

Eight Months Later: Hurricane Katrina Aftermath Challenges Facing the Infectious Diseases Section of the Louisiana State University Health Science Center

Infectious Diseases Section, Louisiana State University Health Science Center^a

Louisiana State University Health Science Center, New Orleans, Louisiana

The effects of Hurricane Katrina have caused the long-term sequelae of a diminished patient base, of a reduced number of available health care professionals, and of closing hospitals in New Orleans, Louisiana. These changes have substantially impacted the academic infrastructure of New Orleans. This article outlines the post-Katrina response of the Louisiana State University Health Science Center (LSUHSC) Infectious Diseases Section and Health Care Services Division to maintain existing HIV and infectious diseases programs. Although several challenges delayed the immediate reopening of the New Orleans location of the HIV Outpatient Program clinic, the LSUHSC Infectious Diseases Section and Health Care Services Division established clinics outside New Orleans for the care of HOP patients immediately following the hurricane. The HOP clinic reopened in New Orleans (in a temporary location) in early November 2005. Several recommendations for academic clinical, training, and research programs are outlined, to assist other centers that might face disaster aftermath challenges.

On Friday afternoon, 26 August 2005, New Orleans residents blithely left work anticipating their usual weekend activities. Most of us were unaware of a hurricane threat until Saturday morning. Even when we realized the danger and made evacuation plans, we did not immediately realize that our clinical, research, and training infrastructures would be completely destroyed by the storm and that these programs initially would have to be rebuilt without a substantial portion of our staff and without the use of our physical clinic, office, and hospital spaces. Although impressions from persons who stayed in New Orleans during storm have been published elsewhere [1, 2], these articles do not address the prolonged challenges faced by academic centers in the aftermath of the hurricane. This article

describes the efforts made by the Louisiana State University Health Science Center (LSUHSC) Infectious Diseases (ID) Section and Health Care Services Division (HCSD) to maintain existing HIV and ID programs.

CHALLENGES FOR FACULTY RETURN

The mayor of New Orleans ordered a mandatory evacuation of the city on Sunday morning, 28 August. All faculty and most staff who were not on disaster call had evacuated that weekend. Two LSUHSC ID faculty (one covering infection control and one covering the general medicine service) and one ID fellow on the ID consult service—all of whom were on disaster call—weathered the storm at the Medical Center of Louisiana at New Orleans (MCLNO) and then evacuated to Baton Rouge (~128 km [~80 miles] from New Orleans) by the following Friday, 2 September (figure 1). Although some of the remaining ID faculty also evacuated to Baton Rouge, most faculty and fellows ended up in several other states. Because cell phone service and the LSUHSC e-mail system were not functioning for several days following the storm, it was ~2 weeks before the section was able to locate every member. LSUHSC posted an emergency Web site within 1 week of the

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^a The members of the Infectious Diseases Section, Louisiana State University Health Science Center are listed at the end of the text.

Reprints or correspondence: Dr. Rebecca A. Clark, 1542 Tulane Ave., New Orleans, LA 70112 (rclark@lsuhsc.edu).

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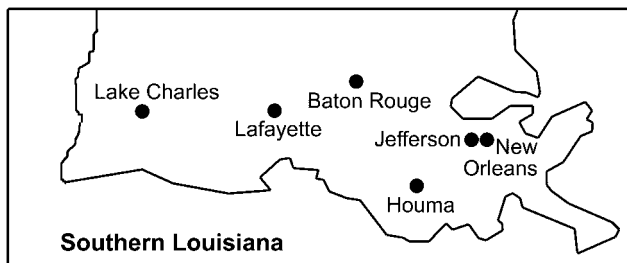


Figure 1. Map of southern Louisiana. One inch equals ~160 km (~100 miles).

storm so that employees might check in, and the ID Section set up a Google e-mail list by the second week after Katrina to connect with section members.

Major dilemmas for faculty trying to return to work in September and October were the availability of housing and of schools for their children. Returning to New Orleans before 1 October was not an option, because the city was closed and most homes were not habitable. During this time, there was no potable water, no phone or 911 service, and no reliable electricity or gas services. Although New Orleans was finally opened to residents living in specific zip codes in early October, these services remained limited, and a 6:00 P.M. to 6:00 A.M. curfew was instated (3). It was unclear at the time whether any schools would reopen in 2005; as well, the mayor of New Orleans recommended that children not return early on because of safety issues. In November 2005, several private schools in New Orleans reopened, but only 1 public elementary and 1 public upper school had reopened by December 2005.

