

Section I. Systems Approach To Planning

THE ROLE OF EMS IN A SYSTEMS APPROACH TO PLANNING

The potential for hazardous materials incidents exists almost everywhere. While infrequent, chemical incidents are capable of endangering the health of the individuals involved and the emergency personnel directed to assist them. People who have been seriously injured by a hazardous material have a greater chance of recovery without complications when appropriate emergency treatment is provided by trained prehospital Emergency Medical Service (EMS) personnel at the scene, and when the patient is transported to a facility having the most appropriate personnel and technical resources to manage his or her care. This requires an integrated emergency medical response. However, many local governments, private businesses, and hospitals do not have a tested hazardous materials response plan in place that integrates all of the responding agencies and personnel. This has resulted in several problems:

- Incidents have been poorly managed on site by first responders.
- Communication channels between the private and public sectors, or among public responders, have not been clearly identified and formalized.
- The medical community has not been firmly integrated into many response systems and may not be prepared to treat multiple casualties resulting from a serious hazardous materials incident.

EMS agencies are a crucial link in the community response system for emergency preparedness planning. EMS personnel are often the first to arrive at an incident scene and must assess the nature and extent of the hazard as well as attend to the immediate needs of victims, including initial treatment of people who may have been chemically contaminated. For effective coordination and communication, hospitals, EMS agencies, and other response agencies must participate jointly in local meetings involving hazmat planning, incident management, and protocol review.

EMS agencies must acknowledge their role and responsibility as a component of the communitywide emergency response system. Administrators should familiarize themselves with the contingency plans of other participants, such as fire, police, and health departments and area hospitals, and understand what services are expected from each participant. Optimally, EMS staff should be represented on planning committees that develop and periodically review these contingency plans.

A common characteristic of the successful management of chemical incidents is adequate contingency planning. Local emergency planning committees are mandated under federal law to identify high-risk locations and ensure adequate response planning and training. Planning requires the involvement of an array of community institutions, including fire, EMS and police departments, community hospitals, other health facilities, and the regional Poison Control Center.

PREHOSPITAL RESPONSE PLANNING

To ensure an effective and safe response to a hazardous materials accident, an EMS agency must develop a written response plan which becomes an integral part of the local community response plan. This agency plan should include important definitions, incident command practices to follow,

operational policies and procedures, safety practices, medical practices, and transportation guidelines. The plan should be developed in collaboration with other response agencies and hospitals, and reviewed annually. Training sessions based on the plan should be given on a regular basis to all agency personnel. Various types of disaster drills should be held each year to evaluate the effectiveness of the plan, as well as of the training sessions. The plan should be revised, and further training offered, based on feedback from its use.

THE SPECTRUM OF HAZARDOUS MATERIALS INCIDENTS

Local and state EMS agencies should be able to participate in the response to a range of hazmat incidents from the individual level, through the multi-casualty, to the mass-casualty level. The hospital(s) and emergency medical responders are key components of the local response system. Planning should integrate hospital(s) and EMS personnel, equipment, and supply needs into state and local hazmat plans. In turn, the hospital must be familiar with these plans and know how to use them if it is involved in an incident that overwhelms its capabilities.

- **Individual patient:** A single individual is contaminated and must be transported to an emergency department:
 - = Can occur in the workplace, in a public place, or at home.
 - = May pose a problem in rural areas with small hospitals, or where there are low levels of hazmat skills and experience among EMTs.
- **Multi-casualty:** This situation is usually limited to a single location:
 - = Involves normal systems of transportation.
 - = Patients are usually treated at the same level facility as a single emergency response, but the demand on all systems is much greater.
- **Mass-casualty:** Disrupts a large segment of the community:
 - = Involves several locations.
 - = Involves additional units to the normal responders (mutual aid); such units may not be part of the local EMS system, and these units may not know how the system works.
 - = Involves long-range mutual aid; normal systems of transportation (ambulances) are inadequate or disrupted.
 - = Patients may be treated locally at different facilities that provide various levels of care, or even outside of the area altogether.
 - = May be an intentional criminal act with secondary harmful devices present.

While transportation incidents attract larger media attention, statistics show that almost 75 percent of acute hazardous materials events, excluding fuel spills, occur in the fixed locations where the chemicals are used or stored. In addition, events resulting in death and injury occur almost 1.5 times as often in fixed locations as in transit.

Hazardous material incidents range from small releases at a factory site to rapidly expanding events that may endanger a community. Regardless of the size or location of an incident, its successful management depends on preplanning. This preplanning often requires coordination among local, state, and federal agencies; industries; medical personnel; military hospitals; the Health Department; the regional Poison Control Center, as well as those in the community who use and maintain stocks of potentially hazardous materials. Contributions to hazardous materials planning come from a variety of sources. These include regulations from the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), state and local planning committees established under Title III of the Superfund Amendments and Reauthorization Act (SARA), state EMS agencies, and federal agencies.

SARA TITLE III

Title III of the 1986 Superfund Amendments and Reauthorization Act (SARA) provides for an infrastructure in states and local communities to plan for effective response to hazardous materials emergencies. The legislation also provides for public access to information on the presence and releases of specified hazardous chemicals in communities.

Title III, The Emergency Planning and Community Right-to-Know Act of 1986, requires that each state establish a State Emergency Response Commission (SERC), consisting of members with technical expertise in emergency response, environmental and natural resources, public health, occupational safety, media, and transportation. The SERC is responsible for establishing local emergency planning districts (usually on a county level), appointing and overseeing local emergency planning committees (LEPCs), establishing procedures for handling public requests for information, and reviewing LEPC emergency plans.

SARA Title III requires that the local committees include, at a minimum, representatives from the following groups: state and local officials, law enforcement, civil defense, firefighters, environmental, hospital, media, first aid, health, transportation, and facility owners or operators subject to the emergency planning requirements. LEPCs were primarily responsible for preparing a comprehensive emergency response plan for their districts by October 1988, using information about the presence of potentially hazardous chemicals reported by businesses and other facilities under Title III. LEPCs were also charged with making information on hazardous chemicals available to the public.

As part of the planning process, each LEPC must evaluate available resources for developing, implementing, and exercising its plan. The plan must include:

- Identification of facilities subject to planning provisions under Title III
- Identification of transportation routes for extremely hazardous substances
- Identification of risk-related facilities
- Methods and procedures for response
- Designated community and facility coordinators
- Procedures for public notification

- Methods for determining release occurrence and the area affected
- Description of emergency equipment and facilities, and those responsible for them
- Evacuation plans and training programs

Under Title III's planning provisions, EPA was mandated by Congress to establish a list of chemicals to help focus local emergency planning activities. In April 1987, EPA listed 406 Extremely Hazardous Substances (EHSs) and established a Threshold Planning Quantity (TPQ) for each. Any business or facility that contains one or more of these EHSs in an amount equal to or greater than its respective TPQ is required to notify the SERC and LEPC. These facilities must also appoint a coordinator to work with the LEPC for specific inclusion of that facility in the local plan.

Representative facilities covered under the planning provisions include not only major chemical manufacturing facilities but a wide variety of chemical users, such as farmers, dry cleaners, and other service-related businesses. Exemptions under this provision apply only to vessels (ship/boat), federal facilities, and transportation operations. Storage incidental to transportation is exempt provided that the EHSs are still moving under active shipping papers and have not reached the final consignee.

Accidental releases of EHSs and other hazardous substances identified in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) must be reported to the LEPC and SERC. This requirement ensures immediate notification of local response personnel. Other provisions of Title III provide further information on the presence, storage, and emissions of hazardous and toxic chemicals. These data further assist the LEPC in obtaining a comprehensive picture of chemical risk in the local district.

Emergency medical personnel can be better prepared to respond to incidents that involve contaminated victims by actively participating in the LEPC planning process. Title III provides for the submission of information on hazardous and toxic chemicals as presented above. In addition, Title III contains a specific provision requiring facility owners or operators to disclose the chemical identity of substances for which companies have made trade secret claims. Access to chemical identities assists health professionals, physicians, and nurses in obtaining further information for diagnostic and treatment recommendations during emergencies, and for prevention and treatment measures during nonemergencies.

