Predoctoral Dental School Curriculum for Catastrophe Preparedness


Abstract: Preparing for catastrophic events, both human-made and natural, is in the national interest and has become a priority since catastrophic events in Oklahoma City, Washington, DC, and New York City. Dentists are a large source of non-physician health manpower that could contribute to the public welfare during catastrophic events that require additional public health human resources. Dentists, by virtue of their education, understand biomedical concepts and have patient care skills that can be directly applied during a catastrophic event. Dentists also can provide training for other types of health care workers and can supervise these individuals. In this article, we propose that dentistry can make a significant contribution as part of a national response before, during, and after a catastrophic event or at the time of a public health emergency. We describe the potential collaboration among a dental school, city and state health departments, law enforcement, the military, and others to develop a curriculum in catastrophe preparedness. Then we describe one dental school’s effort to build a catastrophe preparedness curriculum for our students. The competencies, goals and objectives, and sources of content for this catastrophe preparedness curriculum are described as well as suggestions for sequencing instruction.

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This article describes the development of a curriculum to prepare dental students to respond to a catastrophic event. This curriculum is based on the collaborative activities of one dental school with partners in organized dentistry, medicine, law enforcement, the military, and the federal government. The competencies, goals and objectives, and sources of content for this catastrophe preparedness curriculum are described as well as suggestions for sequencing instruction.

Dental graduates who possess the competencies described here are empowered to play an appropriate role in their communities as early responders to a catastrophic occurrence, whether it is natural or human-made. These competencies are based on the principle that the knowledge and skill learned during the dentist’s education can be directly applied in the dentist’s traditional role as a member of the community health care system.

As a reference point for this discussion, terrorism is defined as the illegal use or threatened use of force or violence; an intent to coerce societies or governments by inducing fear in their populations; typically with ideological and political motives and justifications; and an “extra-social” element, either “outside” society in the case of domestic terrorism or “foreign” in the case of international terrorism. The impact of such an event or threat is to cause “widespread confusion, fear, and psychological stress that have lasting effects on the health of affected communities and on a nation’s sense of well-being.”

Thus, the curriculum discussed in this article is designed to prepare dentists to perform three critical tasks: 1) contribute to the prevention of events, 2)
recognize conditions that indicate there has been an event, and 3) collaborate with others to respond to the needs of the public.

Recent terrorist events in Oklahoma City, Washington, DC, and New York City have captured world attention and stimulated the health care community to enact programs designed to preserve the well-being of the public. The vigorous responses of the public health system to an outbreak of anthrax in Florida and the actions after letters laced with anthrax spores were received by U.S. Congressional offices in October 2001 are significant landmarks in refining the nation’s preparedness for bioterrorism and public health emergencies. In addition to bioterrorism, the outbreak of sudden acute respiratory syndrome (SARS) illustrated the impact of emerging diseases on the health of the public. The SARS outbreak demonstrated the need to respond to natural as well as human-made catastrophic events. The anthrax and SARS episodes demonstrate the need for the entire health care community to understand the processes employed in the identification of new infections, contact tracking, and other elements of surveillance related to the identification of the etiologic agents, manner of spread, and treatment. This is an opportune time to reinforce the characteristics of a sensitive surveillance program and to demonstrate how non-physician health care providers, like dentists, can enhance our capacity to respond effectively in the event of a public health emergency.

Rationale for Dentists’ Role in Responding to Catastrophic Events

A common element learned from past catastrophic events is the surge in demand for individuals trained to assist in the response. The potential vulnerability of the public to attacks with biological weapons—where thousands or even millions may require medical intervention—led to an analysis of the impact of such an event on the health care community. The United States has a need for an effective network of trained people who are prepared to act in the event of a terrorist attack using chemical, biological, radiological, nuclear, or explosive devices (hereafter referred to as CBRNE), a public health emergency caused by the outbreak of a virulent new disease, or a natural catastrophe, such as a hurricane or flood, involving large numbers of people. One approach is to develop non-physician health care providers such as dentists, nurses, and pharmacists as potential frontline or near-frontline personnel to assist in the event of a public health emergency. The “National Public Health Strategy for Terrorism Preparedness and Response 2003-2008” identifies the major components needed to preserve the public health and safety. In its recommendation for the training of a competent sustainable workforce, this report proposes the training of three million professionals in addition to the nation’s current workforce of 500,000 physicians, nurses, and public health professionals. In an analysis of the 2001 anthrax scare in the northeast United States, the Rand organization observed that physicians, hospitals, and health departments were besieged by inquiries about what to do, and they were poorly prepared, did not answer, and at times provided conflicting answers. Thus, it is likely that the surge in demand for assistance in future crises will exceed the capacity of the health care system unless additional care providers are trained.

