

Nutrition Care During Complex Emergencies in the Community

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This article will provide an overview of several different types of complex emergencies that may have public health impact and nutrition consequences. Some of the information may be common sense things we have forgotten, and some information will stimulate your thought and help you prepare to cope in an emergency situation. Nutritional risk is commonly elevated in complex emergencies and is most likely to occur when the crisis is protracted or recurrent. Individuals at the greatest nutritional risk are pregnant women; infants and young children; elderly individuals; those who are housebound; individuals with chronic illnesses or conditions such as diabetes, renal dialysis, or physical handicaps; and those with limited English proficiency. Specific guidance and direction to applicable Web sites are provided. *Nutr Today*. 2013;48(5):219–227

Everyone knows that it is important to be prepared for emergencies. We have heard from our parents and teachers throughout life to “be prepared”—but are we? Can we help ourselves or our neighbors through a natural disaster, such as a tornado or hurricane? In any major natural or manmade community-wide disaster, everyone is a first responder in some fashion. Individuals must be aware of the special needs of their family and themselves. This article will provide health professionals an overview of several different types of complex emergencies that may have public health impact and nutrition consequences. The article is not meant to be all-inclusive. Some of the information may be common-sense things we have forgotten and some information will stimulate thought and help you prepare to cope in an emergency situation. To be prepared, essential health services, including adequate food, water, sanitation, shelter, and clothing, should be available, acces-

sible, acceptable, and adaptable. Nutritional risk is commonly elevated in complex emergencies and is most likely to occur when the crisis is protracted or recurrent. Individuals at the greatest nutritional risk are pregnant women; infants and young children; elderly individuals; those individuals with chronic illnesses or conditions such as diabetes, renal disease, or physical handicaps; those who are housebound; and those with limited English proficiency. Individuals with acute medical conditions or special dietary needs that cannot be met with available resources in the home should be transported to hospital facilities. Thus, it is common that many citizens will face compromised nutritional status in a community-wide disaster because of disruption of basic community and government services. Therefore, health professionals and citizens themselves can and should address their own nutritional and health needs because they know them better than rescue and disaster relief workers would.



TYPES OF EMERGENCIES

Complex emergencies encompass a number of crisis situations that greatly elevate the risk to nutrition and overall health of individuals in an affected area. These might include natural disasters such as floods, earthquakes, and hurricanes. Urban health emergencies would include fires, public health emergencies (epidemics), and blackouts. Terrorist acts might include bombings or poisoning of food or water. Extreme temperatures have also been associated with increased health risk, notably cardiovascular events. The most horrific complex natural disaster was witnessed recently with the March 2011 earthquake, tsunami, and nuclear power plant explosion in East Japan, leaving more than 20 000 dead or missing. This was coupled with great

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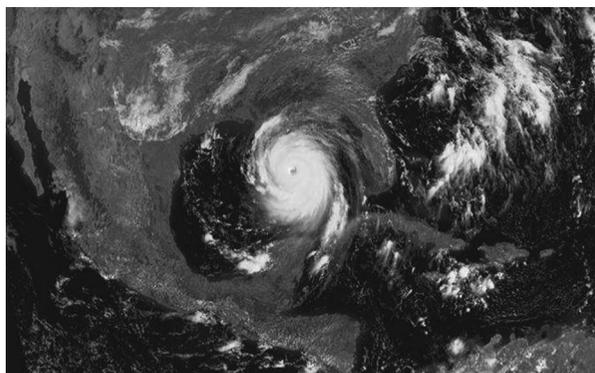
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psychological trauma among the survivors, as well as critical incident stress among the rescue workers.¹ According to an estimate prepared by the Hazards and Vulnerability Research Institute at the University of South Carolina, 91% of Americans live in places at a moderate to high risk for some type of disaster. Of the 10 of the costliest disasters in US history, 8 have been hurricanes that impacted urban coastal areas with high population densities.

HOW PREPARED ARE WE?

A recent Centers for Disease and Prevention (CDC) Behavioral Risk Factor Surveillance System Survey conducted in 6 states during 2006–2008 included, along with its traditional health status module, an optional general emergency preparedness module. Of the survey respondents (total of 37 303), 52% reported that they were in excellent health, 19.2% had an activity (physical, mental, or emotional) limitation, and 1.7% reported 3 or more chronic diseases. Fifty-six percent responded that they had a 3-day water supply, 83% had a 3-day supply of food, and 87% had a 3-day supply of medication. However, when the data were examined in more detail, the respondents with fair/poor perceived health, a disability, or 3 or more chronic diseases were less likely to have the necessary preparedness items. They were, however, more likely to have a 3-day supply of medication than their healthy counterparts.² Currently, the American Red Cross (www.redcross.org) recommends that individuals keep a 7-day supply of medication to carry them through an emergency situation, and the National Kidney Foundation recommends having a 2-week supply of medicines and diet-appropriate foods at home (www.kidney.org). To repeat the obvious, the most important thing everyone can do is create an individual or family emergency plan.



