CHAPTER 19

# Protecting Emergency Response and Recovery Workers

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E mergency *response* and *recovery work* encompasses a broad range of activities, including search, rescue, recovery, cleanup, and restoration. These activities are performed by workers from many occupations. Occupational health and safety hazards endanger these workers, especially when the emergency is complex, unusual, or large-scale. All appropriate measures need to be taken to protect them from these hazards.

This chapter presents the key elements of a protection system for emergency response and recovery workers, emphasizing post-incident health tracking of at-risk workers. It is important to obtain information on (a) worker vulnerabilities before they respond, (b) hazardous exposures during and after an emergency, and (c) changes in workers' health status and their concerns about work exposures. These elements should be codified into a system for response and recovery work that has a defined organizational structure, standard operating procedures, and workers with certified expertise to fulfill key roles.

## DEFINITIONS

A *disaster* is a serious disruption in the functioning of a society that poses a significant level of threat to life, health, property, or the environment and requires external assistance to manage or cope with it.[1-4] We use the following definition of *terrorism*: politically motivated, deliberate action intended to cause harm and disseminate fear and uncertainty.[5,6] Terrorism threatens the collective sense of safety and predictability in daily life by attacking people where they reside and where they work, and threatening those they hold dear.

**Figure 19-1:** Ironworkers balance precariously as they cut through the rubble of the World Trade Center. (Courtesy of the American Red Cross.)

*Emergency response and recovery workers* typically include firefighters, emergency medical services (EMS) workers, and law enforcement personnel, and—depending on the nature and scale of the incident—can include other types of professionals and skilled laborers, such as electric utility workers restoring power and road-crew workers opening transportation routes blocked by fallen trees and other debris.[7] *Essential services* are those that maintain community operations—such as communication systems, public transportation, and public utilities—and provide medical care, public health, and social services. In the context of emergency management, an *incident* refers to an unplanned and emergent situation, such as an earthquake; in this chapter, it refers to any disaster situation.

Despite good intentions and sincere efforts, significant gaps in planning and operations tend to compromise the health and safety of emergency response and recovery workers.[8-14] (Figs. 19-1 and 19-2.) This chapter presents a systematic approach to fully accounting for the health and safety of emergency response and recovery workers—an approach that must integrate key functions within the *Incident Command System* (ICS), which is the standard organizational structure for emergency response.[15,16] Before an incident occurs, capacity must be built and key relationships established within and among relevant organizations. Experts from many disciplines are needed to design the system.

## TIME PHASES IN EMERGENCY MANAGEMENT

The National Response Framework (NRF) organizes emergency and disaster response activities into the following cyclical time phases.

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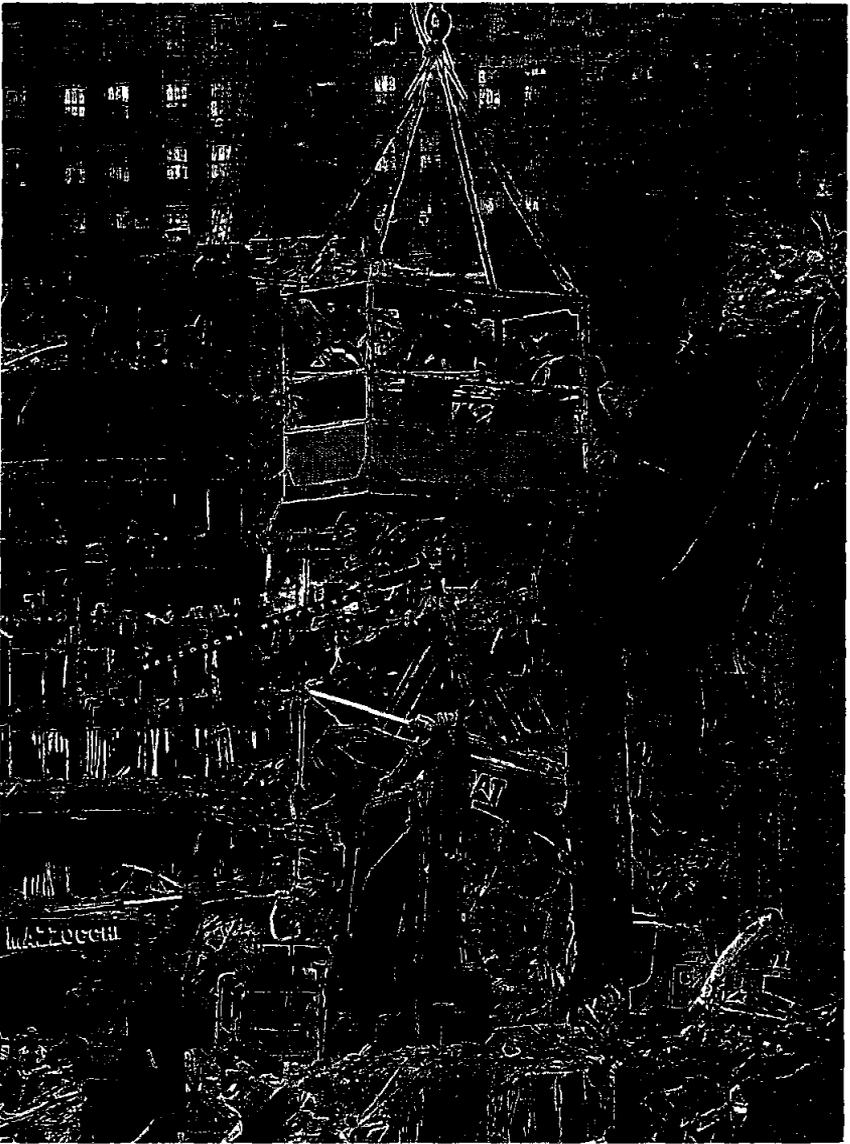
Figure 19–2: Recovery workers being hoisted in a personnel basket at the World Trade Center site. (Photograph by Earl Dotter.)

### Preparedness

In this phase, systems and factors are put in place that facilitate emergency response operations, including planning, training, completing medical clearance and certification for response and recovery workers, acquiring equipment, and evaluating capabilities through training exercises.
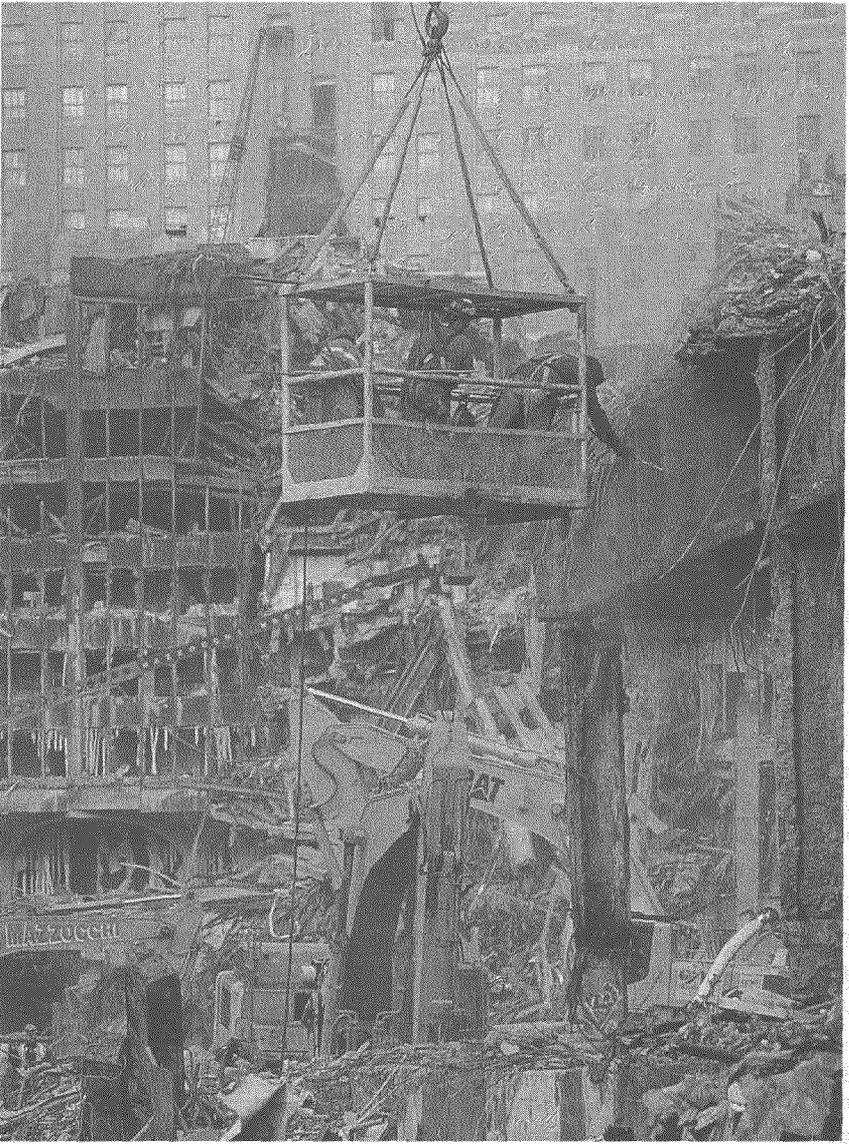
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## Response

In this phase, which begins when an incident has occurred, emergency response workers are deployed to mitigate the consequences of the incident. Rescue workers often take great risks in chaotic situations. There is little time to assess hazards before response begins.

## Recovery

In the short-term, workers aim to re-establish a state of self-sufficiency in the impacted area during this phase, directly supporting community infrastructure and population needs. The transition between response and recovery phases is often not clear. In general, the recovery phase begins when lifesaving activities have been completed and potentially life-threatening hazards have been stabilized. Depending on the incident, recovery may last for months or occasionally years.

## Mitigation

Linking the cycle back to preparedness, preventive measures are taken to reduce disaster vulnerabilities of a residential or workplace community. Interventions include education of workers and the general public, legislation, development of engineering design codes and standards (such as for buildings or roadways), development of organizational policies, land-use management, and program evaluation.[1,2]

These time phases help to describe and coordinate the major elements of disaster management, such as transportation, communication, and public health and medical services. Organizational entities define their "response" phases according to their oversight authority and the timing of mobilizing assets. In this chapter,
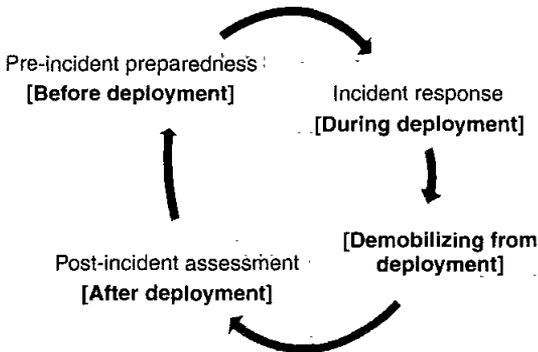


Figure 19–3: Life cycle approach to event-related emergency management at the organizational level and the deployment cycle of individual workers who will handle the response and recovery.

phases are defined according to worker *deployment*—when response and recovery workers are sent to incident site locations (Fig. 19-3). At the end of their work assignment at the incident site, they are *demobilized*—"out-processed" and returned to their usual work stations.

## FRAMEWORK FOR WORKER PROTECTION

The primary method of protecting workers is by controlling exposure to physical, chemical, biological, and psychological hazards. Multiple functions are coordinated within the ICS (Fig. 19-4) and include the following structures[16]:

- The Safety Officer is responsible for conducting safety analyses of the incident site(s) and developing and monitoring compliance with the worksite safety plan, which includes personal protective equipment (PPE) and access to the site(s) of the incident and any contaminated zones.
- The Operations Section is responsible for ensuring that workers are appropriately supervised, for giving clear instructions, and for providing safety briefings to workers before they are deployed.
- The Planning Section is responsible for checking in and tracking all workers, developing their situational awareness, documenting activities, and eliciting the assistance of experts to help understand and mitigate hazardous exposures.
- The Logistics Section is responsible for checking that each worker is in reasonably good health, has or will be assigned necessary PPE, and has provided personal emergency contact information.
- The Finance and Administration Section tracks all workers' compensation matters.

Essential components of a worker protection plan include data sharing, situation awareness, and coordination of required activities. A common information
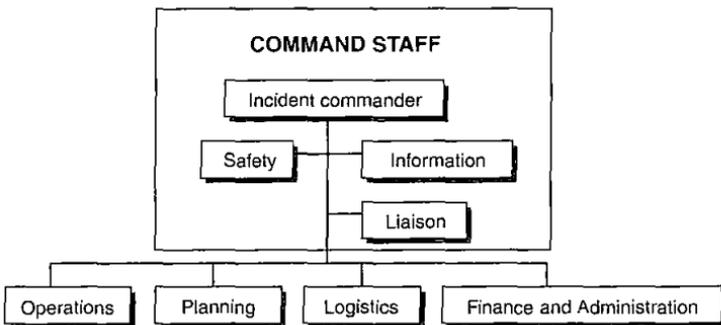


Figure 19–4: The Incident Command System. (*Source*: National Response Team. Incident Command System/Unified Command [ICS/UC]. Technical Assistance Document. Available at: http://nrt.org/production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-52ICSUCTA/$File/ICSUCTA.pdf?OpenElement. Accessed on February 4, 2011.)

technology (IT) platform can help integrate information arising from hazard, illness, and injury surveillance.

## PREPAREDNESS BEFORE DEPLOYMENT—WORKERS AND EMPLOYERS

Workers must be educated, trained, and certified according to their potential deployment roles. The employer must ensure that qualified personnel remain medically and psychologically fit and appropriately outfitted with safety equipment in preparation for deployment. Employers also must have good recordkeeping systems for deployed workers, including information on medical clearance or work restrictions, documentation of specific certification and training, dates of mobilization, and personal emergency contacts.

In any incident, there is usually a need for some "just-in-time" training—such as situational awareness—which may occur onsite or at a nearby staging area, where personnel and resources are gathered and managed for incident response. Disaster safety management requires appropriate infrastructure and interagency planning and coordination before the emergency arises. Planning should integrate psychological and behavioral lessons learned from previous disasters (Box 19–1 and Table 19–1). Responders should have emergency plans and systems established to handle concerns about the safety and welfare of family members and others to prevent diverted attention at work, which can lead to injuries, improper work practices, and poor decision-making.[17]

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### BOX 19–1: INTEGRATING PSYCHOLOGICAL AND BEHAVIORAL COMPONENTS INTO ORGANIZATIONAL PREPAREDNESS

Health can be adversely affected by workplace stress factors, such as job design, organizational structure, management style, managers' and co-workers' commitment to safe work practices, and availability of adequate resources and support to get the job done.[1-3] These organizational factors can complicate personal risk factors such as prior psychiatric illness, substance abuse, and competing demands between family and work.

Terrorism increases fear and uncertainty that can give rise to rumors that undermine response and recovery work. Interventions include leadership initiatives, administrative policies, and enhancement of services by partnering with other organizations that can help provide and/or train others to provide crisis intervention or psychosocial support services as needed, such as stress, anger, and grief management.[1,6,7]

Mental and behavioral health activities are addressed by multiple federal agencies, without clear authority or funding to address the issues stemming

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from disasters. However, behavioral and mental health strategies should be incorporated within overall worker health and medical guidance.

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## REGISTRATION AND CREDENTIALING

A basic tenet of safety in emergency response is to maintain accountability for all workers associated with the incident. In the pre-incident time phase (Fig. 19-3), accountability entails knowing which responders are available to be deployed and documenting that all of them have proper certification to perform their assigned jobs safely. The registration and credentialing system of emergency response and recovery workers should be designed to support the following functions: registration (recording basic worker demographics); credentialing (assigning a level based on education, training, and experience); verification (confirming self-reported information); and official site identification (providing badges that indicate zones of site access).