Dentists are well prepared to play an important role in the response to catastrophic events. Dentists are: a) experts in barrier techniques and infection control; b) trained and skilled in administering drugs by injection; c) skilled in placing sutures and controlling bleeding; d) able to participate in interdisciplinary professional groups; and e) adept at managing uncomfortable patients.

There are 195,000 dentists in the United States mainly practicing general dentistry. Dentists are widely distributed and provide patient care in private practices located in their communities throughout the country. Dentists are respected members of their community and can be available to provide information to alleviate fear. Data from the Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System, in 1999 showed that nearly 70 percent of Americans had at least one dental visit. In addition, all practicing dentists are licensed and have graduated from an accredited dental school. Annually, the fifty-six U.S. dental schools graduate about 4,000 new dentists. As they receive additional training, dentists can add to the response capability in the event of a catastrophic event or public health emergency.

This article describes how one dental school has built a catastrophe preparedness curriculum.
Based on the design of the curriculum that was already in place, it was decided that the most efficient approach would be to organize relevant information and supplement the curriculum in the form of units of instruction (case studies, exercises, and modules) that could be integrated into the instruction without significantly expanding curriculum time or obtaining expertise that was not already available. These units have been placed throughout the curriculum. A survey instrument has been developed to assess students’ attitudes toward catastrophe preparedness, their attitude toward responding at the time of an event, and their self-assessment about their capabilities. This instrument has been pilot-tested and will be used for evaluation of the program. The following sections of this article describe the development of the catastrophe preparedness curriculum at NYU.

Resources for a Catastrophe Preparedness Curriculum

Our faculty recognized that by modifying existing course content, we could provide specific catastrophe preparedness content that met existing course requirements and at the same time provided information related to achieving the objectives for catastrophe preparedness. To accomplish this task, the faculty made heavy use of a wide array of resources that are already available in the public domain.14-17

We started by creating an interdisciplinary task force to construct the overall catastrophe preparedness program. This was highly effective to achieve integration, to identify opportunities for collaboration, and to transfer knowledge between faculty members with various responsibilities for courses. This team consisted of faculty members who expressed an interest in the project and had expertise in relevant areas. They included five faculty with expertise in the following areas: microbiology, oral medicine, oral pathology, dental practice (a retired military person), health promotion, and curriculum development, plus two faculty who were investigators in grants that are focused on preparing health care providers to assume roles in the event of a catastrophe. As the process unfolded, there was dialogue about the appropriate scope and depth of knowledge and skills for the general dentist. Assistance in providing answers for these questions came from a variety of sources such as the school of medicine, the local office of emergency management, the county board of health, and law enforcement and emergency medical personnel (local fire department). As these questions were posed to external sources, closer collaborations followed and networks were formed where the manpower provided by dentists, dental students, and allied dental health care providers was utilized. Students who have volunteered to pursue advanced training opportunities have provided valuable feedback about the curriculum as it is being tested and implemented.

Using existing resources provides learners with a nationally defined core of material that is widely accepted and up-to-date. The CDC and others have developed a variety of resources that are ideal for use in the education of health care professionals at all levels of training.18-21 New information, such as the organization of a response to a public health emergency or a terrorist event, has been integrated in appropriate courses as will be described below. Early in the process of curriculum development, it became apparent that some faculty members and students desired additional training that would qualify them to be first responders. To meet this need, we collaborated with the U.S. military to create elective courses conducted by expert trainers.

Developing Competencies, Goals, and Objectives

The first step in developing the curriculum was to identify the catastrophe preparedness competencies that we wanted our students to achieve. There are several models that can be used to develop designing competencies for catastrophe preparedness. For example, the CDC has developed the document “Bioterrorism and Emergency Readiness: Competencies for All Public Health Workers.” In addition, the Federal Emergency Management Agency (FEMA) and offices of emergency management in each state can serve as resources for determining competencies. Recently, the Association of American Medical Colleges released an association report titled “Training Future Physicians About Weapons of Mass Destruction: Report of the Expert Panel on Bioterrorism Education for Medical Students.” The American Dental Association (ADA) and American Dental Education Association (ADEA) jointly hosted a workshop addressing terrorism and mass casualty curriculum development in November 2003, which
concluded that graduating dentists should be able to 1) detect, contain, refer, and report terrorism and mass casualty events and 2) know where to find resources related to terrorism and mass casualty events.23

All of these resources share common themes: 1) all health professionals have a potential role in a response; 2) education at the predoctoral level can prepare non-physician health care workers for effective roles; 3) for any responder, there must be specific knowledge about the plan for a national response; 4) all health care workers must have references that are readily accessible for use in the case of an emergency; 5) education must include practice to develop problem-solving skills that can be applied; and 6) education must emphasize a conceptual framework rather than exhaustive information about specific facts about potential agents.

**Catastrophe Preparedness Competencies**

Based on these resources, we wrote the following competencies for dental graduates:

- **Competency 1:** Describe the potential role of dentists in the first/early response in a range of catastrophic events.
- **Competency 2:** Describe the chain of command in the national, state, and/or local response to a catastrophic event.
- **Competency 3:** Demonstrate the likely role of a dentist in an emergency response and participate in a simulation/drill.
- **Competency 4:** Demonstrate the possible role of a dentist in all communications at the level of a response team, the media, the general public, and patient and family.
- **Competency 5:** Identify personal limits as a potential responder and sources that are available for referral.
- **Competency 6:** Apply problem-solving and flexible thinking to unusual challenges within the dentist’s functional ability and evaluate the effectiveness of the actions that are taken.
- **Competency 7:** Recognize deviations from the norm, such as unusual cancellation patterns, symptoms of seasonal illnesses that occur out the normal season, and employee absences, that may indicate an emergency and describe appropriate action.

Appendix 1 is a list of goals and objectives that will achieve these competencies. They are measurable objectives that will validate the competencies have been achieved.

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**Approaches to the Development of Course Content**

Foremost in developing course content is the need to build consciousness within the dentist that he or she has a professional and ethical obligation to participate in the response to a catastrophic event and to help the dentist understand how to respond. When responding, all health care workers need to be aware of how they fit into the overall coordinated response after a catastrophic event and know where to access the response team. The United States has built a response infrastructure through the Department of Homeland Security (DoHS) and the Federal Emergency Management Agency (FEMA).

Based on our experiences at NYU, we recommend six strategies to achieve curriculum objectives:

1. Integrate cognitive information that is already part of the predoctoral curriculum. This information plays a critical role in providing the foundation knowledge for understanding CBRNE agents. For example, instruction in microbiology already addresses agents like anthrax, smallpox, tularemia, plague, and other biological agents that have been weaponized. Radiology can be a focus area for radiological physics in terms of radiological weapons.

2. Increase curriculum emphasis on public health, epidemiology, and health promotion. These synergistic areas provide foundational knowledge in such areas as disease patterns and surveillance, increased sensitivity to the needs of the community, and provide an opportunity to apply a national response framework to a local challenge. These topic areas also provide an ideal setting for gaming and case studies that will demonstrate appropriate responses to a catastrophe.

3. Use exercises to facilitate application of knowledge of circumstances characteristic of manmade and natural catastrophic events and public health emergencies. There are case studies of previous events and epidemics that can serve as vehicles for students to learn about the circumstances prior to an event, the details of an event, the response mechanism, the needs of victims that must be met, and the long-term consequences of an event.24

4. Use case studies, drills, and dramatizations using multimedia (such as videotaped scenarios) to simulate potential catastrophic events and to
effectively study the circumstances surrounding past events. This is a critical part of the students’ education because it provides practice in solving problems likely to occur in a catastrophe. Dentists can be early responders during a catastrophic event, or they may assume a leadership position during the organization and implementation of a response. Thus, it is essential to understand the organization of a community response, its levels, and at what level dentists are most likely to participate.

5. Organize catastrophe drills in a manner that provides evaluation and direct feedback. While this is a fundamental part of teaching, it is particularly useful in educating responders. Problem-solving skills will become more effective when the potential responders receive feedback.

6. Introduce new units to provide advanced training for volunteers who want to be equipped for service at the frontline after an event. It is our experience that many students will want advanced training and seek to serve frontline roles during the response to an event.

**Evaluation**

Our evaluation plan is designed to assess the degree to which students can delineate categories of catastrophic events; use the language associated with catastrophic events and the public response; describe the national response organization and the organization in the state and local area; develop communication for use within the response team, family, media, and the general public; apply problem-solving to novel situations and devise appropriate responses; and demonstrate willingness to consider responding at the time of a catastrophic event.