CHALLENGES FOR PROVIDING CLINICAL SERVICE DELIVERY

September–October 2005. Beginning the day after the hurricane, LSUHSC and Tulane medical faculty, as well as private practitioners from Louisiana and from other states, established a field hospital for evacuees on the LSU Baton Rouge campus, in cooperation with the Centers for Disease Control and Prevention. Many New Orleans HIV Outpatient Program (HOP) patients came to public HCSD hospitals throughout the state in the initial months after the hurricane, the largest number of whom came to hospitals in the Baton Rouge area. By mid-September, the LSUHSC ID Section had negotiated the use of space at an HIV clinic associated with the HCSD hospital in Baton Rouge, to see New Orleans patients daily. During that time, another day clinic was established in the Lafayette HCSD hospital's HIV clinic to accommodate New Orleans patients. Unfortunately, staffing these clinics required a 1–3-h commute by many faculty, depending on their location of evacuation. When the statewide computer network was made available

again (~3 weeks after the storm), electronic records (including progress notes and laboratory and radiographic studies) and the HCSD statewide HIV database (LabTracker; with data originating from the HOP clinic in 2004–2005) could be accessed by the HCSD Baton Rouge and Lafayette clinics, which greatly facilitated patient care.

Throughout September, very basic primary care services were available in various New Orleans community areas or clinics. During this time, prescriptions for insured and uninsured HIV-infected patients living in New Orleans were filled by a variety of sources, including the Federal Emergency Management Agency, the Red Cross, and various pharmacies and hospitals located in towns adjacent to New Orleans. However, many patients had already experienced disruption of medication, which was worrisome for several populations including persons prescribed antiretroviral drugs, persons receiving antituberculosis therapies, and persons receiving controlled drugs that cause withdrawal symptoms. Although New Orleans residents could be referred to any of the HCSD HIV clinics (including those in Baton Rouge, Lafayette, and Houma) to obtain antiretroviral drugs, many patients did not have the means of transportation to do so. The Office of Public Health Tuberculosis Control was reestablished in Lafayette, and staff were able to locate nearly 95% of the Louisiana Region 1 population of 102 persons (15% of whom are HIV infected) with active tuberculosis. Most of these patients experienced a 4–6-week treatment disruption.

HOP was able to use an existing contract between a pharmacy located in a suburb outside of New Orleans and the local AIDS service organization (NO/AIDS Task Force) to obtain medications supported by the local Ryan White Title I formulary. Medications covered by Antiretroviral Drug Assistance Program funding (Ryan White Title II) were obtained from the HCSD hospital in Houma. Patients were able to pick up prescriptions with a 5–7-day turnaround time. These services were advertised through informal networking and by HOP social workers who placed information sheets in French Quarter bars and on the door of the HOP clinic's pre-Katrina location.

November 2005–April 2006. By the first week of November, the MCLNO Medicine and HOP clinics had opened in New Orleans in a new temporary space. The HOP clinic provided primary care for adults, adolescents, and children, but the temporary location could initially only offer selected services, including prescription of medication, delivery of medications, and administration of vaccines. The clinic reopened with 1 dedicated phone line, 3 computers (which functioned sporadically), and no furniture in the general work area. Over the next month, phone lines, additional computers, and furniture were added, and computer service was improved. To stock the clinic, equipment and supplies were salvaged from

the original HOP Clinic (which was without power until December), located ~6 blocks from the post-hurricane location.

Limited laboratory, cytology, genotype, and microbiology capabilities were made available in December 2005 and January, February, and March 2006, respectively. As of April, several tests remained unavailable, including blood cultures, G6PD tests, and means to determine hepatitis C virus RNA and hepatitis B virus DNA levels. Specimens are processed in the clinic, then couriered to Houma (112 km [70 miles] away) to a reconstructed laboratory located in a former grocery store.

Insured patients have been able to obtain diagnostic studies and referrals from private outlying hospitals, but uninsured patients requiring urgent studies are referred to the tent MCLNO emergency area, which was initially located in the downtown Convention Center but which has moved to a location previously occupied by a large department store adjacent to the Superdome. Two hospitals, Touro Infirmary and Children's Hospital, have been open in the city since October for both emergency and inpatient services. By January, 10 more general acute care hospitals in surrounding towns were back in operation, and in February, a third hospital, Tulane University Medical Center, reopened in New Orleans. This represents a decrease from 20 hospitals in operation in the same area, before Katrina. HOP patients have used all hospitals, regardless of their insurance status. HOP faculty began staffing the ID consult service at the Touro Infirmary in March.

As of April 2006, with the exception of mental health services, dermatology services, and neurology services (available in the HOP clinic), dental services (available in the tent emergency area), and colposcopy/obstetrical services (donated by private physicians), uninsured patients must travel ≥ 112 km (70 miles) to access other subspecialty services at other HCSD hospitals. Patients in need of tuberculosis or sexually transmitted infection screening are referred outside New Orleans to one health clinic in an adjacent suburb. Between January and March 2006, assistance to pay for taxis and gas vouchers were available to aid in transportation in the New Orleans and Jefferson parishes, but this service ended 1 March. The only travel assistance for patients needing to access subspecialty clinics in Baton Rouge has come from limited support, available after 1 March, generated by fundraising efforts by one of the HOP clinic physicians.

