

## Anatomy of a Public Health Crisis

### Terrorism: Should ASCs Take an Active Role in Homeland Defense?

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Hurricane Katrina taught us to be leery in assuming that the Department of Homeland Security can be entrusted with the effective delivery of a disaster response plan. It also demonstrated that average American citizens must be creative, a bit wily and proactive in seeking solutions to potentially devastating challenges facing our nation's security.

As a physician and health care administrator, I look out upon the horizon that is American medicine in the year 2006 and I see a huge, untapped resource in the several thousand free-standing ambulatory surgery centers that dot our urban, suburban and even semi-rural landscape. I believe that September 11, 2001, changed the way we Americans must think about the way we live our lives and plan for the future; I believe that it is time for America's doctors and nurses — some of our best and brightest — to collectively plan for unknown disasters and take responsibility now for dealing with unknown and unthinkable health care crises that could lay ahead of us. Every politician and think-tank expert believes that there will be another 9-11. It is our duty to make sure that we are prepared.

What can we do as ambulatory health care professionals? Well, as you will see below — in the description of the medical issues surrounding one such "public health crisis" due to terrorism — there is a lot we can do. Across our nation today, there is no greater resource of medical beds, operating rooms, resuscitative drugs and equipment, intravenous fluids, etc., than in the many thousands of

multispecialty and single-specialty surgery centers that span community after community. In fact, as it turns out, these facilities happen to be quite strategically well-placed, advantageously located in multiple and diverse locations around every city in every state.

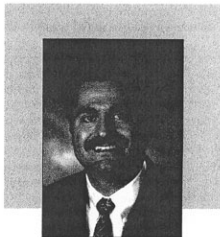
As doctors and nurses, let us do more than concentrate on next year's Medicare fee schedule or list of approved and billable outpatient procedures. Let us start thinking about how we all can, in our own small way, organize and coordinate a grassroots network of volunteers so that we can help out if the next large terrorism attack does indeed occur on our soil. Next time, it may be your neighborhood, or my family, that is hit.

In reading the following disaster scenario, think about how a surgery center also could function as a life-saving instrument for the delivery of public health services:

#### The Nuclear Nightmare

In the world today, there is enough highly enriched uranium to make hundreds of thousands of Hiroshima-type atomic weapons. It is no secret that many thefts of such nuclear material occurred from Russian facilities in the aftermath of the fall of the former Soviet Union. Shortly after 9-11, Princeton University professor Frank von Hippel gave an interview to the *New York Times* during which he explained how relatively easy it was to create a massive nuclear explosion. A five- to 10-kiloton explosion (equivalent to 5,000 to 10,000 tons of TNT) can be created by dropping an approximately 45 kilogram piece of enriched uranium 1.8 meters onto a second similarly sized piece of enriched uranium.

In the past few years, our government has spent hundreds of millions



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of dollars studying and planning strategies for dealing with an urban nuclear blast, and for good reason. After such an explosion in, for example, downtown San Diego — one presumably plotted to kill innocent life and take out one of the world's largest naval bases — there would be an immediate electromagnetic pulse that would knock out all electronic devices within a radius of four kilometers. The shock wave to follow would eliminate every above-ground, topographical structure and kill every living creature within a half-kilometer radius. The next half-kilometer radial band from ground zero would, likewise, be almost completely decimated. Detonation temperatures would reach millions of degrees, would ignite firestorms and would create winds in excess of 600 kilometers per hour. Within a few seconds, at least several hundred thousand San Diegans will have died.

In 2004, the U.S. government studied radiation injuries following a nuclear blast in a mid-sized American city. Of those not killed immediately,

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about 45,000 additional people would soon die, regardless of any subsequent medical treatment. Another roughly 250,000 people would die if denied rapid and sustained hospital treatment, and an approximate additional 150,000 individuals would require medical observation.

### **Radiation Sickness and the Walking Dead**

Accidents like the Soviet Chernobyl incident, small-scale animal studies and military medical records of surviving Japanese following the Hiroshima and Nagasaki detonations provide data used by the scientific community to study radiation sickness. The smallest level of radiation exposure to animal life is termed the "gray" (one gray unit = the number of joules of radiation energy absorbed per kilogram of tissue).

