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Long-Term Care Resident Outcomes Following a Natural Disaster

Pamela Z. Cacchione, PhD, APRN, BC, Lisa M. Willoughby, PhD, Joanne C. Langan, PhD, RN, and Kenneth Culp, PhD, RN

Dr. Cacchione is Associate Professor of Geropsychiatric Nursing, University of Pennsylvania School of Nursing, Philadelphia, Pennsylvania; Dr. Willoughby is Assistant Professor of Psychology, Center for Outcomes Research, and Dr. Langan is Assistant Dean, Community and Clinical Affairs, and Associate Professor, School of Nursing, Saint Louis University, St. Louis, Missouri; and Dr. Culp is Professor, The University of Iowa College of Nursing, Iowa City, Iowa

Abstract

This report describes the outcomes of 17 long-term care residents who were participating in a nursing intervention study. The residents were evacuated for 5 days due to a severe summer storm that caused widespread power outages. These residents were seen the day of the storm and three times per week for 2 weeks following their return to the nursing home. More than half of the participants had significant changes in their NEECHAM Confusion Scale scores ($n = 11$) and modified Confusion Assessment Method scores ($n = 9$) scores, suggesting the onset of delirium. Two participants were hospitalized within the 2 weeks of the evacuation. One participant died unexpectedly. This report provides a rare look into the negative effects of a short-term evacuation due to a natural disaster.

Natural disasters can confuse and stress most community-dwelling older adults, but little is known about how these events affect nursing home residents. This report describes the cognitive and physiological outcomes in frail nursing home residents following a severe summer storm with extensive power outages. The storm caused participants of one research site to evacuate for 5 days during in-place protocols for a larger nursing intervention study addressing sensory impairment. This was a particularly vulnerable population due to the multiple chronic illnesses compounded by sensory impairment. This event provided a rare opportunity to assess the outcomes of a disaster on long-term care (LTC) residents following an unplanned emergency evacuation. Subsequently, the data reported here were excluded from the parent study due to the impact this evacuation had on these residents. Institutional Review Board approval was obtained to evaluate these data.

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Address correspondence to Pamela Z. Cacchione, PhD, APRN, BC, Associate Professor of Geropsychiatric Nursing, University of Pennsylvania School of Nursing, 418 Curie Boulevard, Philadelphia, PA 19104; pamelaca@nursing.upenn.edu.

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BACKGROUND

Since Hurricane Katrina in 2005, significant attention has been given to the outcomes of older adults following a natural disaster. Approximately 71% of those affected by Hurricane Katrina were 60 and older, and 47% were older than 75 (AARP, 2006). Older adults in LTC are a particularly vulnerable group. Prioritization of the needs of older adults in times of disaster is essential. Once the basic physiological needs of ventilation, food, and water are met, attempts are made to meet safety and security needs.

Physiological changes associated with aging and the presence of chronic illnesses make older adults more susceptible to illness or injury under the stressful conditions of a disaster. Simple trauma to the skin can result in skin tears or bruising. Older adults have an increased susceptibility to hypothermia, hyperthermia, or hypothermia without sweating. Vision changes and common eye conditions such as glaucoma, with loss of peripheral vision, place older adults at increased risk for falls and injury in times of disaster. Effective communication is essential to elicit the cooperation of older adults in times of disaster and thus accommodations for older adults with hearing impairments can aid in evacuations. Changes in the sense of touch slow older adults' responses to environmental stimuli, placing them at risk for injuries.

Changes in cardiac function, as well as cardiac disease, often require the use of wheelchairs or stretchers to evacuate frail older adults (Adelman & Legg, 2009). Pulmonary function also declines with aging. With the increased stress of a disaster, older adults may become hypoxic, which may manifest as delirium. Nurses should not assume that an older adult who is behaving irrationally or appears confused following a disaster has dementia and instead should consider potential hypoxia or other causes of delirium (Smeltzer & Bare, 2004). Confusion is not a part of normal aging, and older adults must be afforded ample opportunity to respond to questions asked. The retrieval of information may be delayed and can be slowed even further by stressful situations and events (Adelman & Legg, 2009).

