeland Security (DHS). He assumed acting responsibilities on June 18, 2010, and is responsible for managing the United States Fire Administration and the programs and training activities at the National Emergency Training Center. Chief Gaines served with the Assistance to Firefighters Grant Program for the DHS from its inception in 2001 until 2009. He served as a principal architect and member of the senior staff for three of the primary grants managed by FEMA's Grants Program Office, and was the agency's lead in developing the Staffing for Adequate Fire and Emergency Response (SAFER) Grant program in 2005. Chief Gaines began his fire service career as a volunteer member of the Fairfax County Fire and Rescue Department in Virginia. During his 37-year career, he served in numerous capacities, including fire marshal, chief training officer, and chief of operations, culminating in his appointment as fire chief from August 1991 until December 1998. He was in charge of the nationally recognized Fairfax County Fire and Rescue Urban Search and Rescue team, frequently deployed throughout the United States as well as internationally. Chief Gaines holds a degree in fire administration. He has authored a fire service text, contributed to several others, and written numerous articles for several trade publications. He has served as a faculty member at the United States Fire Administration's (USFA) National Fire Academy, and is actively involved with organizations related to the professional development of the fire and emergency services.

Dia Gainor has served as the Bureau Chief of Emergency Medical Services for the State of Idaho Department of Health & Welfare Division of Health for over 18 years, where a major focus over the past 4 years has been facilitating a statewide multi-agency, multi-association, and multi-disciplinary project to develop legislation that would create systems of shared local governance of regionalized emergency medical services systems in rural areas. She earned a bachelor of science in Emergency Health Services Administration from the University of Maryland Baltimore County and a master's degree in Public Administration from the George Washington University in Washington, DC. During her 12 years of field experience as a paramedic and firefighter in Pennsylvania and Maryland she specialized in vehicle extrication, which continues to drive her professional interest in emergency response personnel safety during highway incidents. A past president of the National Association of State Emergency Medical Services Officials, she currently chairs their Highway Incident & Transportation Systems Committee. The committee is currently charged with overseeing two projects

of national significance: the development of a rural highway mass casualty “Event Response and Readiness Assessment” tool and a proof of concept for an inventory of emergency care resources along segments of highways nationwide. The Western Governors Association awarded her the George S. Mickelson Memorial Fellowship to complete Six Sigma certification at the Juran Institute and help others apply it to EMS challenges. In 2008 she was appointed by Secretary Peters to serve on the National EMS Advisory Council to the U.S. Department of Transportation and was selected by the administrator of the National Highway Traffic Safety Administration to serve as the Council’s first chairman. She has also served on the Intelligent Transportation Systems Transportation Safety Advancement Group since its formation in 2000, which focuses on interdisciplinary opportunities to promote technology and protect public safety personnel and travelers. As its current chairman she is leading the “Next Generation 9-1-1: What’s Next?” Forum project to identify the priorities of traditional emergency response, as well as highway operations personnel that advances in technology transmissions to and through public safety answering points in the future may make possible.

James Grove is a regional director for DHS’ Science & Technology Inter-agency and First Responder Programs Division conducting activities with other federal, state, local, tribal, academia, nonprofit, and first responder organizations and agencies in the mid-Atlantic (Virginia, West Virginia, Maryland, Delaware, District of Columbia, Pennsylvania) and Great Lakes Regions (Ohio, Indiana, Illinois, Michigan, Wisconsin, Montana). He integrates among the various organizations across all threats to identify and facilitate S&T projects and engagement within the regions. He provides a conduit to subject matter experts for government homeland security agencies and first responders. He has a broad range of experience in first responder organizations and emergency management. Mr. Grove served as an Army Medical Service Corps officer in the Maryland National Guard from October 1979 until his retirement as a colonel in January 2008. He served in various staff positions in personnel, logistics, and operations. During the last 10 years of his career he served as the state’s deputy for army operations, director of military support to civilian authorities, and joint chief of staff. In addition, Jim has served as a volunteer firefighter, emergency medical technician, and is a trained hazardous materials technician. Until June 2009, Mr. Grove served as a joint experimentation planner with Benchmark International, Inc., in Alexandria, Virginia, in support of the National Guard Bureau’s J-8 Capabilities Development Division. During this period he lead the development of the National Guard’s experimentation program, science and technology engagement and participated in the design and execution of several major experiments in support of the Na-

tional Guard's domestic operations capabilities development process. Mr. Grove received a masters degree with departmental honors from American Military University in 2000 and a bachelor of arts from Western Maryland College.

Jennifer Hamerlinck is the director of the Mercer County Emergency Management Agency in Mercer County, Illinois, and a public health nurse at Mercer County Health Department. She has 8 years of experience in emergency planning, program coordination, and rural response. She is the co-coordinator for the Tri-County Medical Reserve Corps, supervisor for the Mercer County Flood Relief Program, and a grant writer. She is a recipient of the Certificate of Recognition, Office of Security, Illinois DHS, "Dedicated Service to Illinois residents affected by the 2008 floods" 3/10; and was nominated for the Local Leadership Award at the Illinois Department of Public Health 2nd Annual Director's Awards Reception 2010. Past response coordination includes the June 2008 severe flooding of the Mississippi River with Mercer County being declared a federal disaster area, the 2007 ice storm causing widespread and long-term power outages, and H1N1 response. She has designed and facilitated numerous tabletop, functional, and full-scale exercises including pandemic influenza response, mass medication dispensing site, and mass triage during a chemical incident. Mrs. Hamerlinck has extensive experience in the integration of ICS into a rural response system at the county and regional levels. She lives on a farm with her husband Steve, daughter Jesse, and son Noah.