Compromised nutrition during disasters and prolonged emergencies can result in additional health risks. For example, hurricane Katrina, which severely impacted the gulf coast in 2005, provided a dramatic demonstration of how essential services can rapidly deteriorate after a major disaster. Furthermore, the incidence and severity of chronic

disease conditions can be expected to increase. Surveys estimate that 25% to 40% of those living in the regions affected by hurricanes Katrina and Rita (which also hit in 2005) lived with at least 1 chronic disease. After Katrina, it was determined that approximately 9% to 11% of the population previously living in Orleans and Jefferson parishes of New Orleans had diabetes and were displaced into facilities without adequate supplies or preparations.³ Long-term medical follow-up of older individuals indicated that those individuals who experienced property losses or lost loved ones due to hurricane Katrina experienced higher rates of uncontrolled blood pressure.⁴ Noted also was a 3-fold increased incidence of acute myocardial infarction more than 4 years after Katrina, which occurred in the absence of any change in traditional risk factors.⁵ During emergency situations, people with dementia experience exacerbated symptoms because of anxiety, fear, and confusion. One also needs to consider the mobility of community residents as well as cultural preferences and limitations as differential needs exist for urban, suburban, and rural populations.

Government surveys suggest that many Americans do not currently consume adequate amounts of vitamin D, calcium, and potassium and are thus living with marginal stores of these nutrients. The Figure shows the reported dietary intakes and associated indices of nutrients of public health concern⁶ and illustrates that Americans are currently not meeting dietary intake goals for many foods and individual nutrients. Thus, many Americans have a compromised nutrition status even in the absence of the stress of a natural emergency. Increases in the threat of hunger are most significant among the near poor, particularly seniors with incomes between 1 and 2 times the poverty line, as well as widows, nonmetro residents, women, and households with no grandchildren (www.mowaa.org).

RISK FACTORS FOR NUTRITION-RELATED ADVERSE HEALTH CONDITIONS IN THE YOUNG

Risk factors in infants and young children include poverty and poor health status, functional impairments, and infants who are not breastfed. Infants and young children have higher metabolic needs, necessitating more frequent meals and/or infant formula feedings. More infant formula feedings mean more clean or potable water and a method to sterilize bottles and nipples. During an emergency, use of ready-to-feed formula is recommended over powdered formulas, which require water and refrigeration, neither of which might be available in an emergency situation. Because of this, the American Academy of Pediatrics⁷ has recommended that powdered formulas be used only as a last resort during an emergency. However, when feasible, breastfeeding remains the method of choice. Breastfeeding

Eat more of these:

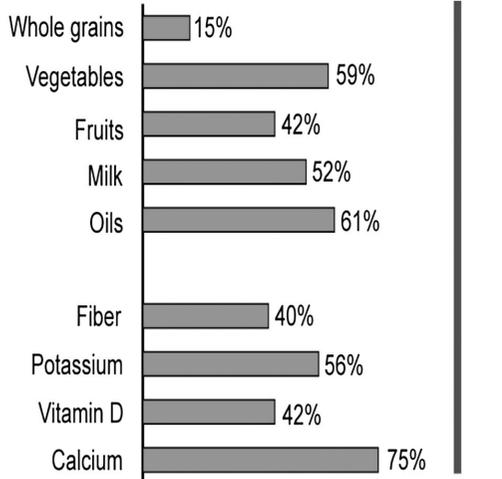


FIGURE. How prepared are we? Americans currently at risk: dietary intakes in comparison to recommended intake levels or limits.

during a disaster or emergency situation presents challenges for both mothers and rescue workers. This was certainly the situation during hurricane Katrina, as few mothers practicing breastfeeding were found, but for those mothers who were breastfeeding, the rescue workers had not been trained in breastfeeding support and management. There is a vital need to support breastfeeding, especially in the early days of an emergency. It has been shown that in complex emergency situations, such as those that occur in third-world countries, death rates among children younger than 5 years are generally higher than among any other age group and that nonbreastfed infants are up to 20 times more likely to die. Women in the United States who are less likely to breastfeed include non-Hispanic blacks, single mothers of lower socioeconomic status, Women, Infants, and Children (WIC) recipients, and those who were born and/or raised in the United States.⁹ A review of educational materials on nursing organization Web sites found that “disaster planning in relation to infant nutrition is painfully absent.”⁸ Increasing the current rate of breastfeeding in the United States is fundamental to optimizing infant nutrition when disaster strikes. A number of educational materials have been prepared to encourage women to breastfeed and how to prepare for an emergency. In summary, when breastfeeding is not feasible, mothers should have a supply of ready-to-feed formula to support their infants’ needs.

RISK FACTORS FOR NUTRITION-RELATED ADVERSE HEALTH CONDITIONS IN OLDER ADULTS

Thirty percent of older Americans live alone. Analysis of data from the Current Population Survey’s Food Security Supplement shows that in 2009, about 19% of households with adults 60 years or older with low incomes under 185% of

the poverty line were food insecure.¹⁰ In fact, the US Administration on Aging helps 11 million seniors and their caregivers through their low-cost community-based services. About 87% of older adults have diabetes, hypertension, dyslipidemia, and/or a combination of these chronic diseases. Additional risk factors for nutrition-related health conditions include functional impairments, social isolation and depression, reduced ability to regulate energy intake, lack of access to nutritionally adequate diets, and poor health or dental problems. Older adults also have a higher dependence on support systems for medical care, medication, food, and other essential needs. Many have limited access in their mobility and access to transportation. Older adults and those who are ill or overweight or become dehydrated are more likely to succumb to periods of extreme heat. Elderly individuals are particularly at high risk in hot weather because they do not adjust to sudden changes in temperature as readily as younger people do. When queried, fewer than half of people 65 years or older were found to abide by heat-emergency recommendations to stay hydrated—because they did not consider themselves to be seniors! Community and family evacuation and hydration control plans need to be specific to the needs of the elderly.

COPING WITH FOOD AND WATER SHORTAGES

Some public health services lost during complex emergencies are life threatening and require immediate attention and may involve coordinating services with multiple groups. Key public health services that are impacted by complex emergencies and their related nutritional consequences are discussed in this article and outