CASE STUDY

Disaster Relief and Recovery after a Landslide at a Small, Rural Hospital in Guatemala

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None.

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Abstract

Introduction: Though many reports have assessed hospital emergency responses during a disaster that affected the facility's operations, relatively little work has been dedicated to identifying factors that aid or impede the recovery of such hospitals.

Problem: On 05 October 2005, Hurricane Stan triggered landslides that buried an impoverished Mayan community in Santiago Atitlán, Guatemala. The six-bed Hospitalito Atitlán also was in the landslide's path. Though opened just months earlier, the institution maintained 24-hour services until reopening in a new facility only 15 days after the landslides.

Methods: This qualitative study examined the Hospitalito Atitlán's disaster recovery using unstructured interviews with key hospital personnel and community members. Participant observation provided information about institutional and cultural dynamics affecting the hospital's recovery. Data were collected retrospectively during June–September 2006 and June 2007.

Results: The Hospitalito's emergency responses and recovery were distinct endeavors that nonetheless overlapped in time. The initial 12 hours of disorganized emergency relief work was quickly succeeded by an organized effort by the institution to provide inpatient and clinic-based care to the few severely injured and many worried-well patients. As international aid started arriving 2–3 days post-landslide, the Hospitalito's 24-hour clinical services made it an integral organization in the comprehensive health response. Meanwhile, a subset of the Hospitalito's non-clinical staff initiated rebuilding efforts by Day 2 after the event, joined later by medical staff as outside aid allowed them to handoff clinical duties. Effective use of the Internet and conventional media promoted donations of money and supplies, which provided the raw materials used by a group determined to reopen their hospital.

Conclusions: Early work by a recovery-focused team coupled with a shared understanding of the Hospitalito as an institution that transcended its damaged building drove the hospital's rapid post-emergency revival. Encouraging a similar sense of mission, emulating the Hospitalito's handling of funding and material procurement, and conducting rebuilding and relief efforts in parallel may aid recovery at other health facilities.

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Introduction

Santiago Atitlán is a Guatemalan town popular with tourists for its colorful culture and picturesque setting on a crater lake beneath three inactive volcanoes (Figure 1A and 1B). Almost all 32,000 residents are indigenous Maya who speak Tzu'tujil as their primary language.[1] Only half are fluent in Spanish, and 75% of households fall below the Guatemalan poverty line.[2,3] Since the municipal water supply is pumped directly from the lake and consumed without purification by 50% of residents, hepatitis A, amoebiasis, giardia, and other infections transmitted by the fecal-oral route are prevalent.[2]