In many cases, evacuations and relocation of older adults are necessary to provide safety and security. Residents of LTC settings are often evacuated to acute care settings, other LTC facilities, or to a family member's home in times of an unsafe situation in their current LTC setting. Relocation under planned circumstances is stressful and often results in poor sequela (Kohn, Levav, Garcia, Machuca, & Tamashiro, 2005; Lach, Langan, & James, 2005; McGuire, Ford, & Okoro, 2007; Rosenkoetter, Covan, Bunting, Cobb, & Fugate-Whitlock, 2007). Unplanned relocation during a disaster has had little study outside of the outcomes of older adults documented during Hurricane Katrina. While Katrina was an extreme disaster with extreme circumstances, short-term evacuations are often due to less severe circumstances. Disasters are relatively infrequent and unpredictable events (Cherniack, 2008); therefore, little is known about how older adults in LTC survive these short-term evacuations.

RELOCATION IN LTC OLDER ADULTS

The literature is mixed as to the repercussions of relocation on the cognitive status and general health of older adults. Early studies demonstrated that older adults did not fare well

(i.e., became confused, disoriented, experienced falls, and became depressed) when being relocated either from their home to a nursing home or even within a nursing home (Miller & Lieberman, 1965; Castle, 2001; Crome & Jones, 2002; Hodgson, Freedman, Granger, & Erno, 2004). Relocation stress syndrome has been described as a state in which older adults experience physiological and/or psychological disturbances following a relocation from one environment to another (Brugler, Titus, & Nypaver, 1993; Mullen, 1977; Wolanin, 1978). More recently, a study documenting the relocation of nursing home residents due to a facility closure demonstrated that residents' health remains fairly stable when relocations are planned and organized and residents are moved to better facilities (Capezuti, Boltz, Renz, Hoffman, & Norman, 2006). However, natural disasters do not allow for that level of precise planning. Natural disasters often precipitate organized chaos, despite proactive advanced planning. In the absence of disaster preparedness plans, pure chaos often ensues.

When they become ill or stressed, older adults often experience an acute change in mental status, known as *delirium*. Delirium is classified as (a) a change in level of consciousness with a decreased ability to focus, sustain, or shift attention; (b) a change in cognition not better accounted for by a preexisting, established, or evolving dementia; (c) developing over a short period of time such as hours to days and tends to fluctuate during the course of the day; and (d) findings during the history, physical, or laboratory examinations indicate that the disturbance is due to the consequences of a general medical condition (American Psychiatric Association, 2000, pp. 83–84). Delirium has numerous precipitating factors including immobility, infections, dehydration, malnutrition, metabolic disturbances, use of a bladder catheter, and use of more than three of the following medications: anticholinergic, opiate, benzodiazepine, and corticosteroid agents (Inouye & Charpentier, 1996; Irving, Fick, & Foreman, 2006).

The stress of an evacuation due to a natural disaster clearly can disrupt older individuals' environment, their caregivers, and their sense of security. Older adults often have visual and hearing deficits, making it more difficult to interpret their environments and precipitating increased stress. This stress can also exacerbate chronic illnesses, further precipitating delirium (Cacchione, Culp, Laing, & Tripp-Reimer, 2003). Delirium is associated with high mortality rates (Francis, Martin, & Kapoor, 1990; Inouye et al., 1999; Marcantonio et al., 2005); this relationship appears to be indirect, meaning it is not the delirium that is potentially fatal but the condition causing the delirium that increases the mortality rate associated with delirium (Cacchione et al., 2003; Francis et al., 1990).