THE STATE EMERGENCY MEDICAL SERVICES (EMS) AGENCY

Planning for hazardous materials incidents should include the appropriate linkage to the state EMS agency. The state agencies are responsible for overseeing a network of local EMS units, and thus are an essential part of the planning process. This body is often part of the SERC.

The duties of these agencies vary from state to state. However, EMS agencies are usually responsible for medical management of civilians and injured first responders. EMS agencies must develop medical mutual aid agreements between counties and establish procedures for distribution of casualties between hospitals. In addition, EMS agencies should maintain an inventory of disaster medical supplies. EMS agencies should also develop and maintain communications protocols for onsite activities

(e.g., between receiving hospitals and the base hospital, between base hospitals and ambulances, between all hospitals and the regional Poison Control Center). Further, EMS agencies must work with local and state officials in designating field casualty decontamination and collection points for a major disaster, and in arranging for the acquisition and distribution of additional equipment, supplies, and pharmaceuticals.

Suggested planning activities include:

- **Incident Management:** Establish with fire and police departments a unified command approach to mitigating a hazmat or Weapons of Mass Destruction (WMD) incident.
- **Triage:** Outline triage procedures to be utilized in prioritizing decontamination and transport of multiple patients.
- **Decontamination:** Institute a regional standard for performing decontamination of ambulatory and nonambulatory patients, in coordination with the fire department, hazmat team(s), and hospitals. Planning should also address how to handle children, pregnant women, the elderly and the infirm, as well as large numbers of patients (mass decontamination).
- **Medical Management Protocols:** The literature on the clinical management of hazardous materials exposures is sometimes inconsistent in its recommendations. Provisions should be made in the plan for obtaining field and hospital medical management information from experienced physicians. For example, the regional Poison Control Center can provide decontamination and medical management protocols via fax, e-mail, or telephone to all receiving hospitals, and through the base hospital or via cellular telephone to EMTs in the field. Planning should address antidote utilization and the rapid acquisition of additional supplies and pharmaceuticals, if needed. Volume III in this series, *Medical Management Guidelines for Acute Chemical Exposures*, contains useful emergency care recommendations for prehospital and hospital personnel.
- **Patient Destination:** Hospital emergency departments are able to provide supportive care. In some cases, however, it may be more appropriate to take the patient to a hospital that has expertise in handling certain kinds of poison exposures or injuries. The plan should include directions for obtaining this information. One option is to contact the regional Poison Control Center or the base hospital. The Poison Center will often know which hospitals are best prepared to handle exposures to which substances.
- **Coordination with Burn Centers, Trauma Centers, Hyperbaric Chamber Facilities, Health Department(s), and Other Specialty Centers:** Provisions should be made to alert and coordinate patient destination with various specialty care centers.
- **Mental Health:** Identify mental health resources, such as critical incident stress debriefing teams, to assist with meeting the mental health needs of patients, response personnel, and the general public.
- **Documentation:** Identify the required incident documentation that must be completed during and after the hazardous materials incident.
- **Media Relations:** Appoint an individual who will handle all media requests for information.

FEDERAL EMERGENCY RESPONSE ACTIVITIES

Contingency planning is essential to the successful implementation of any system designed to manage chemically contaminated patients and to promptly contain the hazard itself. Contingency plans require a coordinated community response that may also involve state and federal agencies.

Preplanning and coordination of services are equally critical at the national level. The federal government established a National Contingency Plan (NCP) to promote coordination of resources and services of federal and state response systems. To oversee this plan, a National Response Team (NRT) and a National Response Center, a network of Regional Response Teams (RRTs), and a group of On-Scene Coordinators (OSCs) have been established. In addition, with passage of the Nunn-Lugar-Domenici Anti-Terrorism Bill in 1996, the U.S. Public Health Service developed a series of strategically placed Metropolitan Medical Response Teams (NMRTs) to respond in the event of Nuclear, Biological, or Chemical (NBC) terrorism. These multidisciplinary teams, consisting of police, hazmat, EMS, and hospital personnel, are specially trained and equipped to respond to serious hazmat incidents as well as to NBC-related situations.