Michael Handrigan currently serves as a senior medical advisor and acting director for the Emergency Care Coordination Center within the Office of the Assistant Secretary for Preparedness and Response (ASPR) at the Department of Health and Human Services. He is an emergency medicine physician with expertise in the science and practice of hemorrhagic shock and resuscitation. Prior to his current role with ASPR, Dr. Handrigan held basic science and clinical research positions with the Center for Outcomes and Evidence in the Agency for Health Care Research and Quality and with the United States Navy through the Henry M. Jackson Foundation for the Advancement of Military Medicine. He also served as an active duty emergency physician and researcher for the United States Army.

Dan Hanfling is special advisor to the Inova Health System in Falls Church, Virginia, on matters related to emergency preparedness and disaster response. He is a board-certified emergency physician practicing at Inova Fairfax Hospital, northern Virginia's level I trauma center. He serves as an operational medical director for PHI Air Medical Group—Virginia, the largest private rotor-wing air medevac service in the Commonwealth of Vir-

ginia, and has responsibilities as a medical team manager for Virginia Task Force One, a FEMA- and USAID-sanctioned international urban search and rescue team. He has been involved in the response to international and domestic disaster events, including the response to the Izmit, Turkey, earthquake in 1999, the Pentagon in September 2001, the response to Hurricanes Rita and Katrina in 2005, and Gustav and Ike in 2008, and most recently, the devastating earthquake in Port-au-Prince, Haiti. Dr. Hanfling was integrally involved in the management of the response to the anthrax bioterror mailings in the fall of 2001, when two cases of inhalational anthrax were successfully diagnosed at Inova Fairfax Hospital. Dr. Hanfling serves on a number of committees focused on disaster-related efforts, including those established by HHS/ASPR, DHS, and the Department of Veterans Affairs. He has contributed to a number of Institute of Medicine Preparedness Forum projects. And he has authored and coauthored articles on subjects related to hospital preparedness and response. Dr. Hanfling received an AB in political science from Duke University and was awarded his medical degree from Brown University. He completed an internship in internal medicine at the Miriam Hospital in Providence, Rhode Island, and an emergency medicine residency at George Washington/Georgetown University Hospitals. He is clinical professor of emergency medicine at George Washington University and an invited member of the George Mason University School of Public Policy Advisory Board.

Jenny Hansen is the CEO of Strategic Partnerships, Inc., a woman-owned small business providing project management support to government agencies undertaking large-scale efforts in public safety communications. Jenny has over 30 years experience in the field of public safety. Much of her career was spent in the San Francisco Bay area where she worked as a supervisor of emergency communications for various agencies including the San Jose Police Department, San Jose Fire Department, San Francisco International Airport, and as a logistics specialist for FEMA Urban Search and Rescue Task Force 3 in Menlo Park, California. She then moved to Montana for a communications integration project in Bozeman, then onto Helena, Montana, where she served as chief of public safety services for the state, creating statewide 9-1-1 and interoperable land mobile radio projects. Her expertise was requested in Washington, DC, where she managed the US-DOT Next Generation 9-1-1 Project and worked closely with the public and private sectors in developing new standards for routing emergency communications in an IP environment. Jenny has been involved in many public safety issues including efforts with local, state, federal, and tribal agencies around the country. She is currently contracted with the U.S. Navy, Space and Naval Warfare Systems Center in Charleston, South Carolina,

and with the State of Pennsylvania Police Department for assistance in consolidating their command center operations.

Kelly Hardy is a highway safety engineer with over 10 years of experience in the highway safety field. She has worked on various highway safety research and development projects for the National Cooperative Highway Research Program and the Federal Highway Administration. As the program manager for safety for the past year at AASHTO, Kelly is responsible for supporting member departments' efforts to improve highway safety from the "4E" perspective (engineering, enforcement, education, and emergency medical response). Kelly coordinates with highway safety partner organizations, and supports AASHTO committees, research projects, and implementation of safety-related publications. Kelly has bachelor and master degrees in civil engineering from Pennsylvania State University.

Christopher A. Hart was sworn in as a member of the National Transportation Safety Board on August 12, 2009, and designated by the President for a 2-year term as vice chairman of the board on August 18. Member Hart joined the board after a long career in transportation safety, including a previous term as a member of the NTSB. Immediately before returning to the board, Member Hart was deputy director for air traffic safety oversight at the Federal Aviation Administration. He was previously the FAA assistant administrator for the Office of System Safety. He served as a member of the NTSB from 1990 to 1993. After leaving the board, he served as deputy administrator of the National Highway Traffic Safety Administration, before moving to the FAA in 1995. From 1973 until joining the board in 1990, Member Hart held a series of legal positions, mostly in the private sector. He holds a law degree from Harvard University and master's and bachelor's degrees in aerospace engineering from Princeton University. He is a member of the District of Columbia Bar and the Lawyer-Pilots Bar Association. Member Hart is a licensed pilot with commercial, multiengine, and instrument ratings. Member Hart's family has a tradition of accomplishment in the field of transportation. His great uncle, James Herman Banning, was the first African-American to receive a pilot's license issued by the United States government, in 1926. His term expires December 31, 2012.

Eileen Holloran is the program coordinator of the HRSA Office of Rural Health Policy where she works to improve health and achieve health equity through access to quality services, a skilled health workforce, and innovative programs. Ms. Eileen Holloran joined the Office of Rural Health Policy in 1991. She is currently the coordinator of the Rural Health Network Development Planning Grant and the Rural Access to Emergency Devices Grant (RAED) Programs. Ms. Holloran is the resident staff expert in the

following focus areas: Transportation, Chronic Disease Management, and Emergency Medical Services. Ms. Holloran has been a public health analyst since 2002 and has directed multiple office programs.