STUDY PURPOSE

The purpose of this study was to describe the outcomes of a small randomly selected sample ($n = 17$) of LTC older adults who were participating in the control group of a nursing intervention study designed to test the efficacy of a nursing intervention for LTC older adults with sensory impairment. These individuals were evacuated for 5 days due to a severe summer storm and were relocated to different facilities with different care providers and physical surroundings. The outcomes of interest in this relocated group were delirium, cognitive changes, hospitalizations, and deaths at the time of the disaster and 2 weeks following return to their home facility.

METHOD

Participants were enrolled in the attention control arm of the parent study, titled “Nursing Interventions for Sensory Impaired LTC Elders.” The purpose of the parent study was to evaluate the efficacy of a nursing intervention to improve vision and hearing impairment and decrease incident delirium and other outcomes. Twenty older adults were randomly selected in the home facility and found to have some level of sensory impairment. The parent study consisted of baseline measures that were repeated at 8 and 16 weeks. One family withdrew their family member from the study, one was found to be delirious at baseline, and another potential participant did not meet the inclusion criteria, thus leaving 17 participants available for follow up. Two participants were missing one weekly assessment during the study period and therefore data from the previous visit were used in its place. As part of the parent study protocols, these participants were found to have vision and/or hearing impairment. Vision was tested using the Early Treatment Diabetic Retinopathy Study eye chart (Ferris, Kassoff, Bresnick, & Bailey, 1982), and hearing was screened using the Madsen Micromate 304 audiometer (GN Otometrics, Denmark) with noise-reduction earphones (Lichtenstein, Bess, & Logan, 1988).

Also, as part of the parent study, each resident was screened for delirium three times per week using the NEECHAM Confusion Scale (NEECHAM, Neelon & Champagne, 1992) and the modified Confusion Assessment Method (mCAM) (Inouye et al., 1990; Lewis, Miller, Morley, Nork, & Lassater, 1995). Secondary outcomes were also evaluated, including participants’ performance on the Mini-Mental State Examination (MMSE, Folstein, Folstein, & McHugh, 1975) and the Geriatric Depression Scale (GDS, Yesavage et al., 1982–1983). The **Sidebar** includes a list of the measures collected at baseline, Week 8, and Week 16.

Measures

The MMSE (Folstein et al., 1975) is a 30-item mental status test that includes questions on orientation to language, attention, calculation, recall, and construction. Scores on the MMSE can range from 0 to 30, with greater scores indicating better cognitive performance. Participants in this study were excluded if they had an MMSE score less than 10. The MMSE has a reported sensitivity of 0.87 and specificity of 0.82 for detecting both delirium and dementia (Folstein et al., 1975). The GDS (Yesavage et al., 1982–1983) is a 30-item, interview-based depression rating scale requiring *yes* or *no* responses, designed for use with older adults (Yesavage et al., 1982–1983). The scale has high internal consistency, a Cronbach’s alpha coefficient of 0.94, and high test-retest values, as well as construct validity with other depression measures. The GDS was chosen for this sample due to the low response burden of the *yes/no* question format. The full 30-item GDS was used to allow for identification of changes in scores. Scores of 11 or greater were considered a positive screen for depression, 15 to 20 were considered positive for moderate depression, and scores greater than 20 were positive for severe depression (Yesavage et al., 1982–1983).

The NEECHAM (Neelon & Champagne, 1992) is a 9-item, 30-point nurse-rated scale that includes the participants’ vital signs and pulse oximetry. Developed to assess for acute confusion/delirium, the NEECHAM includes three subscales: (a) level of responsiveness/

information processing, (b) level of behavior, and (c) level of integrative physiological control. The level of integrative physiological control subscale is heavily based on the individual's vital signs and pulse oximetry levels. Concurrent validity was established for the NEECHAM using the MMSE and the *Diagnostic and Statistical Manual of Mental Disorders*, third edition, revised, criteria for delirium (Champagne, Neelon, McConnell, & Funk, 1987). Interrater reliabilities with the NEECHAM were found to range from 86% to 91% (Neelon, Champagne, Carlson, & Funk, 1996). The reported sensitivity and specificity of the NEECHAM in LTC older adults is 90% and 70%, respectively (Cacchione, 2002). An individual's NEECHAM score was also associated with the level of severity of a delirium episode. A cut-off score less than 24 was considered positive for delirium (Neelon et al., 1996). The NEECHAM and the CAM have been recommended for concurrent use to provide better recognition of delirium (Rapp, Mentis, & Titler, 2001).

The mCAM (Lewis et al., 1995) is a version of the CAM, developed by Inouye et al. (1990) and considered the gold standard screening tool for delirium (Irving et al., 2006). The mCAM is useful in research because it includes tasks to assess attention. A structured question asking the respondent to list the days of the week backward or digits backward is used, which is consistent with original CAM (Lewis et al., 1995). The CAM and subsequently the mCAM contain criteria for documenting the presence of delirium (Inouye et al., 1990; Lewis et al., 1995). Sensitivity was found to range from 94% to 100% and specificity from 90% to 95% (Inouye et al., 1990). Participants in the current study were evaluated for four characteristics: acute change in mental status with a fluctuating course, inattention, disorganized thinking, and altered level of consciousness. Strict scoring criteria were used for the mCAM, which was scored as either *delirium present* (score of 3 or 4) or *delirium absent* (score of 0, 1, or 2). The summer storm occurred on a Wednesday during Week 6 of the study; at this time in the protocol, baseline functioning was clearly established using the instruments listed above. Participants were evacuated that evening due to the loss of electricity in this facility—as well as the majority of the metropolitan area—and were relocated for 5 days. Some of the participants were transferred to two or three different places during that 5-day period. On the participants' return to the home facility, we continued to monitor them for delirium in Week 7 and Week 8. The comprehensive evaluations of all baseline measures were completed in Week 8. Unfortunately, we were unable to screen the participants while they were evacuated to other facilities for numerous logistical reasons.

Participants

Seventeen participants were included in the analysis. They had a mean age of 86.18 ($SD = 7.89$ years) and were mostly women (88.2%, $n = 15$) and Caucasian (82.4%, $n = 14$). This was a particularly frail population, with a mean baseline Cumulative Illness Rating Scale (Parmelee, Thuras, Katz, & Lawton, 1995) score of 24.82 ($SD = 3.97$). The mean baseline MMSE score was 23.18 ($SD = 4.63$), and the mean GDS score was 10.12 ($SD = 6.04$). The sample was found to include similar numbers of participants with hearing impairment only (29.4% $n = 5$) and visual impairment only (23.5%, $n = 4$). Most of the participants were dually impaired (47.1%, $n = 8$). The baseline mean score for the NEECHAM was 27.29

(median = 27.0), and the mCAM scores were all less than 2 and negative for delirium. Four participants had a score of 1 and 1 participant had a score of 2 on the mCAM at baseline.

Procedures

The participants were all screened for delirium with the NEECHAM and the mCAM on the day of the severe summer storm, and these scores were compared with their Week 1 scores. We resumed delirium screens and social visits after their return. We also completed the 8-week comprehensive assessment with this group then exited the facility due to the extensive impact of the evacuation on the participants.

Data Analysis

Due to the small sample and the ordinal scaling of the mCAM, data were analyzed by way of nonparametric techniques. Data from both instruments were analyzed using the Friedman test. Follow-up paired comparisons were made using the Wilcoxon signed ranks test corrected with the Holm-Bonferroni step-down procedure.

RESULTS

The NEECHAM scores at baseline, the day of the evacuation (Week 6), at all three timepoints during the week post-evacuation (Week 7), and 2 weeks post-evacuation (Week 8) are presented in Table 1. The Friedman test revealed significant differences across timepoints ($\chi^2 = 10.82$, $df = 3$, $p = 0.055$). Paired comparisons on NEECHAM scores, compared with baseline values, revealed that scores were lower at the second evaluation 1-week post-evacuation ($Z = -2.67$, $p = 0.032$) and at 2 weeks post-evacuation ($Z = -2.73$, $p = 0.03$). No significant difference was found between NEECHAM scores for baseline and the day of the evacuation ($Z = -0.95$, $p = 0.34$) or at the first or third evaluations at 1-week post-evacuation ($Z = -2.10$, $p = 0.07$ and $Z = -2.27$, $p = 0.07$, respectively).

The NEECHAM is a unique measure for delirium due to the inclusion of the physiological measures of vital signs and pulse oximetry readings. This was found to be important in this sample, as the majority of the change scores occurred in the physiological measures subscale.

The mCAM scores at baseline, the day of the evacuation (Week 6), at all three timepoints 1 week post-evacuation (Week 7), and 2 weeks post-evacuation (Week 8) are presented in Table 2. The Friedman test revealed significant differences across timepoints ($\chi^2 = 24.36$, $df = 5$, $p < 0.001$). The mCAM scores were higher at all three timepoints 1-week post-evacuation compared with baseline (Visit 1: $Z = -2.45$, $p = 0.042$; Visit 2: $Z = -2.76$, $p = 0.03$; Visit 3: $Z = -2.75$, $p = 0.02$). No significant difference was found between mCAM scores for baseline and the day of the evacuation ($Z = -0.71$, $p = 0.48$) and 2 weeks post-evacuation ($Z = -1.09$, $p = 0.55$).

Two participants were hospitalized following the disaster. One was admitted for acute psychosis and anemia, and the other for abdominal pain and vomiting. Unfortunately, there was also one unexpected death within 2 weeks of the disaster. Some other minor but equally

frustrating events for the participants were the delays in returning personal effects, including wedding bands and wheelchairs.

Individual Examples

Mr. D. Mr. D. is an 87-year-old Caucasian man with a history of diabetes, hypertension, congestive heart failure, chronic obstructive pulmonary disease, anemia, coronary artery disease, hypothyroidism, depression, gait disorder, and muscle weakness. He was taking a total of 19 routine medications. Crucial medications on his list included insulin, prednisone (e.g., Deltasone®), escitalopram (Lexapro®), furosemide (Lasix®), and tiotropium bromide (Spiriva®) and fluticasone propionate (Advair®) inhalers. He was also taking five as-needed medications, which included narcotic agents and oxygen.

Mr. D.'s baseline MMSE score was 27 of 30. His baseline NEECHAM and mCAM scores were 27 and 0, respectively. He returned from the disaster evacuation exhibiting signs of visual hallucinations: "multiple women in [his] room and dogs nipping at [his] heels." He was found to be anemic and dehydrated, developed chest pain, and was admitted to the hospital. Changes in his NEECHAM and mCAM scores can be seen in Table 3. In Week 8, 2 weeks following the evacuation, Mr. D.'s MMSE score had dropped to 23.

Mrs. X. Mrs. X is an 85-year-old Caucasian woman with a history of abnormal gait, cerebral vascular disease, muscle weakness, closed hip fracture, diabetes, cardiac arrhythmias, atrial fibrillation, congestive heart failure, lower gastrointestinal bleeding, and urinary incontinence. She was taking 15 routine medications, including psychoactive agents and multiple cardiac medications, including warfarin (Coumadin®). She was also taking six as-needed medications, which included insulin and hydrocodone (Vicodin®). Her baseline MMSE score was 29, and her NEECHAM and mCAM scores were 27 and 0, respectively.

After the evacuation, Mrs. X. returned to the nursing home where initially she did well. Her NEECHAM and mCAM scores are listed in Table 3. During Week 7, Mrs. X. developed hypertension, acute abdominal pain, and vomiting and was hospitalized. This resident was missing her wedding band and wheelchair following the evacuation. She had been assured the facility knew where they were but had not been able to get them returned to her. By Week 8, she had returned to the nursing home and was feeling much better, sitting up and writing cards. Her wedding band and wheelchair had been returned to her, and her MMSE score was 29.

DISCUSSION

In both of these individual examples, the NEECHAM scores demonstrated change prior to mCAM scores. This is due to the significance of a participant's vital signs in the nursing home setting. The majority of the changes in the NEECHAM scores were due to an alteration in vital signs. This manifested in either an increase of body temperature as an indication of possible infection or dehydration or altered blood pressure elevations due to possible stress and strain of the evacuation or hypotension possibly due to their hydration status. Consistency with medication management, adequate fluid intake, and organization to decrease the stress of an evacuation may go a long way in preventing delirium post-

evacuation. The most common cognitive changes identified in the change in NEECHAM and mCAM scores were new onset inattention and disorganized thinking.

This study provided documentation of what clinicians have known for some time, but such anecdotal accounts are seldom described with the clinical instrumentation described here. Unexpected relocation often leads to poor outcomes for nursing home residents. In this study, more than half ($n = 11$) of residents were negatively affected by this evacuation and showed signs of delirium within the 2 weeks immediately following the evacuation. The signs of delirium were demonstrated on the physiological function subscale within the NEECHAM. Changes on the mCAM were primarily seen on acute change and inattention. These changes were indicative of potential fluid and electrolyte imbalances, as well as possible adverse drug reactions.

A limitation of the study was that laboratory data were not collected on participants to confirm fluid and electrolyte imbalances. Although we did track medication changes following the evacuation, medications taken during relocation were not recorded. Unfortunately, because of the significant change in scores on the NEECHAM, data from the 8-week comprehensive evaluations were skewed and therefore were not useful for the larger study. This group of participants was dropped from the parent study due to this extraordinary event. However, this was an unusual opportunity to follow the short-term outcomes following a nursing home evacuation.

CLINICAL IMPLICATIONS

Nurses in all care settings, not just LTC sites, should be aware of the potential difficulties older adults may experience as a result of a natural disaster, especially when evacuations and relocations occur. When older adults involved in a disaster are stabilized, basic physical care, ongoing assessment of chronic conditions, medication management, the return to familiar surroundings, and the return of valued objects should be facilitated as soon as possible. Questions about the disaster should be answered openly and honestly. As this study demonstrates, cognitive changes are to be expected in some LTC residents immediately following disasters. Older adults' safety and security is always important, but when confusion develops, nurses play a greater role, requiring vigilance to maintain that safety and security. Having familiar caregivers present, including family members for reassurance, is also helpful in keeping older adults safe. Maintaining the older adults' medication regimen, diet, and hydration is important in maintaining fluid and nutritional status. All health care providers must be prepared for this phenomenon and ready to assist residents in their eventual return to their routine and some semblance of normalcy. Strategies to prevent or decrease the severity of delirium focus on multicomponent interventions (Fick, Kolanowski, Beattie, & McCrow, 2009). Nurses play a significant role in screening and ongoing assessment for delirium.

Nursing vigilance is necessary during and after a natural disaster, as this study demonstrates. Residents in LTC should be monitored closely at least 2 weeks following a natural disaster that requires evacuation from their living situation. When residents are evacuated to a different facility, clear communication regarding treatments and medications, as well as

hydration and nutritional needs, must be provided to the receiving facility. Decreased thirst sensation coupled with increased fluid demands due to stress sets up older adults for the development of dehydration during and after the evacuation.

Personal belongings should be transferred back with the older adult and not left behind. The delay in doing so created unnecessary distress for this sample. Thorough assessments on the older adults' return to the evacuated facility will assist in identifying potential post-evacuation health problems. Monitoring for delirium following an evacuation will assist in identifying an acute event post-evacuation so nurses can intervene quickly to keep the resident safe.

