

Assessing Levels of Hospital Emergency Preparedness

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Abbreviations:

ASR = acute stress reaction
CAR = Capabilities Assessment for Readiness
MCI = mass-casualty incident
PPE = personal protective equipment

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Abstract

Introduction: Emergency preparedness can be defined by the preparedness pyramid, which identifies planning, infrastructure, knowledge and capabilities, and training as the major components of maintaining a high level of preparedness. The aim of this article is to review the characteristics of contingency plans for mass-casualty incidents (MCIs) and models for assessing the emergency preparedness of hospitals.

Characteristics of Contingency Plans: Emergency preparedness should focus on community preparedness, a personnel augmentation plan, and communications and public policies for funding the emergency preparedness. The capability to cope with a MCI serves as a basis for preparedness for non-conventional events. Coping with chemical casualties necessitates decontamination of casualties, treating victims with acute stress reactions, expanding surge capacities of hospitals, and integrating knowledge through drills. Risk communication also is important.

Assessment of Emergency Preparedness: An annual assessment of the emergency plan is required in order to assure emergency preparedness. Preparedness assessments should include: (1) elements of disaster planning; (2) emergency coordination; (3) communication; (4) training; (5) expansion of hospital surge capacity; (6) personnel; (7) availability of equipment; (8) stockpiles of medical supplies; and (9) expansion of laboratory capacities. The assessment program must be based on valid criteria that are measurable, reliable, and enable conclusions to be drawn. There are several assessment tools that can be used, including surveys, parameters, capabilities evaluation, and self-assessment tools.

Summary: Healthcare systems are required to prepare an effective response model to cope with MCIs. Planning should be envisioned as a process rather than a production of a tangible product. Assuring emergency preparedness requires a structured methodology that will enable an objective assessment of the level of readiness.

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Introduction

During the last decade, medical organizations in many countries have instituted programs to maintain preparedness in order to cope with threats of mass-casualty incidents (MCI). Meeting the challenge of emergency preparedness necessitates defining the components of readiness for a MCI. One definition is the preparedness pyramid (Figure 1), which identifies: (1) planning and policies; (2) equipment and infrastructure; (3) knowledge and capabilities of staff; and (4) training and drills as the major components of maintaining a high level of preparedness. In order to maintain readiness in hospitals, disaster plans must be established. A disaster plan should serve as the mechanism for tailoring the response to specific scenarios and locations.¹ Such organizational plans serve as a basis for an effective response to treating casualties during emergencies, as they delegate those who respond, prepare the necessary infrastructure, and train medical teams.² Nevertheless, one must not regard the plan as the entire essence of emergency preparedness,³ but rather as one ele-

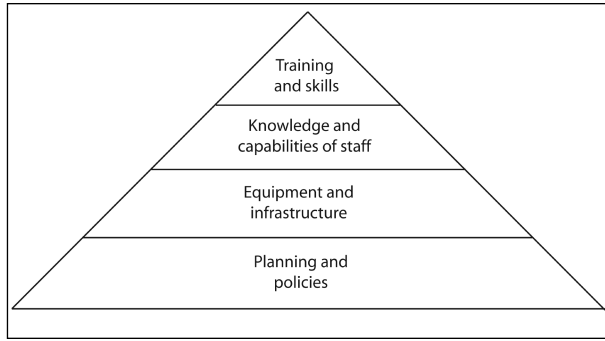


Figure 1—The Preparedness Pyramid

ment in a spectrum of activities. An effective perspective is to view the planning as a holistic process that includes activities aimed at improving emergency response.⁴

Throughout the world, comprehensive efforts to develop key indicators, which will enable the reliable and valid assessment of the status of emergency preparedness, are underway. The assessment program has an important role in reviewing the response model for emergencies prior to the occurrence of an event. Thus, it is possible to identify the strong points and the shortcomings in order to be able to improve the preparedness accordingly.⁵ A well-constructed evaluation tool provides a mechanism for assessing resources for successful hospital operations during a MCI. In addition, it allows for the evaluation of actions required to assure the readiness of institutions during emergencies.⁶

The aim of this article is to review the characteristics of contingency plans for MCIs and models for assessing the emergency preparedness of hospitals, including the components of the process and existing tools that enable assessing preparedness levels.

Characteristics of Contingency Plans for Conventional MCIs

Various actions are required for ensuring emergency preparedness, as detailed in Table 1.⁷ Emergency preparedness should focus on four main issues:

1. Community preparedness versus individual preparedness of each organization;
2. Personnel augmentation plan (including community-wide reserve staff and modifying licensure in emergencies);
3. Communications (backup systems and spokespersons); and
4. Public policies for funding emergency preparedness.⁸

As soon as a MCI occurs, the following steps should be addressed: (1) perform a preliminary needs assessment; (2) mobilize human and material resources; (3) use personal protective equipment (PPE); (4) organize and perform triage; (5) manage explosion-specific injuries; (6) organize patient flow through the emergency department; and (7) efficiently determine patient disposition.⁹ During MCIs in Israel, only limited medical interventions are made on-site, and casualties are evacuated rapidly to the nearest hospitals.¹⁰ Since the priorities for patient evacuation are made quickly by the emergency medical services (EMS) at the

Number	Action Required
1	Focusing on a comprehensive plan that encompasses all potential threats
2	Expanding emergency planning to include a wide range of potential threats, including unconventional events
3	Interfacing with community emergency plans
4	Developing a support system for families of staff members
5	Developing procedures for casualty registration that enable control of a mass-casualty incident
6	Backing-up communication systems
7	Effective functioning of information systems
8	Establishing community coordination and communication
9	Completing a strategic review of managing stockpiles of equipment and supplies
10	Responding to security issues and crowd control
11	Clearly identifying staff
12	Assuring information monitoring systems for detecting and identifying infectious diseases
13	Identifying staff holding dual roles whose absence can negatively effect the readiness of the organization for emergencies

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Table 1—Actions required for emergency preparedness⁷

scene, it is imperative that all hospitals be ready to admit casualties when a MCI is announced.¹⁰

Characteristics of Contingency Plans for Non-Conventional Events

Chemical and Toxicological Events

The capability to cope with MCIs serves as a basis for event preparedness (Figure 2).¹¹ Preparedness can be assessed according to two criteria: (1) the ability to treat a single contaminated patient; and (2) the ability to cope with a large number of patients. Each hospital is required to prepare a plan for this scenario, procure the equipment (PPE), develop decontamination infrastructure, and stockpile medical supplies.¹² Coping with chemical or toxicological casualties necessitates preparing the following elements: (1) decontamination of casualties to avoid secondary contamination of staff or infrastructure; (2) preparedness for treating victims with acute stress reactions (ASR), who are anticipated in high numbers (100–1,000 ASR for every real casualty); (3) expansion of the surge capacity of hospitals (beds, equipment, ventilation machines); and (4) integrating knowledge among medical teams through exercises and drills.¹³ The contingency plans for a chemical MCI should involve preparation of on-site activities and hospital operations (Table 2).¹⁴

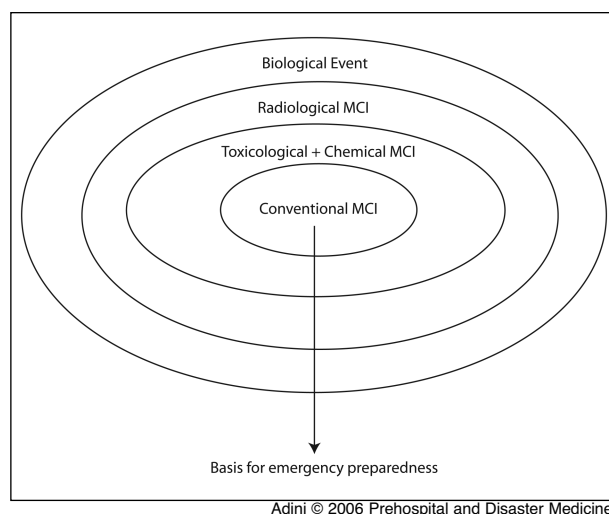


Figure 2—Basis for emergency preparedness (MCI = mass-casualty incident)

