If a mass casualty incident (MCI) occurs on American territory, the main difficulty with disaster response is not from a lack of resources or volunteers but from a lack of a properly managed disaster plan. In fact, first responders and local healthcare practitioners, and even non-clinical locals rush to the scene and to local healthcare facilities to offer their services or make donations. The presence of so many volunteers and donations can be of great help during a disaster if properly managed. Even before 9/11, hospitals were required to have a disaster plan and ensure that their employees were familiar with it. Very few hospitals, however, actually worked on coordinating their disaster response plans with other hospital facilities, Emergency Medical Services (EMS), or local governmental facilities to offer a united response in case of a disaster. Healthcare institutions therefore had difficulties not only working with other institutions preparing for a disaster but also were often unprepared for managing unexpected resources from the community.

Institutional readiness for disasters has improved somewhat since 9/11, with the new government-mandated National Incident Management System (NIMS) compliant Hospital Incident Command System (HICS) and increased clinician familiarity with disaster protocol. Commonly cited references for medical practitioners such as Up-To-Date.com now describe how to manage disaster victims and describe the different signs and symptoms of major biological and chemical weapons of mass destruction. Disaster drill frequency has increased across the country. However, even now, post-9/11, disaster preparedness is in its infancy. A 2007 Centers for Disease Control and Prevention (CDC) study on terrorism preparedness for office-based medical practitioners from 2003 to 2004 showed that less than 50% of physicians received some kind of training on at least one terrorism-related disease. An even smaller percentage of allied health professionals received this training. The debacle of coordinating an efficient response to the flood victims in Louisiana also indicates that more training and education in the field of disaster medicine is needed. Training for the specialized field of terror medicine is also necessary as long as governments are an active target of terrorists.
The specific challenges that any education and training for terror medicine must face in order to be effective, efficient, and customizable for specific kinds of MCI include the problems of engagement, finances, and the need to retrain. First, how should an institution respond to a terrorist attack? The details of a particular hospital’s response plan are not obvious and require thoughtful development by administrators, clinicians, and other hospital staff who are well versed in NIMS protocols. As well, the plan needs to be rolled out to staff in a timely and efficacious manner. Second, financial planning for an MCI is essential: technologically advanced, sturdy, or space-saving medical equipment designed for MCI and often applicable for patient care during normal operations is available. Financial managers should be trained in how to incorporate MCI equipment purchases into their budgetary outlays in order to save expenses later during a real MCI. Third, terror medicine addresses incidents that – by definition – occur infrequently and unpredictably, but have high casualty rates when they do happen. Hospital staff may be trained once in the proper management protocols for MCI, but since they do not practice using these guidelines frequently, they will not be able to recall them quickly during an MCI. In a MCI, losing minutes of time can equate to losing patients. Basic education and training for terror medicine is similar to other situations like fencing: the fencer practices parries and reposts for hours until they are a part of his unconscious muscle memory and he can focus on his overall strategy. In a similar fashion, a doctor should not have to be struggling with putting on the right kind of boots and helmet while a patient lies dying at his feet. Much time can be wasted searching for the location of Personal Protective Equiment (PPE), the right persons to contact for interfacility risk communication, or the right way to request consults during an MCI. Proper education and training before MCI is essential.

The targets of terror medicine education and training are not only physicians and allied health professionals but also administrators, protective service personnel, lab technicians, and other hospital staff.

Physicians need to be ready for two kinds of training. First, they must learn how to recognize the signs and symptoms specific to particular kinds of terrorist weapons. An educational system should be available so that they can be trained on basic clinical guidelines at minutes’ notice, since the specific kind of weapon (e.g., anthrax or nuclear) employed by a terrorist is difficult to predict beforehand and victims usually start arriving at local hospitals within minutes of an attack. A low-frequency/high-casualty MCI can have devastating effects if clinicians in the casualty receiving areas are not ready to apply the appropriate prophylactics, or use current treatment protocols.

Second, clinicians must be ready to adopt management principles that are the same for all MCI but differ from typical medical training, which focuses on managing a single patient well. Since these principles do not vary much for different MCI, they can be rolled out to clinicians well in advance of an MCI. The main management principles are how to manage multiple patients simultaneously, focus on the emergent patients that cannot be shunted aside, and manage time, departmental personnel, and resources (such as Personal Protective Equipment) effectively.
Hospital administrators must be trained in how to support the clinical teams during the stress and time constraints of an MCI. During an MCI, chief administrators in areas away from direct patient care need to be available to manage resources essential for patient care like clinical supplies, transport, and the personnel pool. Administrators must also be prepared to liaise with local government and EMS agencies, and to engage in astute risk communication with the local populace and media. They also need to prepare their facility according to federally mandated and researched management guidelines for the onslaught of an MCI – before it occurs.