*Table 19-1:* LESSONS LEARNED FROM PRIOR DISASTER RESPONSES THAT
CAN HELP US ANTICIPATE PSYCHOLOGICAL AND BEHAVIORAL HEALTH
HAZARDS AND NEEDS

- It is difficult to prepare responders for everything that they might encounter.
- Even experienced responders can face situations and issues that cause uneasiness and distress.
- It is not unusual for responders to be asked to perform work beyond their areas of expertise.
- Responders are highly concerned about family members and friends.
- Timely, accurate, and candid sharing of information facilitates decision-making.
- All managers need to consider the health, safety, and resiliency of workers on the job.
- Resiliency, an integral component of occupational safety and health, requires planning before the incident in order to optimize recovery of workers after the incident.
- It is important to plan for self-care through making good lifestyle choices, such as those related to diet and exercise, ensuring adequate sleep; making time to "recharge"; and retaining social connectivity.
- All appropriate measures should be taken to protect the physical and mental health of responders.
- Responders benefit by sharing their experiences with friends, family members, and colleagues.
- Responders find it difficult to maintain emotional distance when they witness the deaths of children.
- Organizational differences among groups of responders and cultural differences between victims and responders can impede the provision of emergency services.
- Individuals may be thrust into leadership roles for which they have had little to no formal training.

Sources: Moline J, Herbert R, Levin S, et al. WTC medical monitoring and treatment program: Comprehensive health care response in aftermath of disaster. Mount Sinai Journal of Medicine 2008; 75, 67–75; Reissman DB, Watson PJ, Klomp RW, et al. Pandemic influenza preparedness: Adaptive responses to an evolving challenge. Journal of Homeland Security and Emergency Management 2006; 3, 13; Ursano R, Vineburgh NT, Gifford, RK, et al. Workplace preparedness for terrorism: Report of findings to Alfred P. Sloan Foundation. Bethesda, MD: Center for the Study of Traumatic Stress , 2006. Available at: http://www.centerforthestudyoftraumaticstress.org/csts_items/CSTS_report_sloan_terrorism_preparedness2011.pdf. Accessed on June 27, 2011; Vineburgh NT, Gifford RK, Ursano RJ, et al. *Workplace Disaster Preparedness and Response*. In RJ Ursano, CS Fullerton, L Weisaeth, B Raphael, et al. (Eds.), *Textbook of Disaster Psychiatry*, pp. 265–284. Cambridge, England: Cambridge University Press, 2007; and Reissman DB, Kowalski-Trakofler K, Katz CR. Public health practice and disaster resilience: A framework integrating resilience as a worker protection strategy. In S Southwick, D Charney, M Friedman, B Litz. (Eds.). *Resilience: Responding to Challenges Across the Lifespan.* Cambridge, England: Cambridge University Press, in press.

## DISCIPLINE-SPECIFIC AND GENERAL EMERGENCY RESPONSE TRAINING

Emergency response involves the risk of exposure to a variety of hazardous conditions or agents, many of which may not be easily predicted, adequately characterized, or effectively controlled. Training is critical for the preparedness, survivability, and resilience of responders. Training should empower workers to recognize and avoid health and safety risks.

Most emergency responders, such as law enforcement workers, firefighters, and EMS personnel have this training integrated into their credentialing standards. For example, the National Fire Protection Association's Standard for Fire Fighter Professional Qualification outlines the skills and knowledge necessary to perform as a firefighter, including occupational safety for various types of incidents. However, for hundreds of other types of responders, job certification or

training does not address working in disaster zones. All responders should have orientation to the ICS.

## ESTABLISHING A MEDICAL BASELINE AND FITNESS FOR DEPLOYMENT

Fitness-for-duty determinations should consider whether workers will be able to perform essential job functions in the disaster environment without posing a threat to themselves, others, or the mission.[18,19] Medical examinations should include assessments of physical, psychological, and behavioral health. To make these determinations, the following clinical elements need to be considered:

- Active symptoms or complaints
- Current and past physical and mental disorders (and the likelihood that job performance will become impaired, given the anticipated response to the environment or exposures)
- Performance limitations (such as a chronic injury)
- Current medications and treatment regimens (risks that conditions under treatment may worsen, given chaotic work environments, and the possibility for temperature extremes, crowded housing, and long work hours)
- Immune status (required vaccinations)
- Abuse of substances, including nicotine, alcohol, and recreational drugs
- Contraindications to post-exposure prophylaxis or treatment regimens (such as sensitivities to antibiotics)

These determinations should be made in compliance with medical and legal standards as outlined in the Americans with Disability Act. This health information also serves as a baseline for future comparison, which is especially valuable when incident exposure information is difficult to obtain or interpret. Some emergency response workers may already be enrolled in medical surveillance programs as a part of their regular jobs.[20-22]

## OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS APPLICABLE TO EMERGENCY RESPONSE AND PREPAREDNESS

Medical evaluations of emergency response and recovery workers should meet applicable regulatory requirements, including those required by any of OSHA's health-specific standards, such as for benzene or lead. OSHA has identified several health and safety standards relevant to emergency preparedness and response activities.[21] For example, under the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, the medical evaluation elicits medical and work histories, with special emphasis on symptoms related to health hazards and the handling of hazardous substances, and assesses the person's ability to wear a respirator under conditions that may be expected at the worksite.[22] The HAZWOPER

standard also describes the timing of the medical evaluation, such as before the assignment or as soon as possible upon notification by employees that they have developed signs or symptoms indicating possible overexposure to hazardous substances or other health hazards. In addition to developing and conducting medical evaluations, occupational safety and health professionals may also have a role in training workers. For example, under the OSHA Bloodborne Pathogens Standard, training is required for workers who may be exposed to blood or other potentially infectious materials.[23]

The regulatory requirements for emergency preparedness and response represent the minimum required to protect workers. Many OSHA standards are difficult to quickly and fully implement in the emergency response environment. For example, use of hearing protection devices in noisy environments may impact the ability of emergency responders to communicate with one another.[8, 24]

Not all responders are equally covered by OSHA standards. For example, state and local government employees performing emergency response, such as firefighters and law enforcement officers, are covered by OSHA regulations only in the 27 states that operate OSHA-approved state plans. State standards are either identical to federal OSHA standards or, if different, must be at least as effective as the federal standards. Additional considerations, such as mental and behavioral health needs, may also require further attention to meet the needs of emergency response and recovery workers.

## FEDERAL GOVERNMENT RESPONSE TO DISASTERS

The NRF provides a guide for how federal assets are used in response to disasters and other nationally declared emergencies.[2] The NRF, which is scalable, aligns coordinating roles and responsibilities for emergency response by federal government agencies with those of state and local government agencies, nongovernmental organizations, and private-sector organizations.[25] The Worker Safety and Health Support Annex of the NRF, which is coordinated by OSHA,[24] can be activated by the Federal Emergency Management Agency (FEMA). Expert technical assistance, from the National Institute for Occupational Safety and Health (NIOSH) and other entities, may be elicited to help identify, characterize, and control health and safety hazards. Technical assistance can also assist with designing and performing medical surveillance, identifying appropriate immunizations and prophylaxis, and supporting the resilience of emergency response workers.[19] There remain challenges in implementing the functions guided by the Annex, including the authority and timing for activation, which could delay characterization of hazards and protection of workers.[12, 26-29]

### Incident Response (Deployment)

Emergency deployment is the period when workers are actively engaged in responding to an incident. The earliest-arriving responders need to have their own ways of

ensuring their health and safety through standard operating procedures. As a response becomes larger and more formalized, worker protection strategies should be integrated into the ICS for incident oversight.[19]

### Onsite rostering, "just-in-time" training, and selection of personal protective equipment (PPE)

All workers associated with an incident response operation should be *in-processed*— centrally rostered and given site-access badges. It is assumed that those assigned to an incident are healthy enough to work; however, some scenarios may warrant a pre-placement health examination, such as tests on handling hazardous materials or response to long hours in extreme-temperature environments. In general, health screening examinations should address pre-existing physical or mental conditions that could affect responders' ability to perform safely and effectively. Failure to perform may endanger not only affected workers, but others whose work safety is linked to their performance or judgment.

Regardless of previous training, additional training on site-specific hazards, operating procedures, and available resources is usually necessary at the time of deployment, sometimes referred to as "orientation," "just-in-time," toolbox, or tail-gate talks.[31]

Personal protective equipment (PPE) is often needed by response workers and volunteers, guided by a safety analysis performed by the safety officer. When PPE is issued onsite, a cache of properly serviced PPE must be maintained and tracked.

### Integration of exposure assessment, responder activity documentation, and controls

Response workers and volunteers may be exposed to many different hazards during their work. Obtaining and appropriately communicating accurate and useful information on workers' exposures is necessary to ensure that workers are protected.[1,9,14,18,19,32] The focus should include not only chemical and physical hazards, but also psychological hazards, such as witnessing deaths of children or co-workers, facing unfamiliar situations, and experiencing excess stress from inefficient or unsafe organization of complex tasks, mismanagement, or inadequacy of critical resources.[5,6,17,19,33,34]

Onsite, hazards require continual assessment. In general, emergency response agencies have standard operating procedures that integrate into the ICS. It is worth noting that most PPE is designed to function only for a short period of time; for example, workers responding to the World Trade Center disaster experienced failure of PPE as well as fatigue and heat exhaustion from extended use.[8] (See Chapter 3.)

Disaster response activities designed to protect workers are listed in Table 19–2. Emergency response personnel are often required to work extended hours in high-risk environments, where alertness and attention to detail are the only way to

*Table 19-2:* ACTIVITIES DESIGNED TO PROTECT WORKERS DURING
THE DEPLOYMENT PERIOD

- Deploying an appropriately credentialed and experienced health and safety officer
- Establishing site security and perimeter and zone control
- Establishing evacuation routes and procedures
- Registering emergency response workers
- Characterizing potential hazardous exposures associated with incident work
- Designing, implementing, evaluating, communicating, and refining the Incident Action
  Plan for Safety*
- Officially enforcing the safety plan (compliance)
- Maintaining an OSHA-300 log to report injuries and illnesses
- Monitoring of crew shift length for adequacy of rest, hydration, and nutrition
  and prevention of fatigue and heat stress
- Treating all emerging physical or mental health problems
- Monitoring for trends seen in illness and injury surveillance
- Reviewing and approving the medical plan to ensure health care services
- Supervising other safety personnel
- Coordinating safety with overall disaster response management

*ICS 215A, found at the FEMA ICS Resource Center. Available at: http://www.training.fema.gov/EMIWeb/IS/ICSResource/ICSResCntr_Forms.htm.

Source: Occupational Safety and Health Administration. Hazardous waste operations and emergency response (29 C.F.R. 1910.120; 29 C.F.R 1926.65). Washington, DC: OSHA, U.S. Department of Labor, 1994.

work safely. Stress and fatigue can lead to poor decision-making, unsafe work practices, and increased exposure to hazards.[35-37]

### Health monitoring and surveillance

Health monitoring and surveillance are complementary methods to protect the health and safety of incident responders.[19,38-41] *Monitoring* refers to the ongoing and systematic collection, analysis, interpretation, and dissemination of illness and injury data related to *individual* incident responders' health status—enabling evaluation of exposure and how that exposure is affecting individual responders. *Surveillance* refers to the ongoing and systematic collection, analysis, interpretation, and dissemination of illness and injury data related to *the entire population* of emergency responders—enabling evaluation of exposure and how that exposure is affecting a defined population of response workers. Mechanisms and skilled personnel to conduct monitoring and surveillance are integral parts of a comprehensive disaster worker protection system.

### Communication of exposure and aggregate worker health data

Decisions need to be made about the content and timing of messages, target audiences, and spokespeople. Monitoring and surveillance data are communicated to

workers and their employers, both within and outside the ICS. Communication to workers is a joint responsibility of the planning and operations sections of the ICS, with help from the public information officer (Fig. 19-4).

## Demobilizing After Completing Incident Duties

Demobilizing provides closure to the deployment period for both responders and their employers.[1,2,19] It includes exit interviews of responders to verify possible exposures, illnesses, and injuries; review lessons learned; and obtain follow-up contact information. Information is provided to workers about possible health effects and available health services.

## Post-Deployment Phase

This begins when responders return to their usual work and extends as long as is practicable to understand the health and safety consequences of disaster response work. It is important to track worker health status after the incident. Figure 19–5 illustrates the flow of information to support decisions about instituting a post-incident worker health tracking program.[19] This information includes tracking changes in worker health, incident injuries, type and magnitude of identified hazards, safety compliance, and situational concerns.

Federal government authorizations and funding streams differ between the response and the recovery phases. Federal laws and response plans do not specifically authorize post-incident disaster worker health surveillance.[42,43] Since personal insurance does not cover occupational illness or injury, the only system available to assist incident responders with medical and rehabilitation expenses, lost function, and lost wages is the state workers' compensation system (Box 19–2). However, states vary in their qualifying criteria for employment, medical evidence, and inclusion of specific illnesses and injuries. Other legal actions are possible, such as tort claims. For example, Congressional actions created special funds to limit the liability of employers and assist those directly affected by the 9/11 attacks on the World Trade Center (WTC).[44] Legal proceedings can be protracted, as evidenced by the approximately 10,000 WTC responder litigants who reached a settlement 9 years after the disaster.[45]

Certain situations are more likely to activate some form of post-event health tracking, as described below:

- Established or suspected hazardous exposures with known subacute, latent, or long-term health effects
- Responder groups that typically require medical monitoring due to the hazardous nature of their activities or government regulations
- Responder groups that are not able to recognize and communicate about hazards or have other pre-existing vulnerabilities that put them at increased health or safety risk
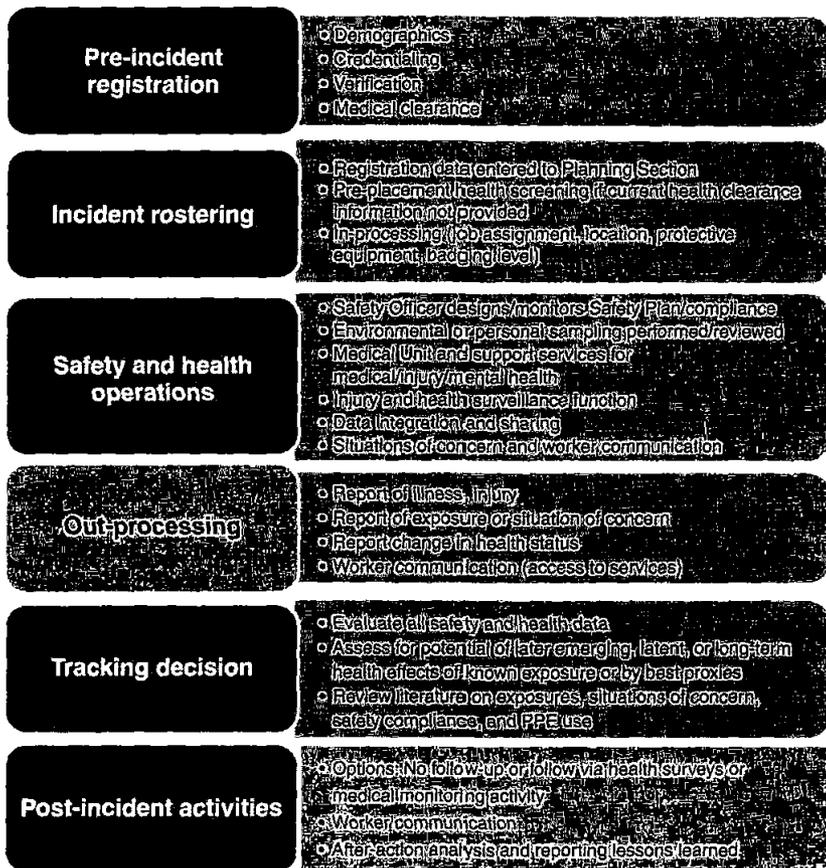
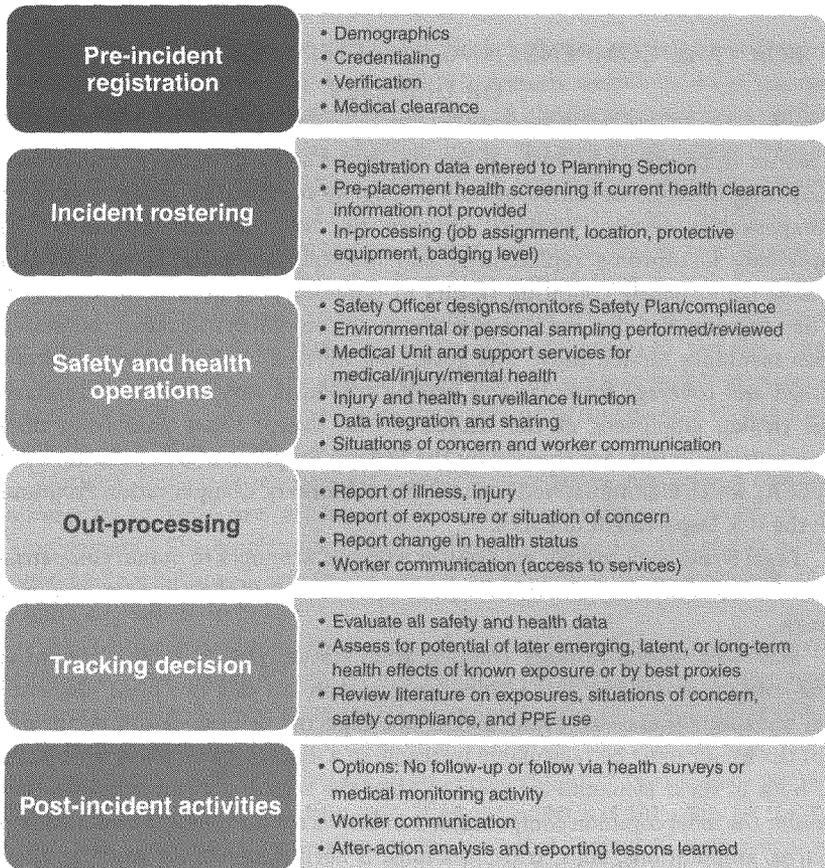| Pre-incident registration | ○ Demographics<br>○ Credentialing<br>○ Verification<br>○ Medical clearance |
| Incident rostering | ○ Registration data entered to Planning Section<br>○ Pre-placement health screening if current health clearance information not provided<br>○ In-processing (job assignment, location, protective equipment, badging level) |
| Safety and health operations | ○ Safety Officer designs/monitors Safety Plan/compliance<br>○ Environmental or personal sampling performed/reviewed<br>○ Medical Unit and support services for medical/injury/mental health<br>○ Injury and health surveillance function<br>○ Data integration and sharing<br>○ Situations of concern and worker communication |
| Out-processing | ○ Report of illness, injury<br>○ Report of exposure or situation of concern<br>○ Report change in health status<br>○ Worker communication (access to services) |
| Tracking decision | ○ Evaluate all safety and health data<br>○ Assess for potential of later emerging, latent, or long-term health effects of known exposure or by best proxies<br>○ Review literature on exposures, situations of concern, safety compliance, and PPE use |
| Post-incident activities | ○ Options: No follow-up or follow via health surveys or medical monitoring activity<br>○ Worker communication<br>○ After-action analysis and reporting lessons learned |

Figure 19-5: Flow of information to support decisions about worker protection during the incident and about instituting a worker health tracking program once workers are demobilized.[19]

- Patterns of injury, illness, or performance that raise concerns about subsequent health consequences
- Knowledge of complex and poorly understood hazards
- Areas of research interest, such as those of the National Occupational Research Agenda (NORA)
- Health disparities and other social justice concerns

Post-incident tracking of emergency responder health and function aims to identify adverse health or functional consequences possibly associated with response work and to intervene early to improve chances for recovery and to stop further exposure for workers remaining onsite.[7]

Health surveillance systems have been established to help track specific types of illnesses and injuries. These systems are usually mutually exclusive, rely on

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## BOX 19–2: COMPENSATING DISASTER WORKERS' INJURIES OR DISEASES

Disaster responders who suffer injury or acquire a disease in the course of participating in response activities may be eligible for benefits under a workers' compensation system. Workers' compensation is a no-fault mechanism for providing lost-income replacement and medical care benefits to a worker whose compensable condition results in temporary or permanent disability. Compensation benefits are administered by the employer's workers' compensation insurance carrier. Most laws governing workers' compensation are state-based and coverage formulas and benefit schedules vary from state to state. All civilian employees of the United States, except those paid from non-appropriated funds, are covered by the Federal Employees' Compensation Act (FECA), which is administered by the Office of Workers' Compensation Programs in the U.S. Department of Labor.