The *Hazardous Materials Emergency Planning Guide*, referred to as NRT-1, provides guidance to help local communities prepare for potential hazardous materials incidents. NRT-1 can be used by local communities developing their own plans, as well as by LEPCs formed in accordance with the Emergency Planning and Community Right-to-Know Act of 1986 (SARA Title III).

The objectives of the *Hazardous Materials Emergency Planning Guide* are to:

- Focus communities on emergency preparedness and response.
- Provide communities with information that can be used to organize the emergency planning task.
- Furnish criteria for risk and hazard assessments, and to assist communities in determining whether a hazardous materials incident plan is needed in addition to the districtwide plan developed by the LEPC.
- Help LEPCs and individual communities prepare a plan that is appropriate for their needs and consistent with their capabilities.
- Provide a method for revising, testing, and maintaining community emergency plans.

NRT-1 is published by the National Response Team, and was developed cooperatively by its federal member agencies, including the Department of Defense, Department of the Interior, Department of Transportation, U.S. Coast Guard, Environmental Protection Agency (EPA), Department of Commerce (National Oceanic and Atmospheric Administration [NOAA]), Federal Emergency Management Agency (FEMA), Department of State, Department of Agriculture, Department of Health and Human Services (Agency for Toxic Substances and Disease Registry [ATSDR]), Department of Justice, General Services Administration (GSA), Department of the Treasury, Department of Labor (Occupational Safety and Health Administration [OSHA]), Nuclear Regulatory Commission (NRC), and the Department of Energy (DOE). NRT-1 represents a concerted effort by federal agencies to consolidate their general hazardous materials planning guidance into an integrated federal document.

NRT-1 states that an emergency plan must include response procedures of facilities and local emergency and medical personnel, as well as a description of emergency equipment and facilities in the community. It also recommends that hospital, emergency medical service, and health department personnel be included as members of an emergency planning team. As previously mentioned, SARA Title III requires medical, hospital, and first aid personnel to be members of the local emergency planning committee. NRT-1 describes relevant publications that provide specific operational guidance to emergency responders, such as the DOT's *North American Emergency Response Guidebook (NAERG)*, which provides guidance for firefighters, police, and other emergency services personnel to help them protect themselves and the public during the initial minutes immediately following a hazardous materials incident.

In addition, the document provides information on the Chemical Manufacturers Association's (CMA) Community Awareness Emergency Response (CAER) and Chemical Transportation Emergency Center (CHEMTREC) programs. The CAER program encourages local chemical manufacturing facilities to inform area residents, public officials, and emergency response organizations about industry operations and to integrate their onsite emergency response plans with the planning efforts of the local community. In some areas of the country, the chemical industry has established physician networks to encourage better dialogue between company physicians and local health authorities. CAER has outlined specific steps for industrial plants:

- Review the plant's emergency plan
- Improve employee awareness and training
- Prepare a community relations plan
- Inventory the status of local emergency planning
- Develop a briefing paper
- Prepare a list of initial contacts
- Meet with initial contacts and identify key officials
- Establish a coordinating group
- Begin implementation steps

On the federal level, EPA and FEMA provide technical assistance and guidance to local and state planners through the SARA Title III program.

The NRT-1 document also recommends that contingency plans include standard operating procedures for entering and leaving sites, accountability for personnel entering and leaving sites, decontamination procedures, recommended safety and health equipment, and personal safety precautions. The document suggests that emergency plans include a list of emergency response equipment appropriate to the various degrees of hazard based on EPA's four levels of protection (Levels A through D; see Section II). Further, it recommends that the list include the type of respirator (i.e., self-contained breathing apparatus, supplied-air respirator, or air-purifying respirator) that should be used, the type of clothing that must be worn, and the equipment needed to protect the head, eyes, face, ears, hands, arms, and feet.

In addition, NRT-1 recommends that medical personnel be made aware of significant chemical hazards in the community to prepare for possible hazardous materials incidents. It also states that emergency medical teams and hospital personnel must be trained in the proper methods for decontaminating and treating individuals exposed to hazardous chemicals.