Richard C. Hunt is the director of the Division of Injury Response in the National Center for Injury Prevention and Control (NCIPC). With 20 years of experience in emergency medicine and acute injury care research, he has been instrumental in leading an effort to identify gaps that exist in the area of acute injury care for our nation. In addition, since his appointment, he has guided research and preparedness activities in disaster and terrorism response as it relates to injuries and fostered partnerships with the acute injury care community that will be crucial in a mass casualty event. Dr. Hunt began his career at CDC in 2004. Prior to that time, he served as professor and chair of the department of emergency medicine at the State University of New York, Upstate Medical University at Syracuse.

John Isfort is currently the director for business development and physician services at Marcum & Wallace Memorial Hospital in Irvine, Kentucky. In addition, he serves as the manager of the Trauma Care program. John is also a paramedic for the Madison County Emergency Medical Services in Richmond, Kentucky. John has been actively involved in rural health issues at the local, state, and federal level. He is a 2007 graduate of the Rural Voices program sponsored by the U.S. Health and Human Services, Health Resources Services Administration (HRSA) Office of Rural Health Policy. John regularly serves as a grant reviewer for HRSA. John has been involved in EMS for over 28 years and is currently an ACLS, PALS, and ITLS instructor. He has been a flight paramedic, dispatcher, and administrator for a hospital-based air medical service as well as a paramedic/shift supervisor for a municipal emergency medical service. He currently serves as the chairman of the Estill County Ambulance Taxing District in Irvine, Kentucky. In this position, John provides oversight and leadership to a rural EMS agency that responds to approximately 3,000 calls annually. John also serves on the Kentucky Trauma Advisory Committee (KTAC) subcommittee on hospital verification. This committee is charged with providing site visits and verification of compliance to those hospitals seeking to become trauma centers in Kentucky. John's interest includes rural health issues related to disease prevention, early detection, and transportation. His EMS interest includes prehospital quality assurance/performance improvement, patient satisfaction, 9-1-1 communications, advanced airway management, air medical service, and grant funding for EMS. He holds both associate and bachelor degrees from Eastern Kentucky University and has completed graduate work in public administration.

Jerry Johnston is a second-generation EMS provider who began his career in 1975. He has been employed by private as well as hospital-based EMS systems. He currently holds the position of EMS director at Henry County Health Center (HCHC) in Mt. Pleasant, Iowa, a countywide all-ALS system. In 1998, HCHC EMS was the recipient of NAEMT's Paramedic Ambulance Service of the Year award. He serves on a variety of local, state, and national organizations and associations. He is a past president of the Iowa EMS Association. He is currently immediate-past president of the National Association of EMTs, an organization where he has served on the board of directors, as treasurer and as president.

Rick Jones is operations issues director for the National Emergency Number Association (NENA). He provides leadership and guidance for NENA's various operationally focused committees and working groups which develop operations standards, best practices, and other operational guidelines. He participates in the U.S. Department of Transportation (DOT) NG9-1-1 Project and 9-1-1 Technical Assistance Center. He has participated in the National Telecommunications and Information Administration (NTIA) TOPS 9-1-1 project on behalf of NENA, with Texas A&M University and Columbia University. He has also participated in the NENA Strategic Wireless Action Team Project, the US-DOT Wireless 9-1-1 Project, and various telecommunications standards-related groups including North American Numbering Council (NANC) Issues Management groups and various Alliance for Telecommunications Industry Solutions (ATIS) committees. He is a member of the E9-1-1 National Stakeholder Council, a group representing the deaf, hard-of-hearing, deaf-blind, and speech-impaired community. He helps manage NENA's Next Generation 9-1-1 Project, including the Next Generation Partner Program. He is often involved in reaching out to the Association of Public Safety Communications Officials (APCO) to be sure staff/members are represented on various initiatives, particularly those related to NG9-1-1, and he serves on various APCO committees, including data exchange/interaction and telematics. He previously served 25 years as public safety communications manager (including 9-1-1, 1989–2002) for a public safety answering point in northern Illinois.

Kenneth R. Knipper is director of the State National Volunteer Fire Council in Kentucky. His emergency service began in 1976 when he joined the Silver Grove Volunteer Fire Department. He was promoted to chief engineer within 8 months, promoted to lieutenant in 1978, to captain in 1981, and elected chief in 1986. Kenneth also served as president in 1980 and 1981 and is still active today. Kenneth recently served on the committee that resulted in his department's fire district merger with two other fire districts. In 1984 Kenneth joined the Campbell County Firefighters Educational As-

sociation, was elected president in 1989, and served on and chaired many committees. In 1984 Kenneth began attending the Northern Kentucky Firefighters Association, served on many committees, and was elected president in 1991. Kenneth also served as a board member on the regional hazmat team. In 1985 the president of the Kentucky Firefighters Association (KFA) asked Kenneth to chair their EMS Committee, where he served in that position until 1998. In 1992 Kenneth was asked to chair the National Volunteer Fire Council (NVFC) Committee, and has served in that position to date. In that capacity Kenneth represents Kentucky's more than 13,000 volunteer firefighters at the national level. Kenneth was inducted into the KFA Hall of Fame in 2008. The NVFC chairman asked Kenneth to chair their EMS Committee, and he has served in that position since 1995. He also represented them on NFPA EMS committees and other federal and organization committees. In 1997 the County Judge Executive asked Mr. Knipper to become the full-time director of the Office of Emergency Management. Kenneth retired from that position in 2008. In 2008 Mr. Knipper was appointed to the National EMS Advisory Council to represent volunteer EMS providers. Mr. Knipper was reappointed in 2010.

