As the hurricane season for 2006 begins, people fear a disaster on the scale of Hurricanes Katrina, Rita, and Wilma. Although criticism of government response to those disasters will shape improvements in our system for managing future disasters, many relatively unheralded successes are equally important. We provided disaster relief in our roles as officers in the U.S. Public Health Service (PHS). In this editorial, we discuss some lessons to inform the future.

Following the landfall of Hurricane Katrina on 29 August 2005, the PHS deployed over 2500 Commissioned Corps officers and over 1200 unpaid federal employees across the Gulf Coast region. In addition to their regular jobs at various government agencies, the PHS officers were trained in emergency relief. When the need arose last summer, they received orders to leave their regular jobs and go to the Gulf Coast, where they served as physicians, nurses, pharmacists, dentists, engineers, administrators, environmental health officers, veterinarians, mental health experts, and mortuary experts. They treated people in shelters; triaged during evacuation processing; vaccinated against tetanus, hepatitis A, and influenza; brought safe drinking water; reestablished waste water systems; assessed public buildings for use as schools; evaluated hospitals, shelters, and nursing homes; ensured safe food and pharmaceuticals; treated sick and abandoned animals; and provided comfort and assurance. To provide these services on the scale necessitated by Hurricane Katrina required advance training, planning, and on-site improvisation. Our story, which unfolded in Alexandria, Louisiana, shows what happened on the ground.

As reports of Hurricane Rita emerged, Alexandria prepared for the hurricane itself and for an influx of evacuees from farther south. Because of Alexandria’s central location in the state, refugees went there when hospitals closer to home reached capacity after Katrina. A small community recreation center and a former YMCA gymnasium became the evacuation center for these patients. Anticipating the medical and infrastructural problems that our evacuation center would face when Hurricane Rita hit Alexandria—loss of electrical power, water, sewage, air conditioning, and supplemental oxygen—and we improvised backup systems. Several logistical problems are illustrative. How does one provide supplemental oxygen to patients with chronic lung disease in shelters that lack wall-based central oxygen? How does one provide electrical power when a hurricane is about to cause power failure, or potable water when water pressure drops after electrically powered pumps fail? How does one avoid decubitus ulcers when bedridden patients must lie for long periods on military cots? How does one control the transmission of methicillin-resistant Staphylococcus aureus when separate rooms for infected people are not available? An incident command team must solve logistical problems before they happen.

Here is how we solved some of the infrastructure problems. As the canister oxygen that came with newly arrived evacuees ran low, we found local sources of tanks and O₂ condensers to replenish our supply. For backup, we strung together H-tanks to create reserves of oxygen and used T-pieces to distribute it from a central tank. Anticipating loss of electrical power when the hurricane struck, our team calculated our electrical current needs and asked the state of Louisiana to provide logistical support from the Louisiana National Guard. Within hours, guardsmen were installing 60-kilowatt portable generators for the evacuation shelters. Anticipating loss of water pressure when the Alexandria pumping stations lost power, we calculated our water needs (drinking, sewage, and sanitation) and established a 72-hour water reserve. We placed a master electrician on call in case central air conditioning failed.

Patient care problems presented other challenges. We improvised 2 nurses’ stations from tables, boxes, and stacked military cots and clustered the sickest patients together. As our team stabilized the most seriously ill, we began to anticipate the medical and infrastructural problems that our evacuation center would face when Hurricane Rita hit Alexandria—loss of electrical power, water, sewage, air conditioning, and supplemental oxygen—and we improvised backup systems. Several logistical problems are illustrative. How does one provide supplemental oxygen to patients with chronic lung disease in shelters that lack wall-based central oxygen? How does one provide electrical power when a hurricane is about to cause power failure, or potable water when water pressure drops after electrically powered pumps fail? How does one avoid decubitus ulcers when bedridden patients must lie for long periods on military cots? How does one control the transmission of methicillin-resistant Staphylococcus aureus when separate rooms for infected people are not available? An incident command team must solve logistical problems before they happen.