CONCLUSION

A severe summer storm, which took place during an in-place research protocol, provided a unique opportunity to follow participants for a short period of time immediately after a natural disaster. This study provided insight into a small sample of participants' cognitive status before and after the disaster. In the scheme of natural disasters, this was small scale, yet it had a significant negative impact on the participants in this study. Unfortunately, the stress and relocation caused by natural disasters will continue to negatively affect LTC residents. Vigilant nursing care to maintain continuity of medical and nursing care and close monitoring following residents' return can potentially mitigate the negative impact.

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HOW TO OBTAIN CONTACT HOURS BY READING THIS ARTICLE

Instructions

2.1 contact hours will be awarded for this activity. A contact hour is 60 minutes of instruction. This is a Learner-Paced Program. Vindico Medical Education does not require submission of quiz answers. A contact hour certificate will be awarded 4 to 6 weeks upon receipt of your completed Registration Form, including the Evaluation portion. To obtain contact hours:

1. Read the article “Disaster Strikes! Long-Term Care Resident Outcomes Following a Natural Disaster” by Pamela Z. Cacchione, PhD, APRN, BC; Lisa M. Willoughby, PhD; Joanne C. Langan, PhD, RN; and Kenneth Culp, PhD, RN on pages 16–24, carefully noting the tables and other illustrative materials that are provided to enhance your knowledge and understanding of the content.
2. Read each question and record your answers. After completing all questions, compare your answers to those provided at the end of the quiz.
3. Type or print your full name, address, and date of birth in the spaces provided on the registration form.
4. Indicate the total time spent on the activity (reading article and completing quiz). Forms and quizzes cannot be processed if this section is incomplete. All participants are required by the accreditation agency to attest to the time spent completing the activity.
5. Forward the completed form with your check or money order for \$20 made payable to JGNCNE. All payments must be made in U.S. dollars and checks must be drawn on U.S. banks. CNE Registration Forms must be received no later than September 30, 2013.

This activity is co-provided by Vindico Medical Education and the Journal of GerontoloGical nursinG. Vindico Medical Education is an approved provider of continuing nursing education by New Jersey State Nurses Association, an accredited approver, by the American Nurses Credentialing Center’s Commission on Accreditation, P#188-6/09-12.

Activity Objectives

1. Identify physiological changes that make older adults in long-term care facilities particularly vulnerable to natural disasters.
2. Discuss signs and symptoms associated with the development of delirium.
3. Identify precipitating factors associated with the development of delirium.
4. Discuss consequences of the stress associated with involvement in a natural disaster for older adults.
5. Identify nursing implications for providing care to older adults involved in a natural disaster.

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Commercial Support Statement

All authors and planners have agreed that this activity will be free of commercial bias. There is no commercial support for this activity. There is no non-commercial support for this activity.

SIDEBAR

MEASURES COLLECTED AT BASELINE, WEEK 8, AND WEEK 16

Vision Screens

- Early Treatment Diabetic Retinopathy Study eye chart for distance vision (Ferris, Kassof, Bresnick, & Bailey, 1982)
- Eye examination for obvious cataracts using the Welch Allyn® PanOptic Ophthalmoscope (Skaneateles Falls, NY)
- Lighthouse for the Blind Near-Vision Screener (Lighthouse International, NY) for near vision
- Pelli-Robson Contrast Sensitivity Chart for contrast sensitivity (Pelli, Robson, & Wilkins, 1988)

Hearing Screens

- Ear examination for cerumen impactions using the Welch Allen MacroView Otoscope (Skaneateles Falls, NY)
- Madsen Micromate 304 audiometer (GN Otometrics, Denmark) with noise reduction earphones for pure tone averages
- Northwestern University Auditory Test No. 6 (R.H. Wilson, 1993) for word recognition