Figure 1A—Map of Guatemala

Figure 1B—Map of Lake Atitlán region

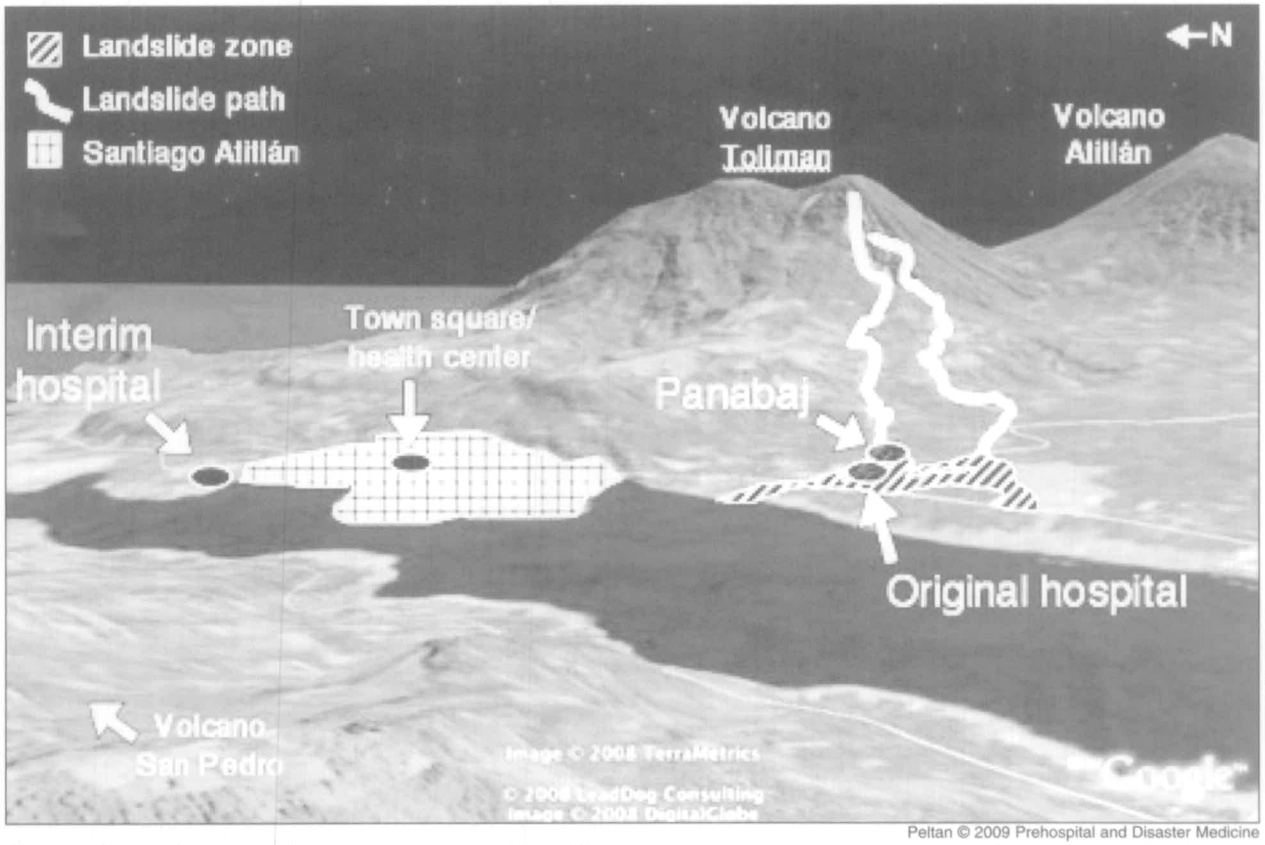

Figure 1C—Schematic of Santiago Atitlán and landslide impact (adapted with permission from Google Earth)

Considered an insurgent stronghold by the army, Santiago Atitlán was a hotspot of Guatemala's 36-year civil war that ended in 1996.[4,5] The local hospital's once exemplary services deteriorated as the local conflict escalated, culminating in 1990, when soldiers killed 13 unarmed protesters at an army base nearby, and in 1993 with the hospital's abandonment.[6,7] In the aftermath, local healthcare options included pharmacies, traditional midwives and healers, several expensive private physicians, a government clinic with minimal resources, and a non-profit clinic (Rxiin Tnamet) equipped with ultrasound, intravenous (IV) fluids, and one physician. Access to advanced or emergency healthcare required at least two-and-a-half hours of rough travel.

The Hospitalito Atitlán opened on 01 April 2005 to fill this gap. Located in its predecessor's building in the impoverished neighborhood of Panabaj, the new institution was the product of three years' work by a committee of local leaders and resident expatriates backed by a US-based nonprofit, Pueblo a Pueblo, that channeled funds to the endeavor. The hospital was equipped with six beds—four inpatient and two labor and delivery—and offered outpatient clinics, round-the-clock emergency care, and prenatal and peripartum care on an income-adjusted fee-for-service basis. In June, basic surgical services—in particular Cesarean sections—began. Local staff included a general practitioner, laboratory technician, pharmacist, nurses, and

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administrators. Three long-term volunteers from the United States—two emergency physicians and a family practitioner with advanced training in the management of high-risk pregnancies—formed the organization's physician core. Short-term international volunteers rounded-out the staff.