Protective service personnel have a key role in MCI management. They serve to protect the hospital environment from hostile attack and maintain order in a chaotic MCI situation. They need to achieve competency in an “all-hazards” approach to handle threats, including MCI and terrorist attacks against their facility. They must be trained to analyze and plan for future threats to hospital security. In order to protect the innocent patients and hospital staff, they also need to analyze the mindset and motives of those who would inflict harm on the hospital. They should be ready to implement the tools available in their institutions to detect potential threats in the hospital.

Clinicians can flood the labs with certain types of lab requests during an MCI. To prevent backup in returning results, lab technologists should be prepared to “surge.” They should also be trained to prioritize between the lab tests that need to be done immediately, and others that are less urgent. Other hospital staff should be given guidance about what procedures to follow if an MCI occurs; for instance, that they must absolutely show their ID badge in order to enter the facility. They should also be trained in general knowledge about the different kinds of disaster codes that are called at their facility and how they affect the day-to-day operations of the hospital at large.

When it comes to understanding how their role as physicians (or as other hospital staff) change in the event of an MCI, a systematic education and training program is useful. For convenience, terror management learning can be classified into three categories: education, training, and exercises and drills.

Education

The goal of terror medicine education is to improve patient care in both predicted and unpredicted situations. Educating for terror medicine encounters the challenge of all new disciplines in that it has had no systematic foundational treatises until now. Terrorists by definition try to shock and surprise their victims, so specialists in terror medicine must also constantly evolve to adapt to new psychological techniques and technological advances, while at the same time searching for underlying emergency management principles that are useful for predicting and responding to most terrorist incidents. In addition, authoring educational material for the field is difficult because terror medicine is based upon low-frequency/high-consequence events, which consequently have few subject matter experts.
The types of weapons used as instruments of terror are now classified as chemical, biological, radiological, nuclear, and explosive (CBRNE), but that division is a recent one and explosive) in the history of MCIs. Early uses of terror weapons do not usually show a systematic application; usually the technology was developed carefully but not applied in the most strategic manner. Conventional weapons were the first to be used in mass casualty events. A very early example of a conventional attack resulting in mass casualties was Archimedes’s burning mirrors used against Roman soldiers.†

The pioneer of chemical weaponry was Thomas Cochrane. In the Napoleonic Wars, he proposed that the British navy use sulfur dioxide, which had a poisonous smoke. In the right wind conditions, it “would drift onto the object of attack with the dual purpose of providing a dense smokescreen and asphyxiating or driving off the defenders.”5 While this use of toxins is a creative approach to chemical weaponry, it is clear that the tactic could easily turn on those who used it. Later, in World War I, chemical weapons were used more frequently. Chlorine gas was used experimentally by the Germans at Ypres in 1915 but the commanders were unprepared for its deadly success in collapsing the Allied line. The great advantage of surprise was thereby lost for an unsystematic attack with limited goals, as Heller points out.6 If the Germans had been educated in the likely outcome of the attack, that is, the routing of thousands of Allied soldiers from their front, they would have more likely employed the new weapon more strategically. As it happened, the Allies had time to develop and roll out gas masks (primitive personal protective equipment) to their soldiers (Fig. 5.1).

No one recognized the true advantages that mass casualty weapons have until World War II. During that period, the effort was made to develop CBRNE weapons as true mass casualty weapons. Discoveries in atomic physics, for instance, led to the development of fusion and fission bombs by the Allies. The bombing of Hiroshima and Nagasaki in 1945 are the first clear examples of deliberate, systematic MCI weapons deployment in human history: a mass casualty weapon was deployed and the ensuing casualty levels and threat of future incidents were key factors in the surrender of Japan shortly thereafter.‡ The Japanese government and healthcare

† When Marcellus [the Roman commander attacking Syracuse, Archimedes’ city] withdrew them [his ships] a bow-shot, the old man [Archimedes] constructed a kind of hexagonal mirror, and at an interval proportionate to the size of the mirror he set similar small mirrors with four edges, moved by links and by a form of hinge, and made it the centre of the sun’s beams – its noon-tide beam, whether in summer or in mid-winter. Afterwards, when the beams were reflected in the mirror, a fearful kindling of fire was raised in the ships, and at the distance of a bow-shot he turned them into ashes. In this way did the old man prevail over Marcellus with his weapons.
John Tzetzes, Chiliades, Book II, Lines 118–128.

‡ Moreover, the enemy has begun to employ a new and most cruel bomb, the power of which to do damage is, indeed, incalculable, taking the toll of many innocent lives. Should we continue to fight, not only would it result in an ultimate collapse and obliteration of the Japanese nation, but also it would lead to the total extinction of human civilization. Such being the case, how are We to save the millions of Our subjects, or to atone Ourselves before the hallowed spirits of Our Imperial Ancestors? This is the reason why We have ordered the acceptance of the provisions of the Joint Declaration of the Powers.
Hirohito, August 14, 1945, capitulation announcement.
personnel were completely unprepared to handle such a disaster. They had no reliable method of communication in a disaster and at first officials refused to believe that an MCI of such a great extent could occur. Their response to the disaster exacerbated the resulting medical problems faced by the victims. Biological and radiological weapons and education have proceeded apace.