Jon R. Krohmer is the assistant secretary (acting) for health affairs and chief medical officer of the United States Department of Homeland Security (DHS). He began his service with the DHS in September 2006 and prior to his appointment to this position in August 2008, he served as the first principal deputy assistant secretary for health affairs and deputy chief medical officer. Prior to his work at the DHS, he was an attending physician and director of EMS, Emergency Medicine Residency, and the Department of Emergency Medicine at the Spectrum Health Butterworth Campus in Grand Rapids, Michigan. In addition, Dr. Krohmer was an associate professor of emergency medicine at the College of Human Medicine at Michigan State University in East Lansing, Michigan. He is the former EMS medical director of Kent County Emergency Medical Services and was the medical director for the West Michigan Metropolitan Medical Response System, the Kent County Medical Reserve Corps, and the Michigan Region 6 Bioterrorism Preparedness Consortium.

Linda Larson has been in the EMS field for the past 10 years. She is currently an EMT-Intermediate and is the EMS director for San Juan County EMS, which provides EMS service for one of the largest counties, including portions of the Navaho Nation, in Utah. She also, serves as the assistant team leader for the Utah Department of Health, Bureau of EMS southeastern EMS Strike Team. These teams are deployed upon request from local jurisdictions through the State Bureau of EMS.

Rifat Latifi is professor of clinical surgery at the University of Arizona, and vice chair for international relations, and director of telemedicine at the University Medical Center in Tucson, Arizona. He is the associate director of the Arizona Telemedicine Program where he leads telesurgery and international affairs. He is the founder and chief executive officer of the International Virtual e-Hospital (IVeH) (www.iveh.org), as well as both the founder and director of the Telemedicine Program of Kosova (TPK) (www.telemedks.org) and the Southern Arizona Teletrauma and Telepresence (SATT) Program at the University of Arizona in Tucson, Arizona (www.surgery.arizona.edu). Dr. Latifi specializes in trauma, general surgery, and critical care, with special interest in reoperative surgery, advanced laparoscopic surgery, and nutritional support of surgery and critically ill patients. He has published eight books and has authored or coauthored over 100 articles and book chapters. Dr. Latifi's principal interests in telemedicine are international collaborations and development of telemedicine and educational programs including electronic libraries in the underdeveloped countries and rural America. An upcoming book edited by Dr. Latifi and Dr. Poropatich on *Telemedicine for Trauma, Disaster and Emergencies Management* is in print and will be published this year. Dr. Latifi joined the University of Arizona's Department of Surgery, Section of Trauma, Critical Care, and Emergency Surgery in 2003. His dedication and passion for improving health care in rural regions and underdeveloped countries has led to several advancements and achievements in telemedicine and teletrauma. Dr. Latifi's leadership has led to the following accomplishments both nationally and internationally:

- The establishment of the IVeH in 2001 as a nonprofit foundation dedicated to improving the healthcare infrastructure in developing countries through the application of telemedicine and e-health.
- Establishment and implementation of the Telemedicine Program of Kosova (TPK) in 2002. Created to help rebuild the medical system in Kosova by introducing and implementing telemedicine, telehealth, and virtual education programs through a four-pronged model: Initiate, Build, Operate, and Transfer (IBOT). The TPK, and the IBOT platform in which it was developed, serves as a model for the development of sustainable telemedicine and e-health systems in developing countries.
- Development of the Southern Arizona Teletrauma and Telepresence Program (SATT) in 2004.
- Awarded an international grant for improving healthcare in the Balkans using telemedicine, advanced technologies, and cultural exchange program as a platform.

- Implementation of the nation's first Tucson ER-Link Telemedicine Project with the Tucson Fire Department and the City of Tucson.
- Medical director Amazon Swim Expedition, 2007. (www.amazon-swim.com/medicalteam).
- Recently awarded an international grant for establishing an integrated telemedicine and e-Health program in Albania, by USAID, using the IBOT model. He has been invited as a key note speaker and has presented at more than 100 national and international scientific meetings around the world and has been featured in the media around the world.

Deborah Levy is a captain with the U.S. Public Health Service and chief of the healthcare preparedness activity in the Division of Healthcare Quality Promotion (DHQP) at the Centers for Disease Control and Prevention. Captain Levy's primary interest is all-hazards healthcare preparedness and emergency response (including pandemic influenza, bioterrorism agents, and natural disasters such as hurricanes and earthquakes). She focuses on working with communities to assist them with integrating planning of the healthcare, public health, and emergency management sectors to improve response to surges of patients during incidents. This focus includes conducting workshops on community models of delivery of health care, implementing alternate care systems, conducting stakeholder (e.g., call centers, primary care) meetings to develop implementation tools and workbooks, as well as working with medical societies, academicians, and practicing clinicians to develop triage and clinical algorithms to cope with a surge in patients. In addition, she has been working with state and local partners through cooperative agreements to identify essential healthcare services under conditions of surge and scarce resources. Captain Levy joined the CDC in 1996 as an epidemic intelligence service officer in the Division of Parasitic Diseases where she focused on waterborne and foodborne diseases as well as water security issues, and moved to the DHQP in 2003. She earned a B.A. in psychology and a master's of public health in epidemiology from the University of California, Los Angeles, and a Ph.D. in epidemiology from Johns Hopkins University's Bloomberg School of Hygiene and Public Health.

Charles W. Mains is the trauma medical director for Centura Health Trauma System, which includes 14 trauma centers throughout Colorado. In addition, he is the medical director of St. Anthony Central's American College of Surgeons verified level I trauma center. Rural trauma experience includes holding the position of medical director of both a level III and a level IV trauma center. As chairman of the Denver Metropolitan Regional Trauma Advisory Council and chairman of the Colorado State Trauma

Center Designation Review Committee, Dr. Mains has extensive experience with trauma care delivery. Dr. Mains holds a bachelor of science degree from the University of Tennessee, a doctor of medicine from Duke University, and completed his surgical residency at the University of Colorado. He is board certified by the American Board of Surgery and is a fellow of the American College of Surgeons. He is a course director for Advanced Trauma Life Support through the American College of Surgeons and is an instructor for fundamentals of critical care support through the Society of Critical Care Medicine.

Gregory Mears is an associate professor in the Department of Emergency Medicine at the University of North Carolina at Chapel Hill. Dr. Mears serves as the EMS medical director for the State of North Carolina and is the executive director for the Emergency Medical Services Performance Improvement Center (EMSPIC). The EMSPIC serves as a resource and technical assistance center for EMS performance improvement activities and houses the North Carolina PreHospital Medical Information System (PreMIS), a component of the National EMS Information System Project (NEMSIS), the EMS Performance Improvement Toolkit Project, and the State Medical Asset Resource Tracking System (SMARTT). Dr. Mears has well-documented interest and expertise in topics such as EMS services systems, EMS performance improvement, and EMS data systems. Dr. Mears served as the principal investigator for the National EMS Information System Project until 2006, and is still serving as a co-investigator with the NEMSIS Technical Assistance Center and the National EMS Database. Dr. Mears is a member of, and has served in a leadership role of, multiple professional organizations over the past 20 years including the American College of Emergency Physicians, the National Association of EMS Physicians, and the National Association of State EMS Officials. Dr. Mears was named by the *Journal of EMS* (JEMS) as one of the top 10 EMS innovators of 2008.

Glenn Mitchell was named chief medical officer after joining the Sisters of Mercy Health System 4 years ago as vice-president for clinical safety. He is now responsible for developing and implementing a full spectrum of physician-related programs such as evidence-based medicine use and effective peer review, and for the development of medical informatics, as well as for safety and quality across the organization. For 30 years he has been actively involved at the local and national level, in the development of emergency and preventive medicine, clinical and administrative practice, medical information systems, provider and staff education, and disaster medicine. Dr. Mitchell is a graduate of Brown University and Brown University Medical School in Providence, Rhode Island. He is board certified

in both emergency medicine and aerospace medicine. He is also a certified physician executive. At Brown University he became chief of emergency medicine at Memorial Hospital, assistant professor at the medical school, and the first medical director of Rhode Island's EMS system. He was placed on the National Emergency Mobilization Board by Surgeon General Koop to guide the formation of the National Disaster Medical System and was the founding chair of the American College of Emergency Physicians' (ACEP) Disaster Committee. In 1984, he entered the active duty Army, serving at Ft. Rucker, Alabama; USUHS medical school in Bethesda, Maryland; Brooks Air Force Base and Brooke Army Medical Center in San Antonio, Texas; the Multinational Force and Observers in the Sinai Desert, Egypt; Eisenhower Army Medical Center at Ft. Gordon, Georgia; the U.S. Army War College; U.S. Southern Command; Headquarters, U.S. Army Medical Command; and finally as commander of William Beaumont Army Medical Center at Ft. Bliss, Texas, where he retired from active duty in March 2005. Prior to joining Mercy, he spent 2 years as chief of emergency medicine and director of ambulatory care while practicing full-time emergency medicine and improving the EMS system for the Indian Health Service, serving the Navajo Nation at Ft. Defiance, Arizona. Dr. Mitchell holds several clinical academic appointments including clinical associate professor at University of Texas Medical Branch, Galveston. He is past president of the International Aerospace Medical Association, and former vice chair of the American Board of Preventive Medicine. In 2002, he received the Outstanding Military Emergency Physician Career Award in recognition of his achievements. Dr. Mitchell has received many other honors and awards including the Defense Superior Service Medal, three awards of the Legion of Merit, and Master Flight Surgeon wings. He has published over 40 papers and book chapters.

Paul Patrick is deputy director for the Division of Family Health and Preparedness for the Utah Department of Health. On February 13, 2006, Dr. Patrick was selected as the emergency medical services director and public health and hospital preparedness director for the State of Utah. In 1988, Dr. Patrick began working for the State of Utah, Bureau of Emergency Medical Services, as a regional consultant. In addition to his normal duties he received additional training at the state and national level. In 2000 he became a program manager for the bureau supervising the Technical Assistance and Quality Assurance Program, and in 2005 he also took on the role as acting director for the bureau. From 1983 to 1986, he served as an affiliate faculty member for the Utah Chapter of the American Heart Association serving as chairman of the chapter for 2 years. In 1987, Dr. Patrick served 2 years on the national faculty for the American Heart Association, and he is currently a member of the Western Regional Stroke Task Force.

Following graduation he worked in the construction industry for 14 years as a supervisor, foreman, and general building contractor. In 1978, Dr. Patrick was certified as an emergency medical technician and worked for 25 years as a volunteer with the Springville Ambulance Service. Dr. Patrick earned a design engineering degree in 1978 from Brigham Young University. He has received many quality awards from the Department of Health, was involved extensively during the 2002 Salt Lake Winter Olympics, preparations for the 2004 Athens Summer Olympics, and with the many agencies in the state on EMS issues.

Sally Phillips is the deputy director of the Health Threats Resilience Division in the office of Health Affairs at the Department of Homeland Security (DHS). Prior to joining DHS, she was a senior nurse scholar at AHRQ, managing a portfolio that ranged from her primary area of bioterrorism to multidisciplinary education for safety and related healthcare workforce initiatives. Prior to her work at AHRQ, Dr. Phillips was a Robert Wood Johnson Health Policy Fellow and Health Policy Analyst for Senator Tom Harkin for 2 years. She brought a wealth of expertise in the area of multidisciplinary education, patient safety legislative initiatives, and curriculum with health professions education to her role at AHRQ. Dr. Phillips joined the AHRQ staff in September 2002 as the director of the Bioterrorism Preparedness Research Program, now the Public Health Emergency Preparedness Program. She is an accomplished author, consultant, and speaker on public health, medical preparedness, and response research initiatives. Dr. Phillips holds a Ph.D. from Case Western Reserve University in Cleveland, Ohio.