Tropical Storm Stan crossed the Yucatan Peninsula on 02 October 2005, attaining Category 1 hurricane status just before making landfall again near Veracruz, Mexico on 04 October.[8] The hurricane and associated rain bands caused widespread flooding and landslides throughout Central America. On the volcanic slopes surrounding Santiago Atitlán, 19 inches (48.3 cm) of rain fell 01–10 October.[9] The storm intensified on 04 October, dropping 9.1 inches (23.1 cm) during a 24-hour period and triggering four major landslides early on 05 October. Two landslides converged on the Panabaj neighborhood (Figure 1C), burying it in mud, sand, rocks, and tree trunks up to 10 feet (3.0 m) deep.[10,11] Some 300–500 people died and 1,500–2,000 were left homeless. Storm damage—including a small, localized tsunami that sank the town's boats—cut nearly all communication and transportation links to the outside world, isolating the town in the immediate aftermath.[12] The landslide buried the hospital building to its eaves, but despite losing its physical plant, the Hospitalito functioned coherently as an institution throughout emergency relief efforts. More remarkably, it reopened in a new facility just 15 days later and regained its pre-landslide level of function within 3–4 weeks.

Disasters occur when the relationship between humans and their environment breaks down on a scale that outstrips the ability of the community to cope.[13] Disasters due to "natural hazards" are the product of long chains of economic, cultural, social, and political forces that govern who is vulnerable.[14] The lifecycle of a disaster includes risk mitigation, pre-disaster preparation, impact, relief/emergency, and recovery/rehabilitation phases, though these stages may overlap.[13] The effectiveness of risk mitigation and pre-disaster preparation, the setting (developed versus developing world), and the type of natural or complex emergency determines the disaster's epidemiology, and therefore, what kind of help the local community needs.[14] Complex geopolitical, economic, and social influences, however, determine who provides help and when help arrives.[15–18]

Many investigators have addressed disaster preparedness within healthcare systems and the components of an effective mobilization of medical resources once a disaster has taken place.[19–26] Less is known about how to successfully rebuild healthcare facilities in the post-emergency phase of a disaster.[27–29] This study attempted to identify factors that facilitated a rapid disaster recovery at one small hospital in a developing country.

Methods

This was a qualitative investigation of the disaster recovery process at the Hospitalito Atitlán. Participant observation, designed to identify individual and institutional attitudes and practices affecting the disaster response, took place during patient care at the hospital and in administrative forums. Unstructured individual interviews were conducted by the author in English, Spanish, or—with translator assistance—Tzu'tujil. Interviews elicited narrative accounts of Hospitalito history and function, the landslide, and the community and hospital response. A total of 41 interviews were conducted with 29 informants, including hospital staff, volunteers, and administrators, as well as community leaders. Nearly all key figures in the Hospitalito disaster recovery participated in the study. Interview and observation data were collected retrospectively from June–September 2006 and in June 2007 and were analyzed qualitatively, deriving results and resolving discrepancies by triangulating multiple accounts of the same set of events. Media accounts, reports by governmental and non-governmental organizations, and individuals' written descriptions provided additional data. Interview data were in good agreement with each other and with public accounts on major factual and thematic issues. Human subjects research committees at the sponsoring and subject institutions approved the study.

Results

Disaster preparation and risk mitigation were not incorporated into Hospitalito planning before or after it opened in April 2005. Hospitalito organizers chose, early on, to use the old hospital facility built by the Catholic Church in Panabaj in the 1960s. They were unaware that the area was landslide prone, despite major events around 1910 and in 1949.[10] More immediate warnings also went unaddressed. During the summer of 2005, government officials and hospital staff learned of water collecting near the top of one of the volcanoes above Panabaj. Though they recognized a landslide risk, the Hospitalito staff depended on the government to respond, and did not formulate a disaster plan.