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Patient care problems presented other challenges. We improvised 2 nurses’ stations from tables, boxes, and stacked military cots and clustered the sickest patients around them. We obtained air mattresses, chairs, and patient lifts from local sources. We implemented 24-hour call.
The ICS was the critical element in a rapid and coordinated response. Quick access to resources is critical to caring for patients under adverse conditions. The key to bringing all available resources to bear on a problem was a command structure that incorporated the people who coordinated those resources: the federal, state, and local response teams. The membership of the ICS included leaders of the cooperating local, state, and federal agencies. Together, they controlled resources that no single agency could command. By cooperating, they could efficiently implement multiple simultaneous medical, nursing, pharmacy, nutritional, logistical, infrastructural, security, and social work interventions. Every morning, the ICS met to identify problems and develop potential solutions and then communicate the plans to the other staff members early in the day. The ICS concept is widely applicable to medical and nonmedical interventions in disaster situations at larger regional, state, and national levels.

Communication must be timely, clear, and specific in a disaster setting because events, problems, and priorities change rapidly. The facilities in Alexandria relied on cellular phones, landlines, walkie-talkies, facsimile machines, digital cameras, and computers, a communication infrastructure that was deliberately redundant to increase its reliability. Adherence to established communication routines is important: Morning ICS rounds and afternoon telephone conferences with PHS headquarters allowed exchange of key medical, logistical, and infrastructural information and sustained confidence at all levels of the mission. The principles of communication that we used in Alexandria—timeliness, inclusiveness, reliability, and incorporation into daily routines—are readily applicable to future disaster management.

In the end, training and planning can prepare strangers to function as a seamless team, but something else is needed. For us, it was the sight of sick older people who needed our best efforts. In his report to the PHS headquarters in Baton Rouge, Captain Walsh said that we were “caring for the grandmothers and grandfathers of Louisiana children. Many of these patients were the poorest of the poor... There is no greater honor than to care for those who have nothing left.”

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<td><strong>General Categories</strong></td>
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| Preparedness and training | Disaster training and deployment experience  
Medical expertise suitable to the patient population  
Ability to anticipate medical and infrastructural needs in rapidly changing environment |
| Command and control structure | Early institution of an incident command structure  
Full engagement of all team leaders |
| Communication | Local (on-site) network  
Regional network |
| Resourcefulness and adaptability | Local problem solving  
Adaptability to evolving circumstances  
Knowledge of local, regional, and national assets  
Medically driven prioritization of problems when confronted with limited resources |

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In evaluating the PHS response in the Gulf Coast states, the PHS Office of Force Readiness and Deployment found many solutions that future PHS disaster medical relief efforts could adopt. The Alexandria mission exemplifies many of these: deploying resources before hurricane landfall; deploying as a preformed, well-trained team; and forming a joint command with state, local, and volunteer partners, which avoids unnecessarily duplicating resources. Many of the lessons that the PHS learned from its practical field experiences are now also embodied in the recently released presidential report on Hurricane Katrina (3). Among the elements of the PHS response, 2 stand out: a central command center and an efficient, widespread communication system.

The ICS was the critical element in a rapid and coordinated response. Quick access to resources is critical to caring for patients under adverse conditions. The key to bringing all available resources to bear on a problem was a command structure that incorporated the people who coordinated those resources: the federal, state, and local response teams. The membership of the ICS included leaders of the cooperating local, state, and federal agencies. Together, they controlled resources that no single agency could command. By cooperating, they could efficiently implement multiple simultaneous medical, nursing, pharmacy, nutritional, logistical, infrastructural, security, and social work interventions. Every morning, the ICS met to identify problems and develop potential solutions and then contribute to a model for future tactical management of medically dependent evacuees in a domestic disaster (Table). Training was a key factor. As part of our PHS duties, 2 of us (Captain Walsh and Commander Orsega) had taken courses in disaster management. In addition to working at their regular jobs, PHS officers act as a national reserve of trained emergency respondents. The PHS Office of Force Readiness and Deployment provides more than 100 online training modules to support this role. We learned leadership skills for disaster settings, how to implement an incident command structure, communications principles, and team-building skills. We had had hands-on experience in other disasters, such as 11 September 2001, anthrax attacks, immunization crises, and natural disasters. Our broad clinical skills were necessary in Alexandria but would not have been sufficient without practical training and experience in organization, communications, logistics, and operations.

Among the elements of the PHS response, 2 stand out: a central command center and an efficient, widespread communication system.

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Lessons Learned from Hurricane Rita

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