Robert Pollack has been the safety data manager for FHWA's Office of Safety since November 2005. In this position he is responsible for developing programs to improve the quality of the data used to make safety decisions. This includes programs such as the Model Inventory of Roadway Elements (MIRE) and the Crash Data Improvement Program (CDIP). Prior to joining the FHWA he spent 18 years as a highway safety specialist for NHTSA's Chicago Regional Office where he was the traffic records coordinator. In this capacity he interacted with the Traffic Records Coordinating Committees for Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin, as well as assisting in the developing the operational methodology for the Section 408, Data and Traffic Records Systems Improvement Program. He has a BS in psychology and a MS in experimental psychology from Illinois State University.

Barbara J. Quiram serves as director of the Office of Special Programs, director of the USA Center for Rural Public Health Preparedness, and

professor of health policy and management at the Texas A&M Health Science Center School of Rural Public Health. She represents the school at the local, regional, state, and national level and serves as principal investigator/project director on a wide range of public health practice and research projects, including the CDC-funded USA Center for Rural Public Health Preparedness and the HRSA-funded Texas Public Health Training Center. Dr. Quiram has over 35 years experience in health care and public health. In 2002, Dr. Quiram codeveloped and implemented the Texas Training Initiative for Emergency Response (T-TIER), a self-supporting, continuing education initiative and the first such training offered in the state. Due to the national attention T-TIER received and the need for this type of training initiative beyond Texas, it was expanded nationally into USA-TIER and taken to other rural states, including South Dakota and Maine. Dr. Quiram has obtained and managed more than 30 projects and research grants. Her research, training and evaluation interests include rural emergency preparedness, rural public health infrastructure, public health workforce development, health policy, and rural community capacity development.

Aarron Reinert is the executive director for Lakes Region EMS. Lakes Region EMS is a rural ambulance service covering a 450-square-mile service area composed of 40 full-time staff with a paramedic/EMT staffing pattern. Previous to Lakes Region EMS, Aarron was the field services manager for the Minnesota Emergency Medical Services Regulatory Board. At the EMSRB, his projects included creating and implementing a statewide web-based data collection system, developing statewide EMS communication systems, and coordinating EMS bioterrorism preparedness. Aarron is considered a national expert in EMS data collection and also a leader in leadership training for current and future leaders in EMS. He has served as a subject matter expert for numerous states such as Georgia, Nebraska, and New Hampshire as they began to develop statewide EMS data collection systems. Additionally, he assisted the country of Ireland to explore the development and implementation of a national EMS data collection system. Aarron was recently reappointed by the U.S. Secretary of Transportation to serve on NHTSA's National EMS Advisory Council. He has pioneered the use of the Balanced Score Card within ambulance services. He continues to be a practicing paramedic of 20 years, has a B.A. in organizational leadership, and is a regular educator for ambulance management and leadership, and he is a consultant for Public Safety Communications and EMS data collection.

Nels Sanddal is the president of Critical Illness and Trauma Foundation and past-director of the Rural Emergency Medical Services and Trauma Technical Assistance Center (REMSTTAC). Mr. Sanddal has been involved

in EMS since the 1970s and has held many state, regional, and national positions in organizations furthering EMS causes, including president of the Intermountain Regional EMS for Children Coordinating Council and core faculty for the Development of Trauma Systems Training Programs for the U.S. Department of Transportation. Mr. Sanddal is a nationally registered emergency medical technician-basic, volunteers with a local fire department, and has been a board member of the CIT Foundation since its inception in 1986. Mr. Sanddal holds a M.S. in psychology.

Dorothy Spears-Dean is a communication and technology professional with over 16 years of experience, possessing extensive knowledge of public safety technology issues affecting state and local governments. She holds an M.B.A. from the University of Richmond and a B.A. from the College of William and Mary. Currently, she is employed by the Virginia Information Technologies Agency as the public safety communications coordinator and is responsible for managing the Commonwealth's 9-1-1 program and spectrum assets. In conjunction with her professional responsibilities, Ms. Spears-Dean is an accomplished author and presenter, having had numerous articles on topics related to information technology published in professional journals. She also has designed a grant management course for the National Emergency Number Association, which she regularly presents around the country, along with lecturing on 9-1-1 related topics at numerous state and national conferences. In addition to her work with the Commonwealth of Virginia, she is completing her Ph.D. in public policy and administration at the Center for Public Policy on the campus of Virginia Commonwealth University.

Craig Thomas is the chief of the Outcome Monitoring and Evaluation Branch where he is responsible for developing and evaluating public health emergency preparedness program standards and outcome measures that support program improvement and accountability. He joined the Centers for Disease Control and Prevention in 1998 where he served as a behavioral scientist responsible for planning and conducting evaluation activities in support of the Division of HIV/AIDS Prevention. In 1999, Craig accepted an evaluation position in the Epidemiology Program Office, Guide to Community Preventive Services Branch, where he was responsible for developing and managing evaluation projects assessing the dissemination and implementation of published findings from the Guide to Community Preventive Services. In 2003, Craig joined the Program Evaluation Research Branch in the Division of HIV/AIDS Prevention where he developed and implemented the Program Evaluation and Monitoring System (PEMS) and associated projects focused on evaluating CDC-funded HIV/AIDS prevention programs and activities. Dr. Thomas received his Ph.D. in social psychology

with an emphasis in applied research methods, measurement, and program evaluation. He has over 10 years of professional experience in the planning, design, and implementation of evaluation projects and initiatives across a range of public health programs including mental health, tobacco prevention and control, public health emergency management and response, and the prevention of STDs, HIV, and unintended pregnancy.