While terror medicine tends to focus upon MCIs, individual persons – such as Alexander Litvinenko, victim of radiation poisoning – can also be victims of terror attacks, and clinical physicians need to be educated to face these threats as well so that they can not only treat the patient rightly but also know when it is necessary, and how to protect other patients from contamination. Medical practitioners also need to be trained to quickly recognize a victim of a biological attack, so that the appropriate antidote can be applied.

Terror medicine education has a clear goal: to impart information on how to manage patients and communications during a disaster to minimize patient suffering and maximize the use of institutional resources. As shown historically, with the rise of MCI attacks, having greater disaster education can help mitigate the severity and duration of victim injuries should an MCI occur. Because much of the

Fig. 5.1. German medics, wearing an early mask, giving oxygen to gas victim, 1915. British, French, and Russian prototype masks were similar in design. Gas masks being used by World War I medics is evidence of terror medicine educational preparedness. From Heller Combat Studies Institute (Public domain).
field is in constant flux, however, pedagogical material must often be modified and revised, and should require a low level of investment to create. The earliest educators for MCI were in the military, since historically military personnel have borne the brunt of mass casualties. Military healthcare educational research facilities shared a background with military medicine during the cold war, and were the first to approach the challenge of educating on terror medicine. The U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID, http://www.usamriid.army.mil/index.htm), the center of excellence for the Department of Defense medical biological defense research, was founded in 1969. The education section of the Institute focuses on instructing military personnel on defending against biological weapons but recently has branched out to include civilian clinicians in biological terror medicine education.§

Several major civilian research facilities exist in America that provide education for MCI. In the civil healthcare environment only a few academic and hospital based institutes took the initiative and developed content for healthcare providers. Most of the work on terror was developed by grants provided by the CDC and tailored for public health with the assumption that terrorism is a public health domain. A full list of courses and publications is available. The Center for Public Health Preparedness at Harvard has developed partnerships with local, regional, and statewide organizations to promote emergency preparedness educational opportunities (homepage: http://www.hsph.harvard.edu/hcphp/products/webcasts/index.html). The Integrative Center for Homeland Security at Texas A&M University (homepage: http://homelandsecurity.tamu.edu/) has begun to collaborate with Texas A&M faculty to offer courses for degree credit in the field of emergency preparedness and related areas. The Johns Hopkins Bloomberg School of Public Health offers a wide variety of educational material for terror medicine through its Public Health Preparedness division (homepage: http://www.jhsph.edu/preparedness/).

Most of these opportunities, however, focus upon how a system – such as a hospital, clinic, or EMS division – should respond to a terror incident. They do not, however, offer assistance on how to medically manage patients who are victims of an MCI. Several institutions are beginning to respond to this need. The George Washington University School of Medicine, partly because of its location in central Washington, DC, offers an interdisciplinary Disaster Preparedness track program lasting throughout medical school (curriculum: http://www.gwumc.edu/smhs/students/opportunities/ep_curriculum.htm). In Israel, a relatively large number of healthcare providers and researchers have had firsthand experience of

§ The USAMRIID offers several satellite-recorded civilian clinician courses such as “Medical Defense Against Biological Agents Botulinum Toxin,” http://www.usamriid.army.mil/education/satellite.htm.
MCI. At Hadassah University Hospital in Israel, various training and educational materials are offered on terror medicine management (http://www.hadassah.org.il/English). The ER One Institute at the Washington Hospital Center Department of Emergency Medicine, located close to the heart of Washington, DC, offers a variety of educational material specific for clinicians managing patients in the wake of a terror incident (homepage: http://EROneInstitute.org). In particular, the Simulation and Training Environment Lab Learning Management System is an eLearning platform that provides sophisticated and continuously updated education for healthcare providers based upon Israeli and American terror medicine expertise (www.sitel.org, www.web.sitelms.org). The Institute for Bioterrorism and Emerging Disease (BEPAST, homepage www.bepast.org) researches, collects, and shares information, and is chartered to facilitate up-to-date resource planning and the dissemination of knowledge on emerging diseases related to terrorism or natural disease outbreaks.