The resurrected HIV clinic in New Orleans has been busy since the day it reopened, and has consistently served 30–50 patients daily. By March 2006, nearly one-third of the active pre-Katrina population ($n = 2800$) had been seen in the New Orleans HOP clinic. The clinic is anticipated to return to its pre-Katrina location in April, but it will share the space with other subspecialty clinics that have been displaced because of the closure of other MCLNO clinic areas.

CHALLENGES TO CONTINUE ID AND HIV TRAINING PROGRAMS

All fellows, with the exception of 1 who has been working on his MPH through online classes, were distributed by October to HCSD hospitals, most with which the LSUHSC ID Section had an existing pre-Katrina contract. Because MCLNO was the primary training hospital for LSUHSC trainees, its closure forced the rapid identification of other potential hospitals for the relocation and training of students, residents, and fellows.

Reestablishing educational programs was a challenge, given the widespread geographic distribution of faculty and fellows; however, in mid-October, a weekly case presentation or didactic lecture was scheduled in Baton Rouge, the most centrally located city. In November, the “citywide” conference (a joint effort between 4 ID fellowships: LSUHSC adult, Tulane adult, Ochsner adult, and LSUHSC/Tulane pediatric programs) resumed at a hospital located in a town adjacent to New Orleans.

By the end of September, the fellowship program director filed a post-Katrina plan with the Internal Medicine Residency Review Committee of the Accreditation Council for Graduate Medical Education. With the assistance of the Office of Graduate Medical Education, the Accreditation Council for Graduate Medical Education documentation requirements for evaluation, duty-hour logs, and letters of agreement were reestablished using a server-based residency-tracking software package. Although the LSUHSC fellowship program had been approved for accreditation until 2009, the program director was notified in November 2005 of an interim visit to be conducted Thanksgiving week by the Accreditation Council for Graduate Medical Education because of the havoc caused by the hurricane. The LSUHSC fellowship remains accredited, but is scheduled for a full-scale Accreditation Council for Graduate Medical Education site visit, to be conducted by the end of 2006.

CHALLENGES TO CONTINUE RESEARCH PROGRAMS

Before Katrina, several pharmaceutically supported clinical trials and epidemiologic studies were conducted in the HOP clinic. With the exception of 1 pharmaceutical trial studying a new entry inhibitor, all studies were placed on hold following Hurricane Katrina. The local principal investigator worked with the pharmaceutical company and the hospital administrations in Baton Rouge and New Orleans to keep the entry inhibitor study open. The 2 patients taking the study drug before Katrina contacted the study nurse or investigator by cell phone within a few weeks after the hurricane. One patient elected to remain in Texas, but the other resumed study visits at the Baton Rouge HIV clinic in September.

A cross-sectional study of oral HPV infection in HIV-infected

individuals was resumed 2 months after the hurricane at the Lafayette HCSD HIV clinic, with transport of samples to Baton Rouge for processing and storage. An ongoing HSV vaccine trial was interrupted for 3 months until stored patient files were recovered and a new clinical facility was located in Baton Rouge.

Independent basic and translational research studies were also severely affected by Hurricane Katrina. Regular and backup electrical power to the research buildings were lost for an extended period of time (>6 weeks) and remained unreliable until March. Numerous clinical specimens that were stored in ultra-low (-80°C) freezers had thawed out and were covered with mold, and many were subsequently lost. Preliminary studies have demonstrated a retained integrity of stored DNA pellets (β -globin positivity was confirmed by PCR), and serum samples have retained antibody activity. Overall, liquid nitrogen tanks that had been refilled or removed within 1 month of the hurricane fared better than the ultra-low freezers. However, operations to refill and remove these tanks were hampered by the lack of knowledge of the location of tanks, by poorly fitting containers resulting in evaporation of liquid nitrogen, and by the need to carry refill tanks up many flights of stairs.

LSUHSC was awarded 1 of the National Institutes of Health (NIH)-supported Sexually Transmitted Infections/Topical Microbicides Cooperative Research Centers in August of 2004. Three of the 4 projects depended on New Orleans study populations that were subsequently scattered throughout the United States following the hurricane. This scenario presented unique challenges, because these clinical studies are recompleted on a set, 5-year cycle. The investigators will not be able to recover the time lost towards completing their protocols and must either enhance enrollment under difficult circumstances or radically change the goals of their projects. As well, unique reagents created by center investigators and unique serum collections were lost and must be replaced. New clinical investigation sites are being established or evaluated in Baton Rouge and Pineville, Louisiana; Jackson, Mississippi; and Houston, Texas. By the time these clinical investigations are reestablished, the center's core laboratory will have reopened in New Orleans.