Legal issues may complicate disaster workers' attempts to obtain compensation for injuries or diseases that they believe arose out of their disaster response work.

State and federal workers' compensation statues reflect the legal origin of the concept of *accident*. An accident in common law has two basic elements: (a) unexpectedness—an event that is not expected or designed to occur; and (b) the injury must be reasonably traceable to a definite time, place, and cause. If both of these elements are present, then the accident is compensable. As a result, the most common compensable conditions are traumatic injuries, such as burns, amputations, slips, trips, and falls. If both elements are missing, however, workers have more difficulty getting compensation. In many workers' compensation cases, workers have suffered from a disease, not an injury.

Since the concept of occupational disease was unknown to common law of master-servant liability in the 19th century—from which workers' compensation law was derived in the early 20th century—compensation for disease conditions has lagged behind compensation for injuries. All states and the federal government now have coverage for occupational diseases, but obstacles to workers obtaining compensation for other diseases still remain.

To qualify, many states require a distinctive relationship between the specific disease and the nature of the employment. For example, many states require that the disease be due to a cause that is peculiar to a particular occupation, such as baker's asthma, and not commonly found in the general population. Many states put lists, or schedules, of specific occupational diseases into their workers' compensation statutes. If a disease is not on a statutory schedule, then workers must establish at administrative hearings the case for why they should be compensated for non-listed diseases. These limitations often prevent disaster workers getting compensated for diseases they believe are related to their response activities.

Since World Trade Center disaster workers had dust exposures at Ground Zero that resulted in various diseases not previously described as an "occupational disease," it has been difficult for them to obtain compensation for lost wages or medical benefits. In addition, many statutes place a time limit of 2 years on filing a claim for an injury or illness, which does not prevent someone filing claims for injuries, but can be a significant barrier for later-occurring diseases. If a disease believed to be related to exposures during response work does not manifest itself within the claim filing period, then a claim cannot be approved for compensation. To address this issue for World Trade Center disaster workers, the New York State Legislature allowed workers to "register," even if they had no workers' compensation claim. This allowed responders to preserve their right to file a claim in the future for a later-occurring disease arising from their disaster-related work.

Workers' compensation benefits extend only to those injuries and diseases suffered by an "employee" arising out of or occurring in the course of his or her "employment." The employment relationship is grounded in the status of the individual performing work: Is the worker an employee, an independent contractor, or a volunteer?

The law has several tests to distinguish an employee from an independent contractor—even though both receive financial compensation from the same employer. Although these tests are often complex—and can result in misclassification problems for the employer, the employee, and the government— a simple way to determine whether an employee-employer relationship exists is to use the control-and-direction test: If an employer has the right to control the details of a disaster responder's work, then that individual is an employee of the employer. If not, then that employee is an independent contractor if paid by the employer—and is not covered by the employer's workers' compensation policy.

Disaster workers who do not meet the criteria of the control-and-direction test are considered to be volunteers. Volunteers freely perform service for a humanitarian or charitable reason without promise, or receipt, of compensation. Volunteers can be paid some expenses, reasonable benefits, or a nominal fee. Even so, they are still classified by law as volunteers and not covered by workers' compensation. During large-scale disasters, many individuals who respond as rescue or recovery workers fall into the legal category of volunteers— either registered with a volunteer agency, such as the American Red Cross, or serving "spontaneously," as occurred often during the World Trade Center disaster. The Federal Volunteer Act of 1997 and some state volunteer statutes protect volunteers from being sued by other people who believe they have been hurt by the volunteers. However, there remains a gap in workers' compensation coverage for disaster volunteers who are injured, made ill, or killed during response activities.

differing definitions and information technologies, and are designed to monitor well-recognized or acute conditions, such as infectious diseases or cases of poisoning. Data from one system may not be compatible with data from another. Subtle or long-term effects may not be detected. And most systems have not been designed to detect occupational exposures and resultant injuries and illnesses. Attention needs to be placed on developing surveillance systems that can better track these occupational issues.[14,19,46]

In developing a post-incident worker health tracking program, the following issues should be considered:

- Who will be tracked and how will this influence design? Linguistic, cultural, and geographic diversity will need to be addressed in survey content and implementation plans.
- What information should be collected and how? It is best to use standardized and validated questionnaires, medical examinations, and testing that are informed by the suspected hazards and their exposure pathways. It is important to anticipate how the data will be used or shared: Will the program be linked to biomedical research or scientific analyses? If so, it may require more sophisticated capture and mapping of data.
- How will the program be implemented? Critical components may include early disease detection and medical intervention as well as analyses of illness and injury rates, trends, and relationships between exposures and illness. Medical surveillance is challenging when responders have had uncharacterized or complex exposures, such as after the 9/11 attacks on the World Trade Center. In these situations, multiple health outcomes need to be detected concurrently.[7,47] Counseling on social benefits can offset a downward spiral of disability or unemployment, but requires additional skill sets and allotment of more clinic time.

Both the content and implementation of a monitoring or surveillance protocol may affect program goals. A highly structured instrument requires extensive training to implement a consistent exam, which may adversely affect rapport between clinicians and participating workers. The content, length, and complexity of instruments selected and the manner in which a protocol is implemented are likely to influence the quality of care delivered, the quality of surveillance information collected, and the capacity of the system.

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# TERRORISM AND PUBLIC HEALTH

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