Bioterrorism

The basis for coping with a bioterrorism event is the capability to cope with a conventional MCI. However, biological events require additional planning for protecting staff, containing the contaminants, and providing specific medical treatments. The effects on the medical system will be more significant and will linger for a longer period of time than would those of a conventional MCI.¹¹

Radiological Events

During a radiological event, it is likely that the public will demand information, which may result in available resources being overwhelmed.¹⁵ A carefully planned, well-executed, risk communication program is a vital part of any effort to address the threat of terrorism involving radioactive materials, and it may be one of the most important actions that will help people cope with the event.^{15–17} Therefore, risk communication is important for coping with a radiological MCI, and will influence the outcome of the event.¹⁸

Key Components of Emergency Preparedness

Maintaining the emergency preparedness of medical organizations is not a static effort, but is a dynamic framework that necessitates developing an organizational emergency plan, training staff, reviewing resources, and establishing command and control systems.¹¹ An effective plan must be constructed for four stages of emergency management: (1) mitigation; (2) preparedness; (3) response; and (4) recovery.¹⁹ The issues that must be addressed in order to maintain MCI readiness include organizational emergency contingency plans,²⁰ checklists (action sheets) that specify the activities required of each staff member,²¹ equipment and infrastructure preparation,²² staff reinforcement,²³ and staff training.²⁴ Each element contributes to a higher level of emergency preparedness.

Number	Main elements
1	Division of the site of event to three subsections—(1) hot zone (contaminated); (2) warm zone (where decontamination is performed); and (3) cold zone (clean area)
2	Medical treatment according to MCI protocols
3	Decontamination of casualties
4	Provision of PPE for medical teams
5	Identification and detection of chemical agents
6	Coordination and sharing of information
7	Education and training of staff

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Table 2—Main elements of a contingency plan for a chemical MCI¹⁴ (MCI = mass-casualty incident; PPE = personal protective equipment)

Assessment of Emergency Preparedness

Rationale

The main rationale for the assessment of emergency preparedness is to promote effectiveness, raise professionalism, present preparedness status to interface agencies, serve as basis for analyzing operational capabilities prior to an event, and encourage a culture of managing emergencies through preparing the population to prevent emergencies or their consequences.²⁵ The preparedness assessment serves as a common ground for evaluating emergency readiness, and enables the various organizations to communicate strong points and elements that require improvement. Assuring emergency preparedness only can be achieved by developing procedures for an annual assessment of the emergency plan, including clear goals, structure, and measures of effectiveness.¹⁹

Assessments

Alternate assessments of emergency readiness include:

1. *Assessment of capabilities*—identifying shortcomings and bottlenecks;
2. *Assessment of compliance* with national doctrines and protocols;
3. *Performance assessment*—review of functions during drills;
4. *Assessment of needs*—identifying organizational needs for improvement in relevant areas of planning, equipment, training, etc.; and
5. *Assessment of preparedness strategies*—standardization of planning, and inter-organizational cooperation.²⁶

Components of the Assessment Process

Research conducted on readiness shows that most of the tools used for assessing emergency readiness emphasize the management of specific agents and do not refer to extensive planning issues.²⁷ The preparedness assessment should include: (1) elements of disaster planning; (2) emergency coordination; (3) internal and external communication; (4) training; (5) expansion of the surge capacity of hospitals;

(6) staffing and personnel; (7) availability of equipment; (8) stockpiles of pharmaceuticals; and (9) expansion of laboratory capacities.^{27,28} Efforts are in progress to develop objective parameters to measure results in 12 categories: (1) regional linkages; (2) planning and structure of response to bioterrorism; (3) training and exercises; (4) triage, diagnosis, and treatment of casualties; (5) decontamination capabilities; (6) isolation and control of infectious diseases; (7) public health surveillance; (8) surge capacity; (9) laboratories; (10) vaccinations and pharmacies; (11) safety and mental health support; and (12) information systems and public relations.²⁷

A review of existing assessment tools in the area of emergency preparedness indicates that many agencies invest extensive resources in the effort to develop such tools.