Educational deliverable options vary, and deciding which one is most suitable depends on several variables. First to be considered is the educational time frame. That is, the educational coordinator must consider if the occasion is emergency preparedness education, but without an impending MCI occurring or, on the contrary, if a Code Orange for anthrax contamination was just called overhead. Second, the number of students must be considered; if large, an institutionalized, easily accessible course would be appropriate, but if small, a department-specific inservice might be better. Third is the educational budget. Finally, the preferences of the clinical personnel should be considered. Some have familiarity with web-based training and are more likely to enjoy being educated online, but others are more comfortable with printed material, and will absorb the information more easily that way.

Educational material can be accessed in hardcopy mainly through journals, since few books in English have yet been specifically aimed at terror medicine education. Both disaster-specific journals and terror-medicine articles in emergency medicine serials are now easily available to most medical education facilities, and since 9/11 the number of articles pertaining to terror medicine has “increased tremendously,” according to G Kelen and L Sauer (Acad Emerg Med Volume 14, 5 Supplement 1, 189–190). In fact, we are on the cusp of an upsurge in terror medicine educational material in all media, not simply through the printed word. Online terror medicine education is available through satellite lectures, online recorded lectures and/or

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¶ Cf. for instance Disaster Medicine and Emergency Health Preparedness, started in 2007. ISSN: 1935-7893, The Official Medical Journal of the World Association for Disaster and Emergency Medicine and the Nordic Society for Disaster Medicine, and the American Journal of Disaster Medicine.

|| The CDC and the Johns Hopkins School of Public Health also offer education via satellite links. See also http://www.usamriid.army.mil/education/satellite.htm
PowerPoint presentations,** question-and-answer scenarios†† and online printed material‡‡ workshops, and seminars.

At this point, terror medicine is yet to be academically recognized in its own right, although the closely related fields of Disaster Medicine and Homeland Security are disciplines at accredited American institutions. We expect that this book will be the cornerstone for establishing the field of terror medicine as a global discipline. In order to progress in the field, researchers should gather experts from around the world in order to compile evidence-based learning into one standardized manual. Educational experts should consult those medical professionals in China who have experienced SARS, garner the expertise of African physicians who have seen Hemorrhagic Fever Virus firsthand, confer with Israeli security experts on Conventional MCI, and learn from Russian physicians who experienced treating patients from radiation incidents. Terrorists do not restrict their attacks to one nation or one type of weapon. Likewise, terror medicine experts should gather educational material to rollout for every current feasible terror weapon to assist their clinicians in the front lines of attack, whether be it on a battlefield or at Ground Zero.

Training

Training involves teaching students to practically apply cognitive knowledge about a field so they can reach a competency level in it. The most effective training has been found to be systematic, which uses structured tools and has relatively standardized measurements of success. While education for terror medicine is based upon different kinds of lectures and is largely theoretical, the demands of an actual MCI require that students learn pragmatic MCI management skills by hands-on courses. The goal of a systematic terror medicine training program, then, is to teach students how to practically apply the appropriate knowledge both as an individual and as an integral member of a team.

Throughout history, many types of training for events with large numbers of casualties have been developed. Most of the preparations were for bringing about MCI rather than for responding to it. Even so, it is useful to review historical types of training because the principle of preparedness remains the same: regularized training is remarkably effective. Students who were trained in these systems were often demonstrably more successful during combat than their counterparts, who

** For instance, see The Yale New Haven Center for Emergency Preparedness and Disaster Response at http://ynhhs.emergencyeducation.org/ and the Simulation and Training Environment Lab Learning Management System (LMS) at www.web.sitelms.org.
†† The Question and Answer format for diagnosing different types of biological MCI victims at http://www.bioterrorism.uab.edu/home.html through the University of Alabama School of Medicine.
‡‡ See the Johns Hopkins Bloomberg School of Public Health for examples of online printed material.
had little or no standardized training. The Spartans, for instance, were famous for
the harsh training and indoctrination of their citizen-soldiers.\footnote{Plutarch, Lives of the Noble Greeks and Romans: Lycurgus. At the age of seven, Spartan boys left home and went to live under military discipline. Those who showed the most skill and courage were appointed by the old men to be leaders, with the authority to order the other boys and the power to punish disobedience. The main subject they studied was command and obedience. Spartan boys learned enough reading and writing to be literate, but learning how to endure pain and conquer in battle was considered even more important.} Because of this training, they were the most feared soldiers in ancient Greece due to their immaculate discipline and valor.\footnote{See Thucydides describing the surrender of the Spartans at Pylos (Tr. Hobbes: Thucydides, The English Works, vol. VIII (The Peloponnesian War Part I, IV:40) [1839]). Of all the accidents of this war, this same fell out the most contrary to the opinion of the Grecians. For they expected that the Lacedæmonians [Spartans] should never, neither by famine nor whatsoever other necessity, have been constrained to deliver up their arms, but have died with them in their hands, fighting as long as they had been able: and would not believe that those that yielded, were like to those that were slain.} §