Cognitive knowledge about CBRNE will be evaluated as part of examinations in biomedical sciences in the appropriate subjects, such as microbiology and biochemistry. The collaborative group developing the curriculum includes faculty who teach systemic and oral pathology, oral medicine, microbiology, practice management, and ethics. These faculty members are well placed to assess responses to case studies that they included. For example, they could study the response of students to a case study in which *Bacillus anthracis* spores are introduced into a workplace by a package in the mail. In another example, in oral medicine, they could evaluate knowledge about a smallpox vaccination program, including indications, contraindications, vaccination technique, post-vaccination response, and risks as part of the testing in that course. In the fourth year, groups of students will be evaluated in their approach to problem solving during table top exercises. Finally, students will complete an instrument that surveys their assessment of the importance of a variety of CBRNE agents and an assessment of their competence to respond.

**The Curriculum**

Implementing the curriculum in catastrophe preparedness was accomplished in a short period of time. There were content experts within the present faculty who volunteered and assisted in adapting content. Basic science faculty, for example, used information in the public domain and altered course content to include relevant CBRNE examples in their teaching. Technology is ideal to use for providing information for students as well as presenting examples. Since 2000, the NYU College of Dentistry has employed the DVD-based searchable text collection (Vitalbook®) in the predoctoral program. In addition, course directors utilize the “Blackboard®” program to present resources to students. In general, students are accustomed to searching digital resources for information. A recent survey of fourth-year students showed that more than 50 percent use a personal digital assistant as part of their clinical activity. A skill necessary at the time of a catastrophic event is the application of information-seeking skills. These skills can be practiced by our students without adding new resources or developing new infrastructure.

Other external resources were reformatted for use in our curriculum. In an oral medicine course, for instance, images and information about the smallpox vaccination program from the CDC website were incorporated into the course.25,26

At the present time, planning is proceeding to use digital resources like personal digital assistants for the storage of basic facts, clinical signs and symptoms, and first-line responses about the infectious diseases that may introduced during a terrorist action. PDAs can also be used to record telephone numbers that should be readily available to responders such as local law enforcement, the county and/or state health departments, and the CDC.

Some of the knowledge and skill that are essential in responding at the time of a catastrophic event is already part of students’ fundamental training. Students receive certification in basic CPR, learn about the management of wounds, and become ex-
erts in practicing infection control and skilled in managing infectious patients early in their dental education. These skills basic to the practice of dentistry can be generalized and effectively applied in the management of persons after a catastrophic event.

Students develop skills in a sequential manner and are capable of increasingly complex skills. Therefore, the curriculum has been developed in stages or levels that correspond to the academic years to correspond with the increased capability of learners and the potential for the curriculum to provide the needed skills and knowledge within the context of the integrated program we have developed. At the present time, all students in all years have had contact with the new catastrophe curriculum. The Class of 2004 experienced an abbreviated version because the content was developed when they were third-year students. Students in the first, second, and third years will experience the full curriculum in catastrophe preparedness. The sequence of instruction is described here to guide other schools who may wish to implement a similar curriculum.

First Year. The initial experience is designed to provide familiarity and understanding of catastrophic events and raise important ethical issues about the dentist’s responsibility to respond during an event or public health emergency. The language of CBRNE (chemical, biological, radiological, nuclear, and explosive) is introduced. The curriculum includes a short-duration course that explores contemporary issues in dentistry. One issue is “the dentist’s role in catastrophe preparedness” and the ADA’s efforts to provide education for dentists. An ethics course explores the dentist’s obligation to take a responder role as part of the study of the ethical principles of Beneficence and Social Justice. Information about the impact of CBRNE agents has been incorporated into biomedical sciences courses as part of understanding biological processes with emphasis on the impact of selected chemical agents at the cellular level. A course that explores doctor-patient relationships includes methods of communication at the community level.

Second Year. Students at this stage have acquired knowledge about biomedical sciences. Also, they have accumulated relevant facts such as the CDC categories of agents. The analysis of case histories of past catastrophic events provides increased breadth of understanding about the form of previous events and the response to them. An essential part of this analysis is providing information about the structure of a national response and the qualifications that are required of the responders. The second-year curriculum expands students’ knowledge about microbiological agents and the pathophysiology of potential chemical and biological agents. Students analyze a clinical case that resulted from a terrorist event and a case about a public health emergency.

Third Year. At this stage, students have foundation knowledge about biological agents and have analyzed previous events. Through experiences in the clinical curriculum, students acquire skills to qualify as early responders including certification in CPR, management of simple wounds, and infection control procedures. Communication skills are refined through clinical experiences and feedback. Students demonstrate, through self-assessment, a level of comfort with their knowledge and a willingness to respond at the time of an event. The elements of surveillance activities, such as appointment cancellation tracking and disease patterns, are added to the students’ capabilities.