Using Measurements in the Assessment Process

Assessment Measures

An assessment program must be based on valid, measurable criteria, render reliable, valid results, and draw conclusions about the effectiveness of institutions to manage MCIs.²⁹ The measures must be defined clearly, easily understood, reliable, simple, and informative. It is crucial that they are cost-effective and task-relevant, and that they supply a common language to all agencies that take part in managing emergency events.³⁰

Baseline Measurement

A baseline measurement of emergency management capabilities is needed in order to promote emergency preparedness.³¹ The baseline provides information about emergency management and response so that strengths and weaknesses can be addressed, progress can be determined in relation to a defined baseline, and, if necessary, assistance can be provided to areas of greatest need. The parameters identified for the baseline of emergency preparedness include criteria for: (1) resource management; (2) emergency management plans; (3) direction, control, and coordination; (4) operational procedures; (5) communication; (6) logistics; and (7) public information.

Tools for Assessing Levels of Emergency Preparedness

Surveys

The Joint Commission for the Accreditation of Healthcare Organizations (JCAHO) continuously conducts surveys of hospitals in which surveyors assess the level of planning for implementing and improving the emergency preparedness, the extensiveness of plans for various potential emergencies, and the level of staff training for managing MCIs. The surveyors review the following elements: (1) involvement of leaders in planning for emergencies; (2) level of staff understanding of the plan; (3) clinical leadership; and (4) the treatment environment.¹⁹ Hospitals that function equal to or better than the identified standards receive accreditation. Medical agencies willingly participate in the survey in order to receive accreditation, which will enable them to present proof of effective response to emergencies. Nevertheless, this methodology has been criticized³² due to the fact that it has not been possible to show that a relationship exists between mortality rates and medical complications in comparison to the ratings of surveyed organizations. Research points to the absence of performance measures in

the survey, and the fact that the focus is primarily on structural and process measures.³²

Parameters and Checklists as Part of the Assessment Process

Another tool for preparedness assessment based on parameters and checklists was developed by the Healthcare Association of Hawaii. It has been used to assess capability for emergency readiness of the following functions: (1) leadership; (2) hazard identification, analysis, and control; (3) planning; (4) direction, control, and coordination; (5) communications; (6) operations and procedures; (7) resources management; (8) logistics and facilities; (9) public information; (10) orientation and training; (11) exercise; and (12) performance improvement.⁶ As an integral part of the evaluation, general information regarding the profile of the organization is gathered. The level of performance of each of these parameters is graded on a scale from 0 to 3, and some actions reward the hospital with a bonus grade. The checklist of parameters is intended to assist the hospital in assessing its level of readiness independently. The shortcoming of this tool is that the standards used are general. There are no specific parameters that should be assessed in order to define the preparedness level.

Capabilities Evaluation

The Capabilities Assessment for Readiness (CAR) evaluates the operative capabilities of a local governing body. Unlike other systems, the focuses of the CAR include: (1) identifying the weak links in preparedness; and (2) serving as a basis to perform the actions required to strengthen emergency preparedness. This tool can assist local administrations in defining priorities and analyzing a program for emergency preparedness improvement. This tool has two main goals: (1) establishing a database of information for local governments that can be used as part of the needs analysis; and (2) strategic planning and national implementation of readiness for emergencies.²⁵ On this basis, it is possible to define standards, goals for improvement, and measures to evaluate improvement processes. Another structured tool for evaluating capabilities was developed in order to monitor the readiness levels of a medical response team to a MCI caused by weapons of mass destruction (WMD).³³ The elements included in the assessment tool are described in Table 3.