The 2005 landslide struck Panabaj at 04:30 h on 05 October, breaking open the hospital's main door but sparing its occupants. Alerted by the on-call doctor, the family practitioner crossed the still-flowing mudslide to reach the Hospitalito. The two physicians set up an impromptu clinic in a nearby government complex that quickly had become the main refuge for survivors. Two other American physicians cared for victims streaming into the government health clinic. The Tzu'tujil physician, awakened by the tolling of the Catholic church's bells, arrived at the Rxiin Tnamet clinic just in time to help one of the Hospitalito nurses deliver a mud-covered woman's healthy infant. Most survivors of the landslide escaped with lacerations, contusions, or abrasions; only a few with severe injuries mixed with these minor wounds, and the worried well arrived at the emergency clinics. One administrator lost a close friend, but other Hospitalito personnel were spared property or personal losses, promoting involvement in relief efforts. Reported one Hospitalito physician, "Part of my reaction to this whole thing is that there must be something wrong with me because I wasn't crying like everybody or apparently depressed like everybody. But the fact of the matter was that ... none of the people I actually knew were injured or lost anything. ... It was almost like I was there but I wasn't there."

This first, uncoordinated phase of relief efforts became an organized, but still local response after approximately 12 hours. Ambulatory survivors were evacuated from the landslide zone, leaving the two Hospitalito doctors behind

overnight to care for four patients—one with a probable ruptured diaphragm, two with severe lacerations, and one with blunt pelvic trauma—too badly injured to move. To manage patients too sick to leave the makeshift clinics and to treat the minor injuries and psychological trauma continuing to inundate the in-town clinics, hospital staff decided to institute 24-hour inpatient and urgent care. Since they suspected outside aid might not arrive for several days, they decided to centralize operations at Rxiin Tnamet, allowing implementation of a sustainable schedule of 12-hour shifts and consolidation of equipment and supplies. When the public health director called the first meeting of an emergency health committee on 06 October, the Hospitalito's self-assigned task was deemed an appropriate, ongoing role for the organization given its capabilities and expertise. At the health director's suggestion, the infirmary moved to the public health center, which offered more space. Meanwhile, the two remaining hospital doctors and their patients were evacuated from Panabaj and the patients were sent onward to a government referral hospital.

Outside aid started arriving on 07 October, slowed by broken communication links and small landslides that repeatedly closed roads throughout Guatemala. However, the trickle quickly became a flood of non-governmental organizations bringing supplies and personnel. Besides health department staff and the Hospitalito director, the emergency health committee chaired by Santiago Atitlán's public health director grew to include representatives of a varying list of aid organizations. While the Hospitalito took responsibility for centralized 24-hour emergency and inpatient services, other groups—including the Red Cross, Médecins sans Frontières, and a Catholic organization called the Order of Malta—received assignments from the health committee that fit their goals and capabilities to local requirements. A team of Cuban physicians, for instance, spread out to conduct basic clinics and disease surveillance in the refugee shelters. Coordinated during the health committee's twice-daily meetings, disparate organizations monitored health needs, treated routine and disaster-related medical problems, and provided epidemiologic surveillance, mental health interventions, portable latrines, communal and on-site water purification, a mass tetanus vaccination campaign, and hygiene education. Termed "optimal" by Médecins sans Frontières, this emergency health effort prevented any major disease outbreaks despite thousands of under-vaccinated people living in ill-equipped shelters in an area where food- and water-borne illnesses run rampant.[30] The public health director also met daily with the community disaster commission and representatives of its eight other subcommittees, maintaining a cohesive, overall, local disaster response.