Fourth Year. Seniors have mastered the basic knowledge and possess the skills that make them capable of functioning as a responder. Building on their patient care experiences and education in practice management, basic elements of surveillance are applied using small group table-top exercises. Seniors develop a personal catastrophe response plan for themselves, for a hypothetical practice, and for their families. Digital and hardcopy resources are made available; for example, the clinical features of cutaneous and inhalational anthrax, signs, symptoms, and patterns of smallpox, and the management of those diseases. At this level, students are assessed to determine the importance they assign to their role in the community to be a responder during a catastrophic event. Also, students’ confidence in serving as a responder and accomplishing the catastrophe preparedness competencies previously described are assessed. Based on preliminary data from a pilot administration, there is evidence that our students are willing to consider taking part in a response to a catastrophic event in their community.

Summary

Each U.S. dental school should consider how it will develop a curriculum to prepare dentists for responding in the event of a catastrophic occurrence. At the present time, as the result of ADA-ADEA ac-
activity, six dental schools are collaborating to develop catastrophe preparedness content they will make available to other schools. Developing relevant course content does not require allocating large numbers of new hours or sacrificing experiences that compete for curriculum hours. Existing courses can undergo modest refinements to provide examples relating to terrorism and catastrophe response. With the ongoing threat of terrorist events, the competencies proposed in this article, modified to fit the needs of each school, should become part of the educational experiences provided to students so that the skill set of practicing dentists includes the capacity to serve as an early responder in a catastrophic event.

REFERENCES

Appendix 1. Goals and objectives of a curriculum in catastrophe preparedness

Goal 1: Develop foundation knowledge about chemical, biological, radiological, nuclear, and explosive events as circumstances that may result in a public health emergency.

Objective 1.1: Describe the general characteristics of agents that have potential as CBRNE agents (CDC Category A, B, and C agents, radioactive materials, nuclear devices, and other weapons of mass destruction).

Objective 1.2: Describe a range of agents used by terrorists, including chemical, biological, radiological, nuclear, and explosive devices.

Objective 1.3: Define the terms chemical, biological, radiological, nuclear, and explosive (CBRNE) in the context of terrorist activities in the past, recent, and potential in the future.

Objective 1.4: Understand the psychological impact of a catastrophic event and how a potential responder may feel.

Objective 1.5: Describe the organization of a response to a terrorist event and/or a public health emergency.

Objective 1.6: List and describe actions that are characteristic of first responders.

Objective 1.7: Synthesize information between terrorist events, public health emergencies, and knowledge from the biomedical sciences.

Objective 1.8: Apply the principles of wound management to the management of head and neck trauma associated with explosive devices.

Goal 2: Gain knowledge about the scope and breadth of a national response after a catastrophic event.

Objective 2.1: Describe generally the role of various health care professionals in a coordinated response to a catastrophic event or public health emergency.

Objective 2.2: Describe the general role of federal, state, and local agencies at the time of a human-made or natural catastrophic event.

Objective 2.3: Describe the specific role of each major component and the point at which dentists, acting alone or in groups, would interface with the national response.

Goal 3: Develop skill that can be used to participate or assist in a response at the time of a CBRNE event.

Objective 3.1: Describe the organization of a response to a catastrophic event and/or public health emergency.

Objective 3.2: List and describe the principles of triage.

Objective 3.3: Demonstrate skill in interacting with victims after an event or over a long-term period.

Objective 3.4: Demonstrate skill in adapting the techniques learned for dental treatment to the administration of drugs, vaccines, and other agents that may be required in the pre-event or post-event period.

Objective 3.5: List and define the components of a response team and potential contributions that can be made by dentists.

Goal 4: Develop skills in communication.

Objective 4.1: State the local, state, and/or federal guidelines and regulations that may be applied to a terrorist event or a potentially catastrophic public health emergency.

Objective 4.2: Categorize information related to a CBRNE event or a public health emergency in a manner that is useful to civil and military authorities.

Objective 4.3: Demonstrate skill in communicating with lay persons about risks and outcomes from exposure to toxic materials and biological agents.

Objective 4.4: Develop a prototype response to support patients and family in the event of a terrorist event or public health emergency.

Objective 4.5: Demonstrate an understanding of the basic components of surveillance.

Goal 5: Provide experiences that will facilitate the development of problem-solving skills in response to new and novel circumstances presented in scenarios and simulations to gain and practice skills needed at the time of a catastrophic event or public health emergency.

Objective 5.1: Demonstrate problem-solving in large and small groups when faced with a new and novel program.

Objective 5.2: Demonstrate skill during training opportunities and gaming about catastrophic events.

Objective 5.3: Demonstrate consistent progress in analyzing study cases of terrorist events and public health emergencies.