Organizational Self-Assessment of Preparedness

Self assessment enables each organization to monitor its level of emergency preparedness continuously. Following the assessment, self-review summation can be reported, as described in Table 4.³⁴

A Public Health Ready tool intended to encourage cities to promote their emergency readiness was developed. Thirteen cities currently are using this tool, which necessitates them to present documents verifying their performance in activities relevant to emergency preparedness. The topics reviewed include:

1. *Preparedness planning*—an emergency response plan that specifies the responsibilities of the public health agency and the roles of its staff when respond-

Number	Components
1	Procedures for notification of hospital regarding the occurrence of an emergency event
2	Procedures for protecting hospital from secondary contamination
3	Triage capabilities and administering definitive medical care to casualties
4	Assurance of security services to support medical staff
5	Availability of personal protective equipment to medical teams
6	Stockpiles of pharmaceuticals and equipment (including ventilation machines) or a plan for backup systems for life-saving equipment
7	Medical staff capabilities to identify and treat casualties from WMDs
8	Existence of medical protocols and level of acquaintance of staff with guidelines
9	Procedures for staff call-up systems during emergencies
10	Procedures for transport of non-medical equipment (food, water, laundry, etc.)
11	Training programs for medical staff

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Table 3—Components of readiness assessment tool³³
(WMD = weapon of mass destruction)

ing to emergencies. The agency must present a response plan that is integrated with the community response plan. The plan describes the functional roles of the staff in emergencies. The plan and the job action sheets are easily accessible to all staff, and the agency demonstrates a process for regular exercising and updating of the plan;

2. *Individual worker competency*—The members of the workforce are competent to perform the core emergency preparedness competencies. The agency must confirm that it conducts a training needs assessment; and
3. *Exercise and simulation*—The response plan is tested and individual worker emergency preparedness competencies are presented successfully, through participation in an exercise.³

Limitations of Assessment Tools

One limitation of many of the tools reviewed is that they do not specify the elements that must be assessed. There also is an absence of a methodology to measure the level of preparedness and readiness. Most tools enable the executive personnel to map the topics relevant for emergency

Number	Components
1	An executive summary which provides a brief summary statement of the overall status and level of readiness of the emergency management program
2	Program description of the rationale for determining the organization's response plan for emergencies, based on the results of a hazards survey
3	Exemptions or deviations from issued standards or directives
4	Results of hazards surveys or assessments
5	External coordination activities involving external emergency response organizations and resources, including participation in training, drills or exercises
6	Training programs for members of emergency response organization, including plans and goals for the current and upcoming years
7	Exercises, including overall objectives for the next five years
8	Evaluations, appraisals, and assessments by the organization itself or by external agencies
9	Findings and corrective actions identified through external evaluations/appraisals that have been resolved during the past fiscal year
10	Resource requirements of personnel, operational budget and equipment requirements

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Table 4—Components of written report regarding level of preparedness³⁴

readiness, but they do not serve as an effective mechanism for an organizational evaluation of readiness and preparedness. It is recommended that a holistic assessment tool be developed, which will allow for an extensive evaluation of preparedness of hospitals for MCIs. An assessment tool should be based on determining standards of performance, defining parameters of preparedness, developing measures for evaluation, and developing a system for assimilating the findings. The methodology of establishing such an assessment tool is described in Figure 3.