Early on, the Romans had professionalized gladiator training; later, they realized
that this training could carry over into other areas and applied it to their soldiers
so that they were well versed in sophisticated weapons tactics.\footnote{As Valerius Maximus (ca. 20 ad) wrote in Factorum et dictorum memorabilium libri ix (Nine Books of Memorable Actions and Speeches) 2.3.2, The practice of weapons training was given to soldiers by P. Rutilius, consul with C. Mallis. For he, following the example of no previous general, with teachers summoned from the gladiatorial training school of C. Aurelus Scaurus, implanted in the legions a more sophisticated method of avoiding and dealing a blow and mixed bravery with skill and skill back again with virtue so that skill became stronger by bravery’s passion and passion became more wary with the knowledge of this art. (Tr.: The Latin Library at Ad Fontes Academy.)} Later, starting in 1493 A.D., the Ottoman Empire systematically trained thousands of enslaved children of Christian subjects to be Janizaries, elite guards, and soldiers.\footnote{See Islamic History Sourcebook: James M. Ludlow: The Tribute of Children, 1493. From: Eva March Tappan, ed., The World’s Story: A History of the World in Story, Song and Art, (Boston: Houghton Mifflin, 1914), Vol. VI: Russia, Austria-Hungary, The Balkan States, and Turkey, pp. 491–494.} *** Ever since the Renaissance, most military and paramilitary institutions have employed

§§ Plutarch, Lives of the Noble Greeks and Romans: Lycurgus.
\¶¶ See Thucydides describing the surrender of the Spartans at Pylos (Tr. Hobbes: Thucydides, The English Works, vol. VIII (The Peloponnesian War Part I, IV:40) [1839]).
\|| \|| As Valerius Maximus (ca. 20 ad) wrote in Factorum et dictorum memorabilium libri ix (Nine Books of Memorable Actions and Speeches) 2.3.2, The practice of weapons training was given to soldiers by P. Rutilius, consul with C. Mallis. For he, following the example of no previous general, with teachers summoned from the gladiatorial training school of C. Aurelus Scaurus, implanted in the legions a more sophisticated method of avoiding and dealing a blow and mixed bravery with skill and skill back again with virtue so that skill became stronger by bravery’s passion and passion became more wary with the knowledge of this art. (Tr.: The Latin Library at Ad Fontes Academy.)
\*** See Islamic History Sourcebook: James M. Ludlow: The Tribute of Children, 1493. From: Eva March Tappan, ed., The World’s Story: A History of the World in Story, Song and Art, (Boston: Houghton Mifflin, 1914), Vol. VI: Russia, Austria-Hungary, The Balkan States, and Turkey, pp. 491–494.
systematic training. The more rigorous the training, in general the more successful were the students.

Until the past half-century, systematic training regimens were largely used for military training and readiness and no programs for training clinicians to respond appropriately to a mass casualty event were implemented significantly. In the present day, educators and trainers have realized that training military members for war is similar in principle to training responders for MCI preparedness. Both involve readiness for low-frequency/high-casualty events: even though a battle may not loom in the near future, still, military personnel must be ready for it when it occurs. Likewise, physicians should be ready to lead their teams in the event of an MCI, and systematic training should give them the skills necessary to respond effectively. Training clinicians for terror medicine is thus a new and – given the worldwide terrorist threat levels – vitally important field. Training now involves two steps. The student must reach a competency level in a particular subject, and then undergo exercises to maintain the ability to perform that procedure. The frequency of exercises for the second step varies inversely to how often a procedure is performed in medical practice. Some procedures are crucial and have a high level of complexity, so require ongoing training. For example, C-sections are complex procedures, yet are central to obstetrics/gynecology practice, so a resident in the field must frequently be tested on the ability to perform the procedure. Other protocols are straightforward and may only be necessary if an MCI were to occur. Thus, training for these procedures can be rolled out on an ad hoc basis and is called “Just In Time Training.” For instance, clinicians do not need to know how to use a cyanide antidote kit in nearly every medical situation, so it would not normally be worthwhile for them to memorize the proper steps in the application of the antidote. However, if patients could have been poisoned by a cyanide agent, then they would need to be trained speedily in the proper application of the antidote.