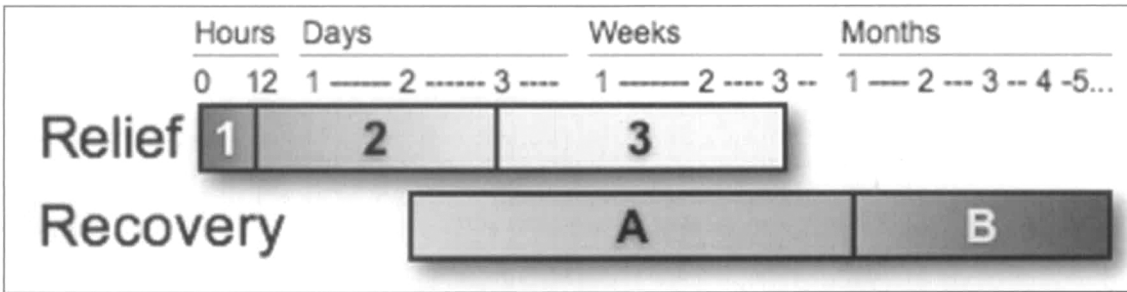
At a staff meeting on 08 October, the president of the Hospitalito's board launched its recovery effort, declaring, "You still have jobs. The Hospitalito still exists. We still have work to do". However, in interviews for this study, it was apparent that no key Hospitalito personnel ever doubted it would reopen; the only issue was when and where. According to one Hospitalito physician, "Why would you not [reopen]? The need is here, the need will continue. ... We were going to continue to provide 24-hour-a-day, 7-day-a-week access to health care come hell or high water. I mean that's why we came here. There was just no question in my mind." Non-clinical Hospitalito personnel in Guatemala and US-based supporters began work to reopen the Hospitalito soon after outside aid started arriving in Santiago Atitlán and while medical staff still were fully engaged in the emergency relief response. The US charity, Pueblo a Pueblo, spread word of the disaster and began fundraising. The Internet proved particularly important: visitors to the Hospitalito's widely-linked Website saw frequent updates about the situation in Santiago Atitlán as well as donation appeals.[31] The BBC and *Los Angeles Times* coverage featuring the Hospitalito, which, along with significant mentions in other major news media including CNN, *The Washington Post*, and National Public Radio, also increased the Hospitalito's visibility.[32,33] Within four weeks, roughly US $200,000 was collected, while donations of supplies often exceeded the Hospitalito's ability to use, sort, or store them. Unneeded, inappropriate, or poorly-packaged contributions in fact consumed resources needed elsewhere. Many of the hospital staff, particularly the American medical personnel, at times felt overwhelmed simply responding to all the offers of help.

The arrival of outside aid groups freed local administrators and medical personnel from relief work to focus on recovering the hospital. After 12 October, when the government prohibited future use of the landslide zone, attention turned to finding an interim site. Among the limited options, the only ambulance-accessible facility with adequate space, affordable rent, and owners willing to allow conversion of their vacation property into a makeshift hospital lacked the desired central location. After the lease was signed on 15 October, renovation and supply of the interim hospital began immediately with help from community and tourist volunteers whose tasks were assigned by a hospital administrator acting informally as construction foreperson. Since transferring supplies from the Panabaj site was difficult, donations of new consumables and big-ticket items—particularly the water tank and operating room setup—by aid organizations and supporters abroad facilitated equipping the interim hospital. On 20 October, 15 days after the landslides, the interim Hospitalito opened its doors for 24-hour care with a two-bed emergency room, four inpatient beds, a two-bed labor and delivery room, two clinic rooms, a pharmacy, and a laboratory. The operating room opened with an emergency Cesarean section on 22 October. Within a few weeks, the Hospitalito was functioning at a level equal to or better than before the landslide.

More than two years later, publicity from the disaster continued to boost material and personnel support and to ease fundraising for construction of a new hospital on a site purchased in July 2006. Risk mitigation was a key consideration in both site selection and facility design. Meanwhile, the Hospitalito has settled into its "interim" facility, returning to issues—boosting clinical capability and nursing competency, revising the sliding-scale fee system, and defining the role of international physician volunteers—that occupied the institution prior to the landslide.