Israeli Experience in Assessing Emergency Preparedness

In Israel, a pilot study aimed at assessing the emergency preparedness of hospitals to deal with emergencies was conducted, using a structured tool that included 700 parameters. The evaluations were conducted as an ongoing process, commencing with the extensive evaluation of the hospital plans prior to the assessment. This was followed by an assessment of the readiness of the hospital infrastructure, equipment, lessons learned from drills and MCIs, and the knowledge of participating personnel. The assessment process was completed with evaluations of performance during MCIs. The evaluations were performed in all 24

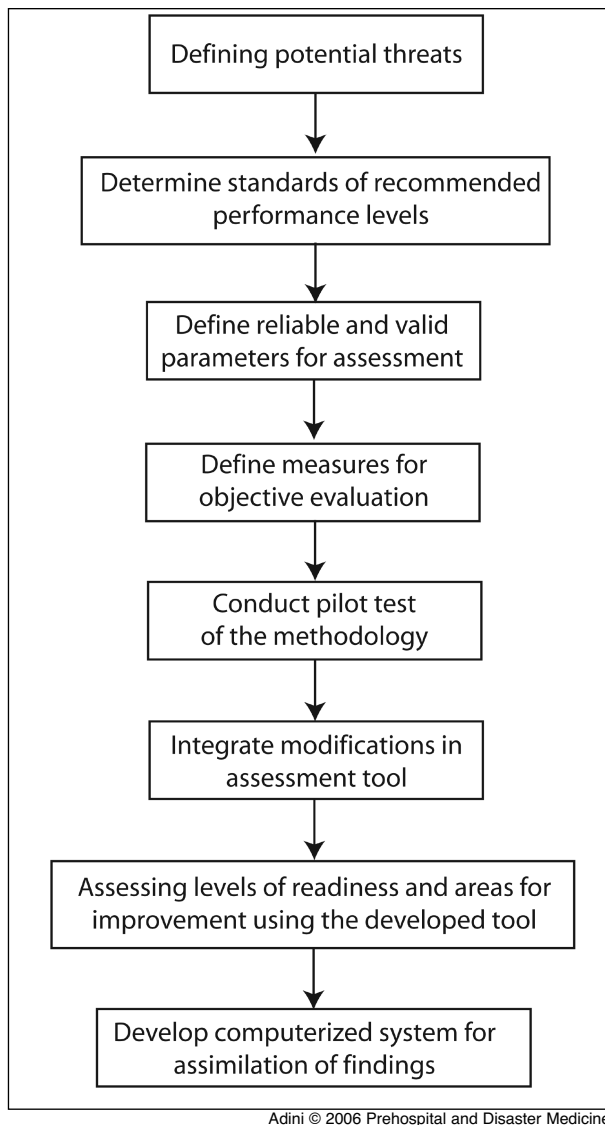


Figure 3—Building a tool to assess emergency preparedness

general hospitals for each potential type of MCI, both conventional and non-conventional. The performance levels were calculated based on the relative importance of each element for emergency readiness, and each hospital received a detailed report of its level of readiness.

Summary

In every country, healthcare systems are required to prepare an effective response model to cope with MCIs. The preparedness required for dealing with MCIs is different from the routine functions of the medical organizations required to deal with individual patients. Mass-casualty incidents necessitate admitting and treating large numbers of casualties in a short time span. Often times, there may be a lack of balance between needs and available resources. An effective response is based on a pre-designated contingency plan, which maps the various activities that will operate during an emergency. However, this plan is only one element of the preparedness process. An effective perspective is to envision planning as a process rather than the production of one tangible product. The preparedness planning involves all the activities, practices, interactions, and relationships that are aimed at improving the ability of the system to cope with various emergencies.

Assuring emergency preparedness requires a systematic, structured methodology that enables an objective assessment of the level of readiness. Efforts are aimed at developing such tools, which will be used by the health organizations and the supervisory governing agencies. Until recently, no methodology was adopted widely; there are no accepted benchmarks regarding the elements that should be included in the assessment process, and there is a need to develop the structure and process for an effective measurement of the level of readiness. It is recommended that greater efforts be invested in developing a comprehensive methodology for assessing emergency preparedness that will be integrated into the contingency plans of medical organizations, and thus, will contribute significantly to promote readiness for MCIs.

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