Several different types of medical training vehicles are useful in terror medicine procedures. Training on real, living patients is the traditional way that clinical personnel have learned how to perform procedures. The advantage of training on live patients is clear: since the patients have complete fidelity to actual victims, then the physician learns exactly how to do a procedure correctly. Since terror medicine focuses upon low-frequency events, it is not ideal to rely upon live patient training to teach physicians the proper MCI response: most clinical personnel would not encounter a terror victim until an actual MCI, when large numbers of patients would threaten to overwhelm his or her ability to treat them. Other methods of training

and spend the night in a long, lighted hall, with an overseer, who walks up and down, and permits no one to stir. When they are received into the corps of the Janizaries, they are placed in cloister-like barracks, in which the different odas or ortas live so entirely in common that the military dignitaries are called from their soups and kitchens. Here not only the younger continue to obey the elders in silence and submission, but all are governed with such strictness that no one is permitted to spend the night abroad, and whoever is punished is compelled to kiss the hand of him who inflicts the punishment.
have recently been developed in response to the problem of training for MCI and use simulation, “the artificial representation of a situation, environment, or event that provides an experience for the purposes of learning, evaluation, or research.” High-fidelity patient simulators are “[c]omputer-controlled, full-body mannequins …” They serve many purposes, such as “imitat[ing] cardiovascular and pulmonary physiology well and allow[ing] verbal interactions with a patient,” and can also specialize in “simulating regional anatomy.” Twenty patient simulators are being rolled out at different facilities across the country for various purposes. At the National Capital Area Medical Simulation Center at Walter Reed Army Hospital, Washington, DC, a number of advanced patient simulators for MCI are used in courses for MCI preparedness as well as for clinical training (http://simcen.usuhs.mil/). The National Capital Area (NCA) Simulation Center has several training departments, including Clinical Skills Teaching and Assessment Laboratory, the Virtual Training Center (VTC), Room and Computer Laboratory, and the Surgical Simulation Laboratory. The SiTEL Clinical Simulation Centers at the Washington Hospital Center in Washington, DC, and the Union Memorial Hospital in Baltimore, MD, partner with the leading manufacturers of clinical simulators to develop, research, and evaluate new products and technologies to fit the next generation of Clinical Simulation Centers (www.csc.sitelms.org and www.sitel.org) (Fig. 5.2).

A number of medical schools now incorporate training on high-fidelity simulators into their core curriculum, although most use them for conventional medical
training rather than for MCI training. In Israel, the Medical Simulation Center (MSR) trains clinicians on the appropriate responses to an MCI patient with a high-fidelity patient simulator (http://www.msr.org.il/Courses_Medical_Simulation_Center/166.htm).

Using standardized patients – who are actors or volunteers simulating an illness or disorder – are another excellent way that institutions provide training to clinicians for MCI responses. To increase realism, a standardized patient can even be moulaged in imitation of a real patient. The Federal Emergency Management Agency (FEMA) uses the Nobel Training Center for courses on emergency preparedness. The Military USMARIID offers courses for bioterrorism preparedness with standardized patients. The National Disaster Life Support Foundation offers standardized patients in their Basic Disaster Life Support and Advanced Disaster Life Support courses (http://66.160.8.45/index.asp). The American Burn Association provides the American Burn Life Support hands-on course that utilizes standardized patients to train clinicians and first responders on how to treat burn patients (http://www.ameriburn.org/). The ER One Institute at the Washington Hospital Center offers the Hospital Disaster Life Support (HDLS: www.HDLS.SiTELMS.org) and Hospital Disaster Life Support II (HDLS II: www.HDLS2.SiTELMS.org) courses. The Armed Forces Radiobiology Research Institute (AFRRI) also utilizes standardized patients during training (http://www.afrri.usuhs.mil/www/news/previousheadlines/terror_disaster_drill.htm). Finally, standardized patients are commonly used by medical schools to teach students the appropriate ways to respond to a patient situation without compromising quality of care for any real patient.

In the constantly evolving field of terror medicine training, the most recently developed training method is by a virtual simulator. Instructional designers and multimedia programmers develop and deploy online educational training games which offer a powerful way to educate and train on competencies-based content for healthcare providers. The teaching method employed is often a first-person interactive simulation training whereby the user will be placed in a virtual Emergency Room, Emergency Operation Center, or other key emergency preparedness position (Fig. 5.3).

The user will be required to perform various tasks that will reinforce the best practice procedures for MCI, and his adherence to these protocols is scored (Fig. 5.4).

Sometimes the virtual simulator will include a pre and post test to test the user’s acquisition of knowledge. The participant will have learned the correct disaster responses so that when a real MCI occurs, he will know how to respond calmly and efficiently. One virtual simulator available publicly, “Emergency Room: Code Red,” trains the participant in clinical management of cases typical during an MCI. “Code Orange,” developed by SiTEL at the ER One Institute, is a serious game which uses the techniques of the commercial strategic games (such as “Civilization”†††) and applies it to the field of hospital emergency management where it trains the participant in managing communication, personnel, supplies,\footnotetext{††† Created by Sid Meier for MicroProse in 1991.}
Fig. 5.3. An overview of a virtual, interactive Emergency Department that locates patients, other player movements, and supplies along with a map of the scenario. (Courtesy of the Code Orange Simulation by SiTEL® and the ER One Institute)

Fig. 5.4. An emergency preparedness simulator user interface. (Courtesy of the Code Orange Simulation by SiTEL® and the ER One Institute)
and patient flow effectively according to government-mandated incident command standards (NIMS and HICS) (Fig. 5.5).