Debbie Von Seggern-Johnson is the EMS/trauma coordinator for the University of Nebraska Medical Center in Omaha, Nebraska. Prior to her role at UNMC, she was the BLS/ALS program coordinator at Nebraska Methodist College. Deb began her career in EMS in 1991 and has remained active with various volunteer agencies. She is currently a nationally registered paramedic, a Nebraska state-certified EMS instructor and is the assistant fire chief of the North Bend Volunteer Fire Department. She has been involved with and served on many organizations and committees at the national, regional, state, and local levels of EMS and the American Heart Association for many years. In 2000, she was the recipient of the Leo O'Brien Jr. Award for Excellence and Outstanding Contributions to EMS, and AHA Coordinator of the Year in 2001 and 2002. She also received the Chuck Woll Memorial-EMS Instructor of the Year in 2002. Deb is currently the Nebraska EMS Association (NEMSA) president and past president of the Nebraska Association for Advanced Providers. She has taught all levels of healthcare professionals, including first responders up to physicians who serve as medical directors in the areas of initial and continuing education needs. One of her personal goals is to actively mentor emergency healthcare professionals in the areas of effective communication and organizational needs specific to their areas. Deb has organized and chaired many state and regional emergency medicine conferences for prehospital providers and clinicians. In 2010, Deb received UNMC's Chancellor's Silver U award for special achievements to help meet UNMC's mission. She has touched many lives through her career in EMS, and her passion remains strong.

Leonard J. Weireter, Jr., is the Arthur and Marie Kirk Family Professor of Surgery at Eastern Virginia Medical School. He is the medical director of the Shock Trauma Center at the Sentara Norfolk General Hospital in Norfolk, Virginia. He is a governor of the American College of Surgeons and is the chairman of the ad hoc Committee on Disaster and Mass Casualty Management of the American College of Surgeons Committee on Trauma.

Jolene R. Whitney has worked with the Bureau of Emergency Medical Services, Utah Department of Health, for 29 years. She spent the first 6 years of her career as a regional EMS consultant traveling through nine counties in rural Utah. She became assistant training coordinator in 1986. She was pro-

moted to program manager for EMS systems and trauma system development in 1991. Ms. Whitney is currently the deputy director for the Bureau of EMS and Preparedness, and supervises 22 staff performing various functions related to trauma system development (including stroke and STEMI), chemical stockpile emergency preparedness, surge capacity and MCI planning, emergency department, trauma and prehospital databases, EMS licensing and operations, BCI, certification and testing processes, critical incident stress management, National Disaster Medical System, EMS medical disaster resources, and the EMS for Children Program. Jolene earned her masters in public administration from Brigham Young University and a B.S. in health sciences, with an emphasis in community health education from the University of Utah. Jolene made the dean's list in her masters program and graduated with cum laude honors with her undergraduate degree. She was certified as an EMT-basic in 1979. She also obtained certification as an EMT instructor and became certified as an EMT III (intermediate) in 1983. She has attended numerous conferences, courses, and workshops on EMS, trauma, and disaster planning and response (ICS 100, 200, 700, and 800). Jolene is a coauthor for three publications on domestic violence, and state and hospital surge capacity planning. Ms. Whitney has served on several national committees and teams, which include state EMS system assessments for NHTSA (Michigan, Delaware, Oklahoma, and Missouri), ACS trauma system assessments (Minnesota, Alaska, Louisiana, Colorado, and Texas), HRSA rural trauma grant reviewer, and contributor to the development of the HRSA model trauma system plan, the NASEMSO trauma system planning guide, National Trauma Data Standards, and the NHTSA curriculum for EMT refresher course. Jolene is the current chair for the National Council of State Trauma System Managers/NASEMSO and served as vice chair for the previous 2 years. She is a member of the American Trauma Society, Utah Emergency Managers Association, and previous member of the National Association of State EMS Training Coordinators and Utah Public Health Association. Ms. Whitney spent 250 hours in the Olympic Command Center, serving as an EMS liaison for the 2002 Winter Olympics in Salt Lake City, Utah. She assisted in the passage of state legislation and funding for the EMS grants program, trauma system, DNR, and CISM. In 2005, Jolene was nominated by her staff and received a Utah Manager of the Year Nominee Award from the governor. She also received appreciation from the Utah Association of Emergency Medical Technicians in 2006 for dedication and support.

Timothy Wiedrich is section chief of the Emergency Preparedness & Response at the North Dakota Department of Health. Tim Wiedrich joined the North Dakota Department of Health in 1984 as a program representative for the Division of Emergency Health Services. He became the state

emergency medical services training coordinator in 1986 and was appointed director of the division in 1988. In 2002, Tim became a section chief for the North Dakota Department of Health reporting directly to the state health officer. Divisions within Tim's section include the Division of Public Health Preparedness, the Division of Hospital Preparedness, and the Division of Emergency Medical Services and Trauma. Tim also directs the Division of Education Technology. Tim received bachelors and masters degrees in business administration and management from the University of Mary. He received a Certificate of Public Health Emergency Preparedness from the University of Minnesota School of Public Health. He is a past president of the National Association of State Emergency Medical Services Directors. He served as the first president of the Directors of Public Health Preparedness, which is a national organization of state officials organized under the Association of State and Territorial Health Officials. On October 19, 2009, Tim received the State-Level Excellence in Public Health Award from the Association of State and Territorial Health Officials. This national award is given to recognize outstanding service on behalf of the public health community.

Gamunu Wijetunge is a 2008 graduate of the University of Maryland College Park (UMCP) School of Public Policy with a master's in public management. He was admitted to public administration honors society (Pi Alpha Alpha). He has been an actively practicing volunteer paramedic, firefighter, and lieutenant with the Wheaton Volunteer Rescue Squad since 1995. Gamunu is currently a staff member in the Office of Emergency Medical Services (OEMS) at the National Highway Traffic Safety Administration (NHTSA). He is a staff specialist on homeland security/preparedness, workforce issues, and pandemic flu planning.