Discussion

There were three distinct stages of medical disaster relief in Santiago Atitlán (Figure 2). After 12 hours, an organized



Stage	Start	End	Activities
Relief effort			
Stage I	Hour 0	Hour 12	Scattered medical staff provide uncoordinated care. Non-medical staff work in community leadership roles or simple relief roles.
Stage II	Hour 12	Day 3	Local medical services resources centralized, 24-hour care available at public health center. Clinic in landslide zone evacuated. Severely injured sent by boat to national hospitals.
Stage III	Day 3	Week 2	Outside aid arrives. Committee under leadership of public health director coordinates. Hospitalito responsible for inpatient care, also supplies mass tetanus and targeted hepatitis A vaccinations. Other groups manage distributed clinics, disease surveillance, and water purification.
Recovery effort			
Stage A	Day 2	Week 4	Website begins posting updates and receiving donations (Day 2). Non-medical (and subsequently medical) staff organize for rebuilding. Decision made to relocate from Panabaj (Day 7). Interim site leased (Day 11), then renovated and equipped. Interim site opens for emergency and inpatient care (Day 16). First surgery performed (Day 18). Settling in at interim site continues for several weeks.
Stage B	Beyond week 4	--	Pre-disaster focus on building hospital capacity resumes in interim facility, now boosted by exposure and donations prompted by landslide. Planning and fundraising begin for new hospital; construction begins July 2007.

Figure 2—Outline of steps of the Hospitalito Atitlán disaster response

local phase succeeded the initially uncoordinated response. The third stage began around Day 3 and was characterized by extensive involvement of international aid organizations. Local leadership maximized community involvement and ensured interventions were acceptable to the local population. As an organization, the Hospitalito functioned effectively within the relief effort by focusing on the clinical services its staff were equipped to provide rather than public health work for which they lacked training or experience. Opening the interim hospital and ongoing work toward a new permanent facility represent two distinct stages within the Hospitalito's "rehabilitation" effort. Critically, the relief and recovery efforts overlapped. In consequence, though the disaster initially forced diversion of resources from development work to disaster response and early recovery, the resources and attention garnered offset this expense. The landslide actually left the institution in a better financial and safety situation than before the disaster development.[34–36]

Hospitals are simultaneously essential and vulnerable facilities, confronting both a disaster's external consequences—the surge in patients—and the crisis that results if hospital function is impaired and the disaster becomes internal.[37,38] Advance planning and mitigation efforts can prevent internal disasters, minimize their severity, and promote recovery. Evacuating to a pre-identified interim facility, for instance, could speed resumption of clinical services. But convincing resource-poor hospitals—which stand to benefit the most—to dedicate scarce resources to disaster planning and mitigation is difficult. Small grassroots projects like the Hospitalito also may lack individuals trained in the importance of such measures, a deficit at least partly responsible for the Hospitalito's failure to enact measures that might have reduced the landslide's impact. The effect of this hard-earned lesson is an emphasis on risk mitigation in the site selection and design of the new facility now under construction. But despite the Safe Hospitals Initiative launched by the International Strategy for Disaster Reduction and the World Health Organization (WHO) in 2008 to encourage resource allocation in this field, incidents like the one discussed here will continue to occur, creating a need for information about factors that help hospitals rebuild after a disaster (Table 1).[39]

Some reasons for the Hospitalito's rapid reopening were situational, including the salvageability of many supplies and the availability of an appropriate interim facility. In particular, key Hospitalito personnel reported no personal losses, conflicting commitments or—besides the nurses and physicians who initially worked in the landslide zone—per-

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Situation-Specific Factors	Reproducible Factors		
	Structural	Organizational	Institutional Outlook
- Hospital supplies not damaged - Staff unharmed both personally and materially - Appropriate, affordable interim facility available	- Internet presence with updates that draw traffic - Mass media coverage - Existence of a pipeline for charitable donations - Local control of relief funds - Outside aid groups replace equipment and supplies	- Recovery process (planning, funding) begun early - Dedicated group breaks away from day-to-day emergency relief efforts to focus on recovery - Utilization of unskilled volunteers to complete simple tasks	- Hospital viewed as an institution, not a structure - Shared vision/goal promotes teamwork - Key staff invested in the survival of the hospital