Radiation to humans at the level of two to three grays is cruelly deceptive and usually deadly. People with this level of exposure get sick and then get better again. This latency period ultimately gives way (days to weeks) to progressive clinical symptoms, followed by death. With an incremental increase in radiation exposure, affected individuals will experience a more immediate onset of symptoms and a shorter latency phase.

The most susceptible vital organ tissue in the human body is the bone marrow (specifically, the stem cells). Stem cells are affected at the level of one-half gray unit and are completely wiped out at about the level of five grays. Platelet and neutrophil levels begin to fall immediately with measured levels reaching zero within days to weeks of exposure. Victims often succumb to infections and bleeding with inherent vulnerabilities exacerbated by poor sanitation and secondary wounds associated with such a regional catastrophe. Radiation exposure exceeding five grays often leads to massive gastrointestinal tract damage — specifically to mucosal cells responsible for maintaining a

safety barrier between gut bacteria and the bloodstream. The insult to these cells usually leads to massive bacteremia, septic shock and death. The central nervous system is significantly impaired at levels of exposure nearing 10 gray units.

After a nuclear disaster to any urban area (even in the best-case homeland security response scenario), the resources to deliver palliative care to the "walking dead" will be severely limited. Under ideal recovery conditions, the key ingredients of care must consist of intravenous fluids, antimicrobial and antibiotic treatment, anti-emetic agents, nutritional support and blood transfusions.

The Bioshield Act, which was signed into law by the president in 2004, commits \$5.6 billion to further research and to devise better disaster response mechanisms for dealing with chemical, biological and nuclear agents of mass destruction. One potential new agent, granulocyte colony stimulating factor (G-CSF), is being developed by Amgen of Thousand Oaks, California. G-CSF prevents the loss of bone marrow precursor cells and contributes to the proliferation of such cells. Despite presently lacking Food and Drug Administration approval, Amgen has already sold large quantities of this substance to the U.S. government based on animal and human trials that have demonstrated efficacy. There remain, however, serious drawbacks to G-CSF, including a cost exceeding \$5,000 per patient per two-week treatment period. In addition G-CSF has an array of clinical side effects and must remain refrigerated during storage. Lastly G-CSF has limited effectiveness if treatment is delayed beyond several days post-exposure.

### **La Jolla, California Company**

Hollis-Eden pharmaceuticals of La Jolla has developed an inexpensive, chemically stable steroid with very few side effects. Called 5-AED (5-An-

drostenediol), this drug was developed as an adjunct treatment for chemotherapy patients and was identified by government investigators as early as 1996 for the treatment of radiation injury. In trials involving rhesus monkeys, 5-AED has alleviated radiation-induced tissue damage, decreased clinical signs and symptoms of injury and increased blood cell production. Again, this compound must be administered shortly after exposure to be effective.

### **Information for Health Care Professionals**

A quick search of the Web demonstrates ample private and government sites for information describing circumstances of civilian exposure to a nuclear explosion or radiation exposure. As one example, a group calling themselves Doctors for Disaster Preparedness puts out a newsletter titled "Civil Defense Perspectives." In addition, the U.S. Department of Homeland Security maintains an extremely informative Web site called <READY.gov>. Here one can check the national "alert" level, ranging from green to red, and access easy-to-read, timely information on biological, chemical and nuclear threats. There also is information on nuclear blast scenarios, radiation injuries and natural disasters.

A proper discussion of the anatomy of an urban nuclear explosion, and the consequences of large-dose radiation exposure, can fill an entire scientific text. Hopefully this discussion offers several springboards for further investigation.

Can our nation's ASCs function as a network to provide lifesaving treatment in the event of massive civilian casualties, as seen in the example of an urban nuclear explosion? The answer is: absolutely yes! What can we do? Simply put, we can continue to think in creative and perhaps unconventional ways. ASCs can (and, I believe, should) form local, collective teams that could be mobilized in the event of an emergency. This should

be a community effort, as the ability to communicate with and access outside help may be impossible.

Solving some of the great public health/homeland security challenges that lay ahead will require something

different than maintaining the status quo.

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