

Surviving the Storms

Emergency Preparedness in Texas Nursing Facilities and Assisted Living Facilities

Carmen Castro, MS, CHES; Diane Persson, PhD; Nancy Bergstrom, PhD, RN, FAAN; and Stanley Cron, MSPH



A 2006 report issued by the U.S. Department of Health and Human Services, Office of Inspector General found that frail, elderly residents evacuated from nursing facilities in Gulf Coast states after Hurricane Katrina experienced more problems, such as depression, dehydration, and skin tears, than did the majority of residents who sheltered in place.

ABSTRACT

This study assesses the preparedness of long-term care facilities in Texas responding to Hurricanes Katrina and Rita. A 41-item questionnaire was mailed to facilities; the response rate was 42%. Among responding facilities, 4,513 residents were evacuated, and 6% of respondents reported resident death. Financial losses were reported by 8% of nursing facilities and 45% of assisted living facilities due to transportation and staff overtime. Respondents indicated the need for improved disaster preparedness training, better coordination, and transportation. Changes in policy and practice will lead to better trained staff who will provide the care residents need for improved health outcomes during future public health disasters.

In a 3-week period in 2005, Texas responded to Hurricanes Katrina and Rita. Although Hurricane Katrina made landfall along the Mississippi coast, the state of Texas took in more than 450,000 evacuees, requiring massive local, state, and federal responses (Brodie, Weltzien,

ABOUT THE AUTHORS

Ms. Castro is Aging Program Specialist II, Dr. Persson is Director, Long-Term Care Ombudsman Program, and Dr. Bergstrom is Director and Theodore J. and Mary E. Trumble Professorship in Aging Research, Center on Aging, and Mr. Cron is Instructor in Nursing, Center for Nursing Research, School of Nursing, The University of Texas Health Science Center at Houston, Houston, Texas.

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Address correspondence to Carmen Castro, MS, CHES, Aging Program Specialist II, Center on Aging, School of Nursing, The University of Texas Health Science Center at Houston, SON-628, 6901 Bertner Avenue, Houston, TX 77030; e-mail: Carmen.Castro@uth.tmc.edu.

Altman, Blendon, & Benson, 2006; Brown, 2006; Centers for Disease Control and Prevention, 2006; Curiel, 2006; Gavagan et al., 2006; "Medical Special Needs," 2006). Among those arriving were hundreds of frail older adults, many of whom were placed in Houston-area long-term care facilities. A state bed occupancy rate of 75% for nursing facilities and 69% for assisted living facilities enabled Houston nursing facilities take in evacuees. However, the sudden influx of residents from Hurricane Katrina made it difficult for facilities to implement existing disaster plans when Hurricane Rita approached so quickly after Katrina.

BACKGROUND

In disasters, some long-term care facilities may be under a mandatory order to evacuate; others may have the option of evacuating or sheltering in place (not evacuating), depending on management's decision. Moving frail older adults, even under normal circumstances, can result in negative health outcomes, such as mortality, physiological decline, psychological distress, and depression (Castle, 2001; Killian, 1970; Markus, Blenkner, Bloom, & Downs, 1972). A report issued by the U.S. Department of Health and Human Services, Office of Inspector General (2006) found that frail and elderly residents evacuated from nursing facilities in the Gulf Coast states after Hurricane Katrina experienced more problems, including depression, dehydration, and skin tears, than did the majority of residents who sheltered in place.

The role and function of long-term care facilities in disaster preparedness remains largely undefined. More than 20 years ago, a study of the largest evacuation of nursing facility residents in history documented serious problems transporting residents to shelters, delaying passage of staff through police checkpoints, and staff burnout (Mangum, Kosberg, & McDonald,

1989). Following Hurricane Andrew in 1992, the Florida Department of Elder Affairs drafted a blueprint to serve as a disaster plan for long-term care facilities during hurricane season (Silverman, Weston, Llorente, Beber, & Tam, 1995). In addition, after the Los Angeles Northridge

Changes to state and federal requirements... could lead to improved health outcomes for frail older adults during a disaster.

earthquake, a survey of administrators at 144 facilities in California found that by incorporating nursing facilities into community-wide response plans, staff could meet community needs and optimize disaster response (Saliba, Buchanan, & Kington, 2004).

STUDY PURPOSE

The purpose of this study was to evaluate the need for changes in disaster preparedness policies in long-term care. This retrospective study assessed the implementation of evacuation plans among nursing facilities and assisted living facilities both large and small in Texas during Hurricane Rita in 2005. Although it is impossible to prevent natural hazards, it is possible to mitigate damaging effects.

Regardless of whether facilities evacuate or shelter in place, negative outcomes are possible. In Louisiana, 34 nursing facility residents died because they were not evacuated. In Texas, 23 residents who were evacuated died in a bus fire (Jacobson, 2005). During the 2004 hurricane season, Florida fared better, despite experiencing four storms. More than 10,000 nursing facility residents from 206 facilities evacuated with

no reported resident deaths (Hyer, Brown, Berman, & Polivka-West, 2006). The differences in mortality among the three states can be attributed to the different state rules and regulations regarding disaster preparedness and response. When Hurricanes Katrina and Rita struck, existing regulations required Louisiana nursing facilities to submit their evacuation plans each year to the parish government for review (Khanna, Olsen, & Hassan, 2005). In Texas, facilities were required to have a written all-hazards plan, conduct drills, and train new staff in the all-hazards plan (Texas Department of Aging and Disability Services, 2003).

Hurricane Rita brought about the realization that policy changes are needed in disaster plans for both nursing facilities and assisted living facilities. Clearer preparedness policies addressing the need for detailed evacuation plans are needed to reduce negative health outcomes among frail older adults during an emergency. Detailed evacuation plans should specify method of transportation used to evacuate residents, destination, staffing requirements, and supplies needed to provide residents with the necessary health care services.

Disaster preparedness training is needed for nurses in long-term care. In addition, clear guidelines should be determined regarding whether to evacuate or shelter in place (Lach, Langan, & James, 2005). Changes to state and federal requirements that would require both state and local officials to review and approve nursing facility preparedness plans, such as is done in Florida, could lead to improved health outcomes for frail older adults during a disaster.

METHOD

Sampling Frame

To identify the impact of Hurricanes Katrina and Rita in a 13-county area in Texas, a 41-item questionnaire was mailed to 520

TABLE 1

DESCRIPTION OF NURSING AND LARGE AND SMALL ASSISTED LIVING FACILITIES RELATED TO EVACUATION AND IMPACT (N = 217)^a

Variable	Nursing Facilities	Assisted Living Facilities	
	(n = 65)	Large (n = 45)	Small (n = 96)
Average number of residents	116	72	10
Reported number of resident deaths	5	2	0
Evacuated	35 (54%)	25 (57%)	62 (67%)
Sheltered in place	30 (46%)	19 (42%)	31 (32%)
Accepted Hurricane Rita evacuees from Texas	36 (55%)	18 (41%)	13 (14%)
Experienced financial loss	52 (80%)	29 (64%)	33 (34%)
Accepted Hurricane Katrina evacuees from Louisiana	38 (59%)	26 (58%)	26 (28%)

Note. Large facilities were defined as those with more than 20 beds; small facilities were defined as those with 20 or fewer beds.

^a 11 facilities did not identify the kind of facility and were not included in the results/calculations.

licensed long-term care facilities 6 months after Hurricane Rita. A \$5 bill was enclosed to encourage participation. Because only 165 surveys were returned, a reminder postcard was mailed to the remaining facilities, which resulted in a total response of 217 (42%) facilities. Data were entered into a Microsoft® Access™ database and initial analyses conducted. Facilities indicating a willingness to share experiences participated in a focus group to discuss factors that influenced the decision to evacuate or shelter in place.

Survey Items

The survey focused on the impact of Hurricanes Katrina and Rita and whether a facility took in evacuees as a result of either hurricane or evacuated due to Hurricane Rita. This survey was based on one developed in Florida and modified to reflect state-specific terms; no tests for questionnaire reliability or validity were reported (Hyer, Brown, Brown, & Polivka-West, 2005).

The survey items queried the kind and size of facility and the helpfulness of its disaster plan. Administrators of facilities that evacuated were asked to report the amount of time to evacuate, the in-

tended destination, resident or staff experience with negative health outcomes up to and including death, the method of transportation used to evacuate residents, and the adequacy of medicines, supplies, and equipment residents would need while away from the home facility. Additional items questioned the extent of coordination between the facility and local and state agencies, as well as the financial effects of evacuating and/or taking in evacuees.

Statistical Analysis

Descriptive statistics were calculated for all survey items by kind of facility. For univariate comparisons of facilities that did and did not have a resident death, the Wilcoxon rank sum test was used for continuous outcomes and Fisher's exact test for categorical outcomes. Logistic regression analysis (Hosmer & Lemeshow, 2000) was used to model the outcome of resident death during evacuation with four independent variables: number of residents evacuated, number of hours needed for evacuation, physician assessment of residents for travel worthiness, and use of a bus to transport residents during evacuation. The predictive

ability of the model for the outcome of resident death was assessed by the area under the Receiver Operating Characteristic (ROC) curve. Data analysis was conducted using SAS, version 9.1, for Windows.

RESULTS

Respondents

The overall response rate was 42%, with the majority of respondents having been directly affected by the hurricanes, meaning that the facility either took in evacuees from other facilities or were in an area that had to be evacuated due to Hurricane Rita. Of these, 30% were nursing facilities, 21% were large assisted living facilities, 44% were small assisted living facilities, and 5% did not indicate the kind of facility. **Table 1** describes the impact of the hurricane on these facilities.

Assisted living facilities were differentiated by size, with large facilities defined as having more than 20 beds and small facilities (also described as personal care, board-and-care, or residential care homes) as having 20 or fewer beds. Results indicate the financial burden incurred as a result of the hurricane was greater for nursing facilities than for both large and small assisted

TABLE 2

DESCRIPTION OF FACILITIES THAT EVACUATED

Evacuation Issue	Nursing Facilities	Assisted Living Facilities	
		Large	Small
Mandatory evacuation	29 (83%)	16 (64%)	42 (68%)
Voluntary evacuation	6 (17%)	9 (36%)	20 (32%)
Average number of residents evacuated	80	45	10
Facilities that had resident injuries	6 (17%)	2 (8%)	3 (5%)
Facilities that had resident deaths	5 (14%)	2 (8%)	0 (0%)
Primary method of transportation			
Bus	91%		
Facility vehicle		40%	38%
Duration of time on the road (mean/median number of hours)	13 (<i>SD</i> = 9)	8 (<i>SD</i> = 6)	10 (<i>SD</i> = 9)
Necessary medical supplies and equipment available	34 (100%)	24 (96%)	42 (68%)
Staff's families allowed to evacuate with the facility	20 (59%)	14 (61%)	10 (16%)
Residents' families allowed to evacuate with the facility	16 (48%)	9 (43%)	10 (16%)

Note. Numbers vary because of missing data.

Large facilities were defined as those with more than 20 beds; small facilities were defined as those with 20 or fewer beds.

living facilities. Financial losses were reported by 80% of nursing facilities, 64% of large assisted living facilities, and 34% of small assisted living facilities. The two greatest costs associated with the evacuation were transportation and staff overtime.

One facility wrote:

It is the aftermath of financial shortages that is causing us our current problems. We lost a serious amount of both public and private donations, as well as grants that we depend on to pay our operating expenses. Three times we have come very close to missing payroll. Slowly, things are getting back to normal, but another hurricane or disaster will do us in.

The small assisted living facilities experienced even less impact than did the large assisted living facilities, primarily because families were asked to remove the residents instead of the facility evacuating them. One wrote, "Luckily, all of our residents were evacuated by family members. After their experiences on the road, they say I will have to force them to evacuate again."

Among respondents, 46% of nursing facilities, 42% of large assisted living facilities, and 32% of small assisted living facilities sheltered in place. One respondent noted, "We felt our safest option was to shelter in place, which strongly proved to be the safest option during Rita. Our facility remained safe, secure, and comfortable throughout the storm." Nursing facilities and large assisted living facilities that sheltered in place were more likely to accept Rita evacuees from other Texas facilities, as well as receive Katrina evacuees.