Training for an MCI has evolved a long time from the days of the Spartans, and the field is still constantly changing. In the future, training can be expected to involve more technological developments and will become integral to core medical training. The challenge will be to make sure that clinical students do not lose sight of the patient, the individual person who is suffering the effects of an MCI, behind all of the exciting technological enhancements.

**Exercises and Drills**

Once a student completes the initial training for a high-casualty/low-frequency event, then the student’s competency needs to be maintained by exercises and drills. Logistically, exercises and drills are the same, and so can be considered together, but their purposes are different. An exercise is when a student gives a hands-on demonstration of what he has been trained to do. The purpose of an exercise is to
allow the student to maintain his competency. Unlike exercises, which test students in an expected way, drills test student(s) in unforeseen scenarios. The reason a drill is conducted is to find a gap in preparedness: the drill administrators want to see where the system lacks resources or where competencies are not fulfilled. Based upon the results, a drill may also provide a way for an institution to improve future training.

Historically, training, exercises, and drills were considered under the same rubric. For instance, in ancient Greece, training for Olympic events was combined with exercise and drills, as Epictetus writes.‡‡‡ Men who wanted to be Olympic victors had to swear that they had been in training (which implies exercises and drills to test the contestant’s body) for at least ten months prior to the contest.⁹

In modern days, hospital planners realized the potential usefulness of drills and exercises for emergency preparedness. They can be designed based upon the identified stresses specific for the institution’s locations. For instance, on the West coast a drill scenario might involve a nuclear accident if the facility is near a nuclear plant, a tsunami, or an earthquake, while elsewhere in the country a flood or hurricane might be the tested scenario.

Hospitals must incorporate drills and exercises into their facility planning, per the Joint Commission (TJC), which mandates as a minimum two exercises per year. One involves the community and the other must be a full hospital-scale exercise. According to TJC, exercises have a cycle: planning, exercising, and a post-action report. Most of the drills and exercises promoted by TJC are intended to test the integrity of the system and the effectiveness of an institution’s teamwork during a simulated MCI, and assess the competencies of individual practitioners only secondarily. They occur across the country, since they must be done at every institution that can be considered a casualty receiver from an MCI. Several planned exercises, however, are noteworthy for their complexity and fidelity to a real MCI. Operation Kerkesner, a first-year medical student exercise, and Operation Bushmaster, are an exercise and drill for the Uniformed Services University of the Health Sciences and involve medevac as well as regular first responders and hospital facilities (http://www.usuhs.mil/mem/operationinformation.html) (Fig. 5.6).

In the north/central Washington, DC, area, the multi-campus Collaborative Multi-Agency Exercise (CMAX) drill is held and involves Georgetown University Hospital, the National Institutes of Health, Sibley Hospital, Suburban Hospital, the Walter Reed VA Hospital, and the Washington Hospital Center.

‡‡‡ You say, “I want to win at Olympia.” … If you do, you will have to obey instructions, eat according to regulations, keep away from desserts, exercise on a fixed schedule at definite hours, in both heat and cold; you must not drink cold water nor can you have a drink of wine whenever you want. You must hand yourself over to your coach exactly as you would to a doctor. Then in the contest itself you must gouge and be gouged, there will be times when you will sprain a wrist, turn your ankle, swallow mouthfuls of sand, and be flogged. And after all that there are times when you lose.
Epictetus, Discourses 15.2-5, trans. W.E. Sweet cit. ap.
Recently, emergency preparedness experts have developed a range of types of exercises and drills. The first is a Tabletop and requires the least manpower to implement but likewise has the least fidelity to a real scenario. Tabletops are most effective if coupled with a walk-through. The other options fall under the category of a live scenario. Some exercises and drills use live actors or volunteers from the community, who simulate injuries. Other exercises and drills can utilize moulaged actors. The make-up adds to the reality of the drill.

While the drill becomes more realistic when volunteer “victims” flood the Emergency Department (ED) and other key areas, they use space that could be used for patient care and require dedicated manpower. High-fidelity mannikins can also be used and allow for testing of invasive, realistic treatment of injuries (Fig. 5.7).

The most cost-effective and convenient way to implement drills and exercises is through web-based virtual multi-player simulations, which are available 24/7/365 and are not restricted to one location.

Through these simulations different skills such as resource, personnel, and time management can be tested. No real patient care is affected since personnel are managing patients in cyberspace, and virtual simulation uses the least amount of hospital resources. The disadvantages are that – even with workarounds – the scenario is not being played in realtime, and even if the graphics are excellent, the virtual patients lack fidelity to real persons.
While teamwork and system integrity are essential during a real MCI, hospital planners should consider going beyond the minimum requirements of TJC emergency preparedness. The competency of individual practitioners to respond effectively and efficiently to an MCI should also be tested, and can often be done most easily by using an innovative format for the drill or exercise.