Table 1—Factors promoting disaster recovery at the Hospitalito Atitlán

ceived risk to relief work. Given the hospital staff's sense of duty to the local population, neither the organizational coherence nor the individual psychological satisfaction promoting a successful relief study response and recovery are unexpected.[40,41] However, many reproducible structural and organizational factors can be identified:

1. Media attention and a strong Internet presence made the Hospitalito a very visible victim of the disaster;
2. The Hospitalito's sustained relationship with Pueblo a Pueblo provided a mechanism to convert this publicity into tax-deductible donations channeled directly to the hospital. Local, day-to-day control of these funds expedited the recovery and its acceptability to local stakeholders;
3. In contrast to funding, the hospital depended successfully on aid groups with large emergency response infrastructures to help equip its interim site;
4. Aid organizations and private donors effectively delivered medications and other consumables. However, sorting and storing disorganized or unneeded donations was an unnecessary drain on Hospitalito resources in the short term;[42]
5. Beginning rebuilding efforts well before relief efforts ended helped harness the outpouring of goodwill and donations at its peak, allowing the Hospitalito to address both immediate response and future recovery priorities. Equipment donations were secured from material brought in by aid organizations before they departed, and an abundance of unofficial volunteers were utilized for simple but essential tasks; and
6. The organizational ability to simultaneously participate in medical relief efforts and work toward rebuilding the Hospitalito depended on individuals undertaking tasks appropriate to their knowledge and skills. While medical staff focused on clinical care, a dedicated cohort of non-medical personnel began the recovery within days of the landslide.

The Hospitalito's success at gathering donations raises the possibility that, as a visible and "sympathetic" victim of Hurricane Stan, it may have diverted attention and resources from other victims of this widespread disaster.[14] On the other hand, the fraction of "new" aid added to the total supply by the organization's efforts cannot be determined. While the Hospitalito's reconstruction ideally would have been coordinated with other local and national recovery goals, the institution lacked ties to the government or large international aid agencies and therefore, could expect little assistance it did not organize itself. Having identified how to best serve its community's needs—restoring clinical services quickly—it seems appropriate that this community organization took the necessary steps to act accordingly.

Money, supplies, and an intact staff notwithstanding, the Hospitalito might have quietly ceased to exist as an institution if anyone had seriously questioned its survival chances. Instead, key personnel shared a mutual blind spot to the possibility that the Hospitalito would not reopen as an independent establishment. The Board President captured the underlying sentiment—"The Hospitalito still exists. We still have work to do"—that the Hospitalito was an institution existing independent of the structure that housed it. Moreover, the key players had all made extraordinary investments in this institution and its mission to bring advanced medical care to a community that badly needed it. Shared vision and motivation welded a group of individuals into an efficient team determined to restore what had been lost.

This study has several limitations. The data were retrospective and derived primarily from unstructured interviews. No attempt at semi-quantitative or thematic data analysis was planned or attempted. As could be expected for any specific case, the Hospitalito situation is unique in several ways. In particular the Hospitalito is an extremely small hospital, and though it had to move to a new site, its equipment and consumables survived mainly intact.

Conclusions

The New Orleans experience after Hurricane Katrina demonstrated that health system rehabilitation does not automatically succeed medical emergency response, and furthermore, that lack of this essential infrastructure impedes the community's overall recovery.[27,43,44] However, most reports on disaster-stricken hospitals discuss planning, evacuation, and emergency relief activities without addressing health system recovery.[45] The results of this study suggest that material support is necessary but not sufficient for successful hospital disaster recovery. In Santiago Atitlán, a team capable of strategic vision beyond the immediate emergency began concrete work on recovery

early in the disaster aftermath, long before the relief phase concluded. Funding, supplies, and equipment at the disposal of this recovery-focused group provided the means to accomplish a strongly held and vigorously pursued common vision.

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