Sheltering in Place or Evacuating

Federal and state regulations require nursing facilities and assisted living facilities to have and conduct training in an all-hazards plan. Nearly all facilities, regardless of kind of facility and evacuation status, reported having an all-hazards plan, with 63% of nursing facilities, 44% of large assisted living facilities, and 55% of small assisted living facilities that evacuated indicating the

plan was helpful. Nursing facility respondents, regardless of whether their facility evacuated, found their training to be more helpful than did assisted living facility respondents.

Additional data indicate the majority of evacuating facilities (80% of nursing facilities, 68% of large assisted living facilities, 51% of small assisted living facilities) revised their evacuation plans, whereas those that sheltered in place were less likely to make changes. Changes included having better transportation options, evacuating earlier, involving families in the evacuation process, working more closely with local offices of emergency management, and providing better training to employees. In addition, facilities sheltering in place incurred the cost of paying staff overtime. One administrator estimated the cost to be \$50,000.

Relationship and Coordination with State and Local Agencies

Although 75% of nursing facility, 68% of large assisted living facility, and 53% of small assisted living

TABLE 3

RISK FACTORS FOR RESIDENT DEATH

Variable	Resident Death (n = 7)	No Resident Death (n = 117)	p Value
Mean number of residents evacuated	74.29 (SD = 31.77)	36.22 (SD = 40.68)	0.01
Mean number of hours to evacuate	15.57 (SD = 8.34)	10.31 (SD = 8.63)	0.08
Number of residents assessed for travel by medical director/physician	4 (57.14%)	19 (16.81%)	0.02
Number of facilities that used buses for evacuation transportation	6 (85.71%)	46 (39.66%)	0.04

facility respondents said they coordinated their response with local offices of emergency management, only among evacuating nursing facilities did a majority indicate having a good to very good relationship with the local office of emergency management. Only 40% of nursing facilities, 39% of large assisted living facilities, and 4% of small assisted living facilities that sheltered in place reported having a good to very good relationship. However, additional data indicate that since Hurricane Rita, 63% of nursing facility, 71% of large assisted living facility, and 72% of small assisted living facility respondents reported the need to strengthen their relationship with the local office of emergency management.

Respondents were also asked about their relationship with the Texas Department of Aging and Disability Services, the agency that licenses and regulates long-term care facilities. In most states, nursing facilities are more closely regulated than are assisted living facilities and therefore tend to have more interaction with the regulatory agency. A higher percentage of facilities sheltering in place reported having a positive relationship with the state regulatory agency than did those that evacuated.

In response to the question, “How helpful was your state regulatory agency during the hurricane?”, the majority of both nursing facilities (66%) and assisted living facilities (61% of large and 59% of small

facilities) that evacuated indicated the regulatory agency had not been helpful. One respondent wrote:

Personally, [I believe] the state needs to wake up. You cannot put people on buses to drive in traffic to areas where it’s so congested that their air conditioners won’t work, and it takes 16 or 19 hours to go 100 miles.

Staff were more likely to evacuate with the residents if staff’s family members were allowed to evacuate with the facility.

No gas! No plans that are effective. Poor, poor planning at all levels.

Characteristics of Evacuating Facilities

Almost 54% of nursing facilities and 63% of assisted living facilities evacuated residents. **Table 2** shows the average number of residents evacuated from nursing facilities (80), large assisted living facilities (45), and small assisted living facilities (10). Trips that would generally take a short time took many hours. The mean evacuation time was 13 hours for nursing facilities, 8 hours for large assisted living facilities, and 10 hours for small assisted living facilities. Buses were the most common form of transportation (91%) among nursing facilities, although

most facilities used multiple methods of transportation. Necessary medical supplies and equipment were transported by 100% of nursing facilities, 96% of large assisted living facilities, and 68% of small assisted living facilities. As a result, facilities reported they effectively provided care to residents with special needs.

Staff coverage was sufficient, with 80% of facilities indicating they met the residents’ needs. Staff were more likely to evacuate with the residents if staff’s family members were allowed to evacuate with the facility, positively affecting staff coverage. Fifty-nine percent of nursing facilities and 61% of large assisted living facilities allowed staff’s family members to evacuate with them, but only 16% of small assisted living facilities allowed this.