After the hurricane, one early barrier for investigators who were trying to write up completed studies was a lack of access to data located in offices or laboratories in New Orleans. Access to these areas was prohibited until mid- to late October, and even then entry was only permitted to selected individuals with written permission. Computers could not be removed from MCLNO premises, and files could not be opened or transferred because of the lack of power. Unfortunately, some faculty desktop computers were stolen from closed MCLNO offices, which has hampered the completion of studies and manuscripts.

ADMINISTRATIVE CHALLENGES

The storm resulted in the closure of all LSUHSC administrative offices. As of April 2006, ID Section members still have no available office space in any location. ID Section members began receiving some forwarded mail (at times several months old) at the HCSD Baton Rouge hospital in December 2005 and at the New Orleans HOP clinic in January 2006. However, at this time, mail delivery remains unreliable.

FIRES AND FURLONGHS

Without the patient base and functioning MCLNO hospitals to provide revenue, layoffs have been inevitable. Because of these extraordinary circumstances, tenure in the academic institutions could not be used to protect positions. In December, LSUHSC laid off 127 medical school faculty (tenured and non-tenured). Monies that were lost to the LSUHSC ID Section following Hurricane Katrina included MCLNO contracts (infection control and residency supervision), contracts with a community hospital (residency supervision), and prior clinical reserves from billing. Although a MCLNO HIV Professional Services contract (the predominant source of funding for HOP clinicians and staff) was not completely lost, the amount of support was greatly reduced. Ryan White monies were retained. To preserve personnel, ID Section leaders agreed to cut back all salaries to base pay ($\sim 60\%$ of original salaries) beginning in November. This served to preserve other positions, with the exception of 1 member who was furloughed, through June 2006. Fortunately, salaries for most faculty returned to pre-Katrina levels in December, but faculty lay-offs are anticipated by July 2006. The total number of HOP personnel was reduced from 120 before Katrina, to 30 after Katrina. As of January 2006, MCLNO had laid off 3500 of its 3800 employees, retaining only persons essential to the staffing of the MCLNO emergency tent areas, and Medicine and HOP clinics.

DISCUSSION

The acute consequences of natural disasters on academic centers has been previously described (Hurricane Gilbert [4], the Kobe earthquake [5], and the Asian tsunami [6]), but there is little information pertaining to the prolonged aftermath. Hospitals and health care agencies must be able to address situations quickly, establish new facilities, and retain staff, to ensure quality care to effectively meet the standards of the Joint Commission on Accreditation of Healthcare Organizations and the regulations of the Occupational and Safety Health Administration. The New Orleans experience demonstrates these long-term challenges. Specific recommendations to assist other programs planning for unexpected disasters are outlined below.

1. Whenever possible, convert to server or Web-based

electronic storage of data. Frequent back-ups of information on distant servers are critical for immediate information retrieval after the disaster, until local servers can be established. Data that should be electronically stored include the following:

- A. Patient databases.
- B. Institution/departmental/section contact information, including landline numbers and addresses of individual's preferred evacuation sites.
- C. Educational or training program information and resources, such as electronic textbooks.
- D. Study/clinical trial information, including contact numbers for study monitors, and copies of protocols and consents.
- E. All credentialing documents, which, ideally, should be converted into digital format.
- F. Distance-learning software and hardware to assist in the dissemination of didactic and case conferences in the event that faculty and trainees are widely dispersed.

2. All members should either routinely use laptop computers or back up data, so as to carry information with them during an evacuation.

3. Clinical programs should develop their own disaster plan for patients. Examples of information that can be given to patients include the following:

- A. What to do if they are unable to access medications for several days. Instructions for the use of antiretroviral drugs, investigational drugs, and medications that may have withdrawal symptoms if abruptly discontinued are particularly important.
- B. How to find future clinical care sites if an established clinic is nonfunctional (i.e., Web addresses, toll-free telephone numbers, etc.)

4. The program should take into account the impact of a lack of housing and schools and anticipate potential prolonged family disruptions.

5. The program should cultivate alliances with hospitals and clinics located inside the region but outside the immediate area. A citywide or regional consortium of programs and hospitals may be able to assist in the rapid placement of trainees in the aftermath of the disaster.

6. Adequate storage of clinical samples is of paramount importance. Unique clinical samples and/or laboratory-made reagents (unique strains, clones, constructs, etc.) should be stored in ultra-low freezers as well as in liquid nitrogen. Possible storage of unique and irreplaceable reagents in a colleague's laboratory at a distant site and last-minute overnight shipping of unique items to a distant site should be considered.

INFECTIOUS DISEASES SECTION, LOUISIANA STATE UNIVERSITY HEALTH SCIENCE CENTER

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