Linda Williams is Chouteau County emergency management coordinator and an affiliate faculty member at Montana State University. Linda has been the county extension agent for 33 years and the emergency management coordinator for 23 years. This unique combination of responsibilities has melded together to form the basis for her public education-focused rural emergency preparedness programs. In 2007 Chouteau County was the recipient of the "Model Community" award from the CDC. The plaque reads, "For establishing and implementing effective strategies that enhance collaboration and strengthen the relationship between public health and emergency care, thereby serving as an example to other communities to promote the improvement of daily operations and disaster preparedness nationwide." Throughout the years, Linda has been fortunate to be involved in a wide range of emergency-related experiences including: EMT on the Ft. Benton ambulance, 9-1-1 coordinator, Critical Incident Stress Management

Team, and Interagency All-hazard Incident Management Team qualified. As part of an all-hazard incident management team, she has been involved with numerous incident responses and ICS planning for events. Linda also represents MSU as a delegate to the national Extension Disaster Education Network (EDEN) and serves as a board member and treasurer for the Critical Illness and Trauma Foundation.

Robert Winchell is currently the chair of the Trauma Systems Evaluation and Planning Committee of the American College of Surgeons Committee on Trauma. He is also the head of the Division of Trauma and Burn Surgery at the Maine Medical Center, and associate clinical professor of surgery at the University of Vermont School of Medicine. Dr. Winchell received his undergraduate degree from the California Institute of Technology, and his M.D. from Yale University. He did his internship, general surgery residency, and trauma and critical care fellowship at the University of California, San Diego, where he remained on the faculty as associate professor of clinical surgery in the Division of Trauma until 2000. After leaving the University of California, Dr. Winchell established and subsequently directed the Tacoma Trauma Center in Washington, a successful new trauma center operated as a joint venture between two previously competing hospitals. Dr. Winchell moved to the Maine Medical Center in 2001, and assumed his current post in 2004. Dr. Winchell has been involved in trauma center and trauma system design and operation throughout his career in a wide variety of settings covering the spectrum of system development. He was involved with both the day-to-day operations and ongoing development of the San Diego County trauma system for over 10 years and served as chair of the San Diego and Imperial County Committee on Trauma. He participated in the operation and ongoing development of the Washington state trauma system, serving on the state advisory board, and as chair of the Southwest EMS region. Since coming to Maine, Dr. Winchell has worked to develop the Maine state system, is a member of the state advisory board, and was the chairman of the Maine State Committee on Trauma until 2010. In addition to his work with the Trauma Systems Evaluation and Planning Committee, Dr. Winchell also serves as a senior site reviewer for the trauma center verification program of the ACS COT. Dr. Winchell is board certified in general surgery, with added qualifications in surgical critical care. He is a fellow of the American College of Surgeons and a member of its Committee on Trauma, and is also a member of the American Association for the Surgery of Trauma, the Association for Academic Surgery, the Southwest Surgical Congress, and the Society of Critical Care Medicine. He is author of more than 40 scientific papers and book chapters, and has given over 100 regional, national, and international presentations.

Gary Wingrove is director of government relations and strategic affairs for Mayo Clinic Medical Transport of Minnesota and Western Wisconsin. He is president of the National EMS Management Association; chairs the EMS Issue Group of the National Rural Health Association; is president of the Center for Leadership, Innovation, and Research in EMS; and is chairman of the International Roundtable on Community Paramedicine.

Myra L. Wood has been chief executive officer of Vital Link Emergency Medical Service since August 1990 and came into EMS from a nursing and hospital administration career of 13 years. Mrs. Wood has advanced Vital Link EMS from a one-county intermediate service to a paramedic/advanced life support ground ambulance service for three counties and 80,000 people in north central Arkansas. Under Mrs. Wood's leadership Vital Link EMS has achieved accreditation by the Commission on Accreditation of Ambulance Services and has been named the Arkansas ALS Service of the year twice. Mrs. Wood serves on the Arkansas Governor's Trauma Advisory Council and was integrally involved in the development and now the advancement of the new Arkansas trauma system. She also serves as the chair of the Arkansas Emergency Medical Services for Children Council, is the EMS coordinator for the North Central Arkansas Emergency Preparedness Committee, is a current board member and the past president of Arkansas Ambulance Association, and is a consultant with Gerson Lehrman Group. Mrs. Wood consults with communities and ambulance companies that are facing challenges in securing and providing quality emergency medical services. Mrs. Wood is also an invited speaker at numerous state and national conferences speaking on such topics as emergency preparedness, providing and measuring quality emergency medical care, employee development, and leadership.

Michael Zanker joined the Department of Homeland Security's (DHS's) Office of Health Affairs in 2006 and currently serves as director of component liaison coordination providing medical advice for operational planning, response, and force health protection to the department's operating components. Prior to joining DHS, Dr. Zanker served as the Connecticut Department of Public Health's state emergency medical system (EMS) medical director and medical advisor to the Department's Office of Public Health Preparedness. He has held the positions of medical director for the Capitol Region (Hartford, Connecticut) Metropolitan Medical Response System program as well as unit commander of CT-1 Disaster Medical Assistance Team (CT-1 DMAT). Dr. Zanker has had practical experience on numerous DMAT deployments as part of the Federal Emergency Management Agency (FEMA), including Hurricane Katrina in 2005. Dr. Zanker received his M.D. from the Chicago Medical School in 1993. He completed his

residency training in emergency medicine at the University of Connecticut followed by a fellowship in EMS at Hartford Hospital. He is currently on staff at Hartford Hospital and holds the position of assistant professor of emergency medicine at the University of Connecticut School of Medicine. Dr. Zanker is a member of the American College of Emergency Physicians and has held numerous leadership positions within the Connecticut College of Emergency Physicians.