HAZARD ANALYSIS

Hazard analysis is a necessary component of comprehensive emergency planning for a community. It is a three-step decisionmaking process comprised of hazard identification, vulnerability analysis, and risk analysis. This section focuses primarily on hazard identification. Hazard analysis is usually the task of an agency (e.g., the fire department), the Disaster Committee, or the LEPC. EMS personnel should consult with the LEPC or their agency head to review the hazard analysis information for their area.

The first task in conducting such an analysis is to complete an inventory of the hazardous materials present in the community and to determine the nature of the hazard. This is a key step because it permits planners to describe and evaluate risks, and to allocate resources accordingly. However, the task of analyzing all relevant hazards may not prove cost effective for many communities. The planning committee should, therefore, assign priorities to the hazards found in its community and establish affordable limits for analysis. It should be noted that several federal agencies (e.g., DOT, FEMA, EPA) report that frequently encountered substances often pose the most prevalent dangers. These materials include fuels and chemicals, such as chlorine, ammonia, and hydrochloric and sulfuric acids. Such materials should be given special attention (vulnerability analysis) by the LEPC in the planning process.

In this context, a hazard is any situation that is capable of causing injury or impairing an individual's health. During the process of identifying hazards, facilities or transportation routes will be pinpointed that contain materials that are potentially dangerous to humans. The identification of hazards also should provide information on: (1) the types, quantities, and location(s) of hazardous materials in the community, or transported through a community; and (2) the nature of the hazard that would accompany incidents, such as explosions, spills, fires, and venting to the atmosphere.

Hazards should be identified at as many facilities in the community as possible. These include the obvious ones such as chemical plants, refineries, petroleum plants, storage facilities, and warehouses. In requesting information directly from facilities, remember that the planning provisions under SARA Title III require certain facilities to provide the LEPC with any information on the facility that the committee needs to develop and implement its plan. The LEPCs may provide assistance here, particularly if the committee includes industry representatives. It is essential that these industries or businesses understand the role this information plays in ensuring a sound emergency response plan. As previously stated, placing airport, business, or industrial representatives on the community-wide planning committee, as required under SARA Title III, should facilitate their cooperation. The assistance and cooperation of a facility that regularly deals with hazardous materials also presents the local planning unit with a wide array of services. For example, such a facility can provide technical experts, Spill Prevention Control and Countermeasure (SPCC) plans, training and safe handling instructions, and cleanup capabilities.

In identifying hazards, hospitals and educational and governmental facilities should not be overlooked since they all contain a variety of chemicals. Major transportation routes and transfer points, such as airports, vessels in port, railroad yards, and trucking terminals, should also be included in the overall hazards identification plan. SARA Title III planning provisions address many of these potential transportation risk areas by requiring facility cooperation in plan preparation and by including specific risk areas as well as a wide range of chemical handlers, from manufacturers to service-related businesses.

Risk analysis includes the probable damage that may occur if a chemical incident occurs. Information that is necessary for risk analysis includes:

- The type of risk to humans, such as an acute, chronic, or delayed reaction.
- The groups that are most at risk.
- The type of risk to the environment, such as permanent damage or a recoverable condition.

Many documents can be of assistance in conducting a risk analysis. Risk analysis in transportation settings is outlined in the DOT's *Community Teamwork: Working Together To Promote Hazardous Materials Safety, A Guide for Local Officials*. In conjunction with FEMA and DOT, EPA published a supplement to NRT-1 in December 1987. This document, entitled *Technical Guidance for Hazardous Analysis* and often referred to as the Green Book, provides technical assistance to LEPCs in assessing the lethal hazards associated with potential airborne releases of extremely hazardous substances.