Risk Factors for Resident Death

Nearly 6% of facilities that evacuated had residents die. As shown in **Table 3**, three factors were shown to be statistically significant with regard to resident death. Facilities that had a resident death during evacuation had a higher mean number of residents evacuated, were more likely to have their residents evaluated by a physician prior to evacuation, and were more likely to have evacuated their residents by bus. Although the length of time to evacuate was greater for the facilities that experienced a death than for facilities that did not, this comparison was not statistically significant.

Facilities in which resident deaths occurred were corporate owned and certified by Medicare and Medicaid. The facility that had 23 residents die as a result of a bus fire during the evacuation was not included in the responses. This story, while dramatic and tragic, has been reported extensively in the Houston press and the national media. This experience was unique to this one facility.

A logistic regression model for the outcome of resident death using the four risk factors presented in **Table 3** was not statistically significant (global test $p = 0.14$). However, the area under the ROC curve was 0.82, indicating that the model provides excellent prediction for the outcome variable (Hosmer & Lemeshow, 2000). Post hoc power analysis of the tested model with the sample size of 96 facilities indicated that the study was underpowered for detecting statistical significance with logistic regression. For a one standard deviation increase in the number of hours needed for evacuation (8.74 hours or odds ratio for resident death = 1.38), the power of the logistic regression model, including the other three covariates, was only 10%. A logistic regression model including only that risk factor most strongly associated with resident death (physician assessment of residents for travel) showed a power of 61%.

DISCUSSION

This study examined the level of preparedness, as well as the need for policy changes, related to disaster in nursing facilities and the growing and largely unregulated assisted living industry. Our findings agree with those found elsewhere: Facilities need comprehensive disaster plans; securing reliable transportation is difficult; evacuating frail residents is complex; retaining staff during an emergency is challenging; and nursing staff need improved training and education in disaster

preparedness (Dosa, Grossman, Wetle, & Mor, 2007; Lach et al., 2005; Mangum et al., 1989; Saliba et al., 2004; Silverman et al., 1995; Tumosa, 2007).

The response of assisted living facilities underscores how they are different from and similar to

Emergency plans should indicate when and how physicians will be contacted when evacuation is imminent.

nursing facilities. Although the regulatory environment is different, large assisted living facilities were more similar to nursing facilities in responding to evacuation issues. The majority of facilities, regardless of whether they evacuated or sheltered in place, reported a financial impact as a result of their response to Hurricane Rita. However, nursing facilities and small assisted living facilities were more likely to take in Katrina evacuees than were large assisted living facilities.

Regardless of the kind of facility, all facilities that evacuated reported problems related to transportation, evacuation time, and injury or death of some residents. Staffing was a primary concern among facilities that sheltered in place because some staff members resided in mandatory evacuation areas. Overall, the majority of residents who were evacuated returned safely to their facilities and experienced no negative long-term consequences as a result of the evacuation.

In response to Hurricane Rita, our results indicate that more than half of the facilities that responded evacuated residents. Even with more than 4,500 residents evacuated, only 6% of evacuating facilities reported

a resident death as a result of the evacuation.

LESSONS LEARNED

While the lessons learned echo those identified in previous studies, four issues warrant discussion:

- Policy changes.
- Coordination of transportation.
- Role of the medical director or physician.
- Improved staffing.

Policy Changes

This study demonstrates the importance of better coordination and inclusion of long-term care facilities in preparing for and responding to public health emergencies. Regardless of kind of facility or evacuation status, the majority of respondents did not find the offices of emergency management and the state regulatory agency helpful and indicated a need for improved coordination with the offices of emergency management. The need for clear lines of responsibility and authority at the state level parallels the need for evacuation training at the facility level. Although state agencies are working to better integrate long-term care facilities in future disaster response plans, policy changes requiring coordination with emergency management and submission of all-hazards plans to the office of emergency management can lead to improved disaster plans and, ultimately, decreased injury and death among residents. In Florida, where such policies exist, no resident deaths were reported due to the evacuation of residents (Hyer et al., 2006). Strategies need to be developed to train staff to ensure the evacuation plan is operational, including regular participation in drills and sharing of critical information (Friedman, 1994).

Coordination of Transportation

Among facilities that evacuated, the greatest lesson learned was the need for improved transportation

services, including having contracts with buses that provide wheelchair access. New procedures have been developed to facilitate the evacuation of long-term care facilities, individuals with special needs, and the overall community. Those changes include the establishment of contraflow lanes on highways designated as evacuation routes. Contraflow lanes allow for the reversal of traffic on major highways during an emergency evacuation so that all lanes of traffic flow out of the area being evacuated. A new ZIP code-based evacuation plan, which can be found on the Harris County Homeland Security & Emergency Management (2007) Web site, has been developed that will help individuals better assess their risk and subsequent need to evacuate.

Role of the Medical Director or Physician

Improved communication between nursing staff and physicians is vital to resident outcomes. Because only 43% of nursing facilities and less than 15% of assisted living facilities both large and small reported contacting a physician or medical director prior to evacuating residents, emergency plans should indicate when and how physicians will be contacted when evacuation is imminent.

In Texas, new public health preparedness plans developed since Hurricanes Katrina and Rita were tested twice in 2007 in response to Hurricanes Dean and Humberto. Although Hurricane Dean did not hit the Texas coast, the Texas governor deployed a fleet of buses to aid in the possible evacuation of residents; additional barrels of gasoline were transported to mitigate possible gas shortages; shelters were activated; and state, federal, and local officials coordinated their responses (Office of the Governor Rick Perry, August 19, 2007). In anticipation of Hurricane Humberto, the Texas governor activated

search-and-rescue teams to assist in response efforts (Office of the Governor Rick Perry, September 12, 2007). Although facilities sheltered in place, the successful deployment and staging of material provided long-term care staff members with the experience needed to help them better prepare for emergencies.

Improved Staffing

The importance of early evacuation to avoid traffic jams is obvious. Because staffing was an issue for all facilities, evacuating staff's immediate family members along with residents and allowing staff who are sheltering in place to bring their families into the facility helps ensure adequate staff are available to care for residents.

IMPLICATIONS FOR PREPARING FOR EMERGENCIES

Recommendations for educational goals for emergency preparedness vary in specificity and focus. The International Nursing Coalition for Mass Casualty Education (2003) has outlined educational competencies in four areas: performing age-appropriate health assessments, demonstrating the safe administration of medicines, implementing fluid/nutrition therapy, and transporting a patient safely. Lach et al. (2005) suggested nurses need general information on disaster preparedness, including bioterrorism. The educational focus includes several themes. One is the nurse as a person and includes consideration of work hours, sleep and rest, knowing what to bring to the shelter, and adequacy of clinical skills. Second, the physical environment is considered, such as the characteristics of the setting, living conditions, and provision of adequate food, clean water, equipment, and supplies. Community preparations should include residential facilities. Finally, the chain of command in management of residents and the facility should be included in any disaster plan. Nurs-

ing schools have included disaster preparedness and bioterrorism in their curricula and in continuing education. This knowledge needs to be implemented in practice.

According to Silverman et al. (1995) and Lach et al. (2005), clinical guidelines during a public health emergency include:

- Ensuring residents with special needs can be cared for regardless of whether facilities evacuate or shelter in place.
- Ensuring supplies are available in sufficient quantities.
- Assessing fall risk among residents.
- Meeting residents' mental health needs.

Residents with special needs may include those with feeding tubes or those in need of oxygen. Supplies needed include both medical and general supplies. Medical supplies include prescription medications, special dietary supplies, eyeglasses, dentures, hearing aids, incontinence briefs, identification bands for all residents (especially for those with dementia), and generators and ice (if facilities plan to shelter in place) (American Red Cross, 2008). General supplies include bottled water, canned food and a can opener, a battery-powered radio, flashlights, and extra batteries in quantities to last 3 to 7 days (American Red Cross, 2008; Lach et al., 2005). Finally, it is important to assess residents' mental health needs, which may increase during public health emergencies (Lach et al., 2005; Silverman et al., 1995; Tariot, Podgorski, Blazina, & Leibovici, 1993).

CONCLUSION

Regardless of whether facilities in Texas chose to evacuate or shelter in place, each faced a unique set of challenges. In the future, facilities that evacuate must ensure that plans to transport residents are sound, an appropriate destination is determined, medications and supplies are transported and available, adequate

staffing is assured, and planning for residents in long-term care facilities is integrated into community response and recovery plans. The State of Texas has demonstrated that planning and coordination have improved. All communities must make certain the safety and needs of frail older adults are met in emergencies.

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