Functional Screens

- Activity Card Sort for social engagement (Baum & Edwards, 2008)
- Brief Assessment of Social Engagement for social engagement (Morgan, 1998)
- Cornell Scale for Depression in Dementia (Alexopoulos, Abrams, Young, & Shamoian, 1988)
- Geriatric Depression Scale for depression (Yesavage et al., 1982–1983)
- Hamilton Anxiety Rating Scale (Hamilton, 1959)
- Mini-Mental State Examination for cognitive performance (Folstein, Folstein, & McHugh, 1975)
- Modified Confusion Assessment Method for presence of delirium (Lewis, Miller, Morley, Nork, & Lassater, 1995)
- NEECHAM Confusion Scale for presence of delirium (Neelon & Champagne, 1992)
- Nursing Home Physical Performance Test for physical performance (Binder, Miller, & Ball, 2001)
- Simplified Nutritional Appetite Questionnaire for appetite (M.M. Wilson, 2007)

Covariate

- Cumulative Illness Rating Scale for comorbidity and change in status (Parmelee, Thuras, Katz, & Lawton, 1995)

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KEYPOINTS

Cacchione, P.Z., Willoughby, L.M., Langan, J.C., & Culp, K. (2011). **Disaster Strikes! Long-term Care Resident Outcomes Following a Natural Disaster** *Journal of Gerontological Nursing*, 37(9), 16–24.

1. Unplanned relocation is a stressful event with negative consequences for older adults in long-term care (LTC).
2. Delirium may be a common occurrence when LTC residents are relocated during a natural disaster.
3. It is helpful to know a LTC resident's baseline cognitive status to identify acute changes indicative of delirium.
4. Nursing vigilance during a natural disaster is important to meet the physiological, psychological, and safety needs of older adults in LTC.

TABLE 1
SUMMARY OF NEECHAM CONFUSION SCALE SCORES ACROSS TIMEPOINTS

Value	Baseline	Day of Evacuation	1-Week Post-Evacuation			2 Weeks Post-Evacuation
			Visit 1	Visit 2	Visit 3	
Mean (<i>SD</i>)	27.29 (1.53)	26.76 (1.89)	26.06 (1.89)	25.94 (1.98)	26.00 (2.03)	26.06 (1.82)
Median	27	27	26	26	26	26
Mean rank	4.53	3.94	3.26	3.03 ^a	3.18 ^a	6.06 ^a

^aVersus baseline, Wilcoxon signed ranks test $p < 0.05$.

TABLE 2

SUMMARY OF mCAM SCORES ACROSS TIMEPOINTS

Value	Baseline	Day of Evacuation	1-Week Post-Evacuation			2 Weeks Post-Evacuation
			Visit 1	Visit 2	Visit 3	
Median	0	0	1	1	1	0
Mean rank	2.71	2.79	4.09 ^a	4.15 ^a	4.35 ^a	2.91

^a Versus baseline, Wilcoxon signed ranks test $p < 0.05$

TABLE 3

TABLE INDIVIDUAL EXAMPLE MMSE, NEECHAM, AND mCAM SCORES BY WEEK

Participant/ Tool	Baseline	Week 6 (Day of Evacuation)	Week 7 (1 Week Post-Evacuation)	Week 8 (2 Weeks Post-Evacuation)
Mr. D.				
MMSE	27	–	–	23
NEECHAM	27	25	24	20
mCAM	0	1	2	4
Mrs. X.				
MMSE	29	–	–	29
NEECHAM	27	29	25	27
mCAM	0	0	1	0

Note. MMSE = Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975), where scores range from 0 to 30, with greater scores indicating better cognitive performance; NEECHAM = NEECHAM Confusion Scale (Neelon & Champagne, 1992), where a cut-of score less than 24 is considered positive for delirium; mCAM = modified Confusion Assessment Method (Lewis, Miller, Morley, Nork, & Lassater, 1995), where scores of 3 and 4 indicate presence of delirium and scores of 0, 1, and 2 indicate absence of delirium