Conclusions

Terror medicine education and training offer diverse options customizable for institutions’ or individual physicians’ needs. Before implementing any learning program, however, it is necessary to consider what constitutes a successful curriculum. Since terror medicine learning is a field in its earliest stages, it is relevant to consider historical antecedents for successful systematic education and training. All military and Greco-Roman athletic training had one simple, common factor so far as success was concerned: a successful student was a victorious one. Coming in second place militarily was certainly not an option, and likewise only Olympic victors were remembered. No second place prizes were awarded. For modernity, defining what constitutes successful education and training can be more complex and controversial, especially when it comes to terror medicine, as Asher Hirshberg pointed out.¹⁰ Disasters will always occur, hospitals will
continue to receive large numbers of victims, and not all of them can be treated optimally within a short span of time. In a real MCI, the percentage of patients with critical injuries demanding immediate attention is small, and although they are most in need of care, they are often the patients who are less likely to demand attention in the turmoil of a casualty receiving area. Physicians and other clinicians should therefore be trained to recognize and focus upon the few critically injured patients, and firmly transfer resources from less critically injured patients to rescue the ones severely injured. It may seem callous, but there can be no simple triumph in MCI management, and emergency preparedness planners should recognize that fact.

Finding real, solid data about a particular institution’s response to an MCI in order to analyze its effectiveness – and, implicitly, the efficacy of its education and training programs – is difficult, however. The crux of education and training for terror medicine thus lies at the borders of an institution’s surge capacity. When an institution’s surge capacity is approached, the larger the number of critically injured patients, the lower the level of care.\textsuperscript{11} No hospital, however, has ever reported a gradually failing trauma line,\textsuperscript{12} and few agencies admit to mismanagement during an MCI.\textsuperscript{88} Criteria for successful training and education can sometimes be obvious, for example, showing that concretely measurable protocols such as the JCAHO Standardized Stroke Measure Set (Harmonized Measures) were implemented.\textsuperscript{\textit{¶¶¶}} The standard for successful education and training for terror medicine, however, can vary depending on institutional capabilities. A Level One Trauma Center with a certified Burn Center should be held to a different standard than a small, community hospital. The measurement for a successful response to an MCI should be that, without exaggerating real hospital and first responder capabilities, if physicians and other staff are trained well, they should let as few truly emergent patients die as possible.\textsuperscript{|| ||| | |} (Also see chapter 11 for more on these concepts.)

Most facilities do not have the opportunity to learn from a real MCI to plan a better curriculum for the future. Several types of metrics used by the education and

\textsuperscript{88} Cf., for instance, the response to the London bombing in July 2005: “The Metropolitan Police said it and the British Transport Police felt their radio systems worked well and they were able to work around the difficulties communicating underground. ‘We didn’t feel that was detrimental to our response,’ said Asst Comm Alan Brown.” Yet a London Assembly report found that “[p]oor communication and a lack of basic medical supplies hampered the 7 July bombings rescue operation,” BBC online International Version, “7 July report highlights failings,” June 5, 2006: http://news.bbc.co.uk/2/hi/uk_news/england/london/5046346.stm.

\textsuperscript{\textit{¶¶¶}} See the Joint Commission Primary Stroke Centers Standardized Stroke Measure Set (Harmonized Measures) available at: http://www.jointcommission.org/CertificationPrograms/PrimaryStrokeCenters/standardized_stroke_measure_set.htm.

\textsuperscript{|| ||| | |} An MCI is an incident that does not overwhelm all medical facilities’ surge capacities: that is a catastrophe. Training and education for terror medicine as proposed in this chapter does not look at catastrophes, because in that event, no strategic planning can prevent the deaths of many critically injured patients.
training programs described above have been developed by leading subject matter experts and can provide simulated ways to track the successfulness of terror medicine education and training. For education, post-quiz results can be compared with pre-quizzes, and the successful completion of a course can be determined if the student demonstrates a better grasp of the material after completing the educational module than before he learned it. For training and exercises for terror medicine, a student can show competency in a certain procedure by demonstrating it (with a live, standardized, or virtual patient). Successfully completing exams that propose scenarios similar to the ones the student encountered in training are also possible. An individual clinician or a team (such as the Triage Area) can be considered successfully prepared for an MCI if he or the team shows resiliency during a drill.

Overall, education and training for terror medicine is critically important. Many areas of cross-disciplinary research and development are available in this new area. For instance, emergency planners are working on developing reliable metrics for education and training in book, journal, and web-based formats, MCI subject matter experts are beginning to work hand-in-hand with clinical educators and internet gamers to develop multi-player virtual simulators, while computer programmers work to develop internet-based platforms to support these projects.

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