TRAINING

Each member of an EMS agency (career, volunteer, or combined service) is mandated to receive 8 hours of hazmat awareness training each year. This training provides an introduction to basic response principles: the importance of incident recognition, assessment, and taking defensive strategies until more qualified assistance arrives. The National Fire Protection Association (NFPA) has published several standards for fire departments regarding hazardous materials response. In 1997 it released *Standards for Professional Competence of EMS Responders to Hazardous Materials Incidents (NFPA 473)*, which outlines desired levels of competence for EMS personnel responding to hazmat incidents. Level I EMS/HM-trained responders are prepared with the knowledge and skills to safely deliver emergency medical care in the Support (Cold) Zone, whereas Level II EMS/HM responders are prepared to provide care to individuals who still may pose a risk of secondary contamination (i.e., working in the Contamination Reduction (Warm) Zone). Personnel at this level are also able to coordinate EMS activities at a hazardous materials incident and provide medical

support for hazmat response personnel. All EMS agency administrators should familiarize themselves with this standard, as well as with NFPA 472, *Standards for Professional Competence of Responders to Hazardous Materials Incidents*. These two courses and other instructional programs, such as the Domestic Preparedness: Weapons of Mass Destruction Training program, are recommended for all EMS personnel who will be responding to hazardous materials calls.

A growing number of commercially available audiovisual and computer-based training programs are becoming available which provide accurate, timely, and cost-effective instruction. In addition, numerous sites on the Internet offer free access to educational materials pertaining to hazardous materials (e.g., www.NLM.NIH.gov/pubs/FactSheets/toxnctfs.html; www.ATSDR.cdc.gov/hazdat.html).

SELECTED BIBLIOGRAPHY

Auf der Heide, E. 1989. *Disaster Response: Principles of Preparation and Coordination*. St. Louis, MO: Mosby.

Auf der Heide, E. (ed.). 1995. *Community Medical Disaster Planning and Evaluation Guide*. Dallas, TX: American College of Emergency Physicians.

Brunancini, A.V. 1985. *Fire Command*. Quincy, MA: National Fire Protection Association.

Fire Protection Publications. 1983. *Incident Command System*. Stillwater, OK: Oklahoma State University Press.

National Emergency Training Center. 1998. *Guidelines for Public Sector Hazardous Materials Training*. Emmitsburg, MD: HEMP Curriculum Guidelines.

National Fire Protection Association. 1992. *Recommended Practice for Responding to Hazardous Materials Incidents*, NFPA 471. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1992. *Standards for Professional Competence of Responders to Hazardous Materials Incidents*, NFPA 472. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1997. *Standards for Professional Competence of EMS Responders to Hazardous Materials Incidents*, NFPA 473. Quincy, MA: National Fire Protection Association.

National Response Team. 1987. *Hazardous Materials Emergency Planning Guide*. Washington, DC: Government Printing Office.

Noll, G.G., M.S. Hildebrand, and J.G. Yvonna. 1995. *Hazardous Materials: Managing the Incident*. 2nd ed. Stillwater, OK: Fire Protection Publications.

SARA Title III *Compliance Guidebook*. 1988. Government Institutes, Inc. ISBN: 0-86587-749-1.

Sullivan, J.B. and G.R. Krieger. 1992. *Hazardous Materials Toxicology: Clinical Principles of Environmental Health*. Baltimore, MD: Williams & Wilkins.

U.S. Department of Defense, U.S. Army, USAMRICD Chemical Casualty Division. 1998. *Medical Response to Chemical Warfare and Terrorism*. 3rd ed. Edgewood, MD.

U.S. Department of Transportation. 1983. *Community Teamwork: Working Together To Promote Hazardous Materials Safety, A Guide for Local Officials*. Washington, DC: Government Printing Office.

U.S. Department of Transportation. 1996. *1996 North American Emergency Response Guidebook*. Washington, DC: Government Printing Office. [available in English, Spanish and French][<http://hazmat.dot.gov/gydebook.htm>]

U.S. Environmental Protection Agency. 1992. *EPA Standard Safety Operating Guidelines*. Washington, DC: Government Printing Office.

U.S. Environmental Protection Agency and U.S. Federal Emergency Management Agency. 1987. *Technical Guidance for Hazardous Analysis: Emergency Planning for Extremely Hazardous Substances*. Washington, DC: Environmental Protection Agency.

U.S. Federal Emergency Management Agency. 1996. *Guide for all Hazard Emergency Operations Planning*. Washington, DC: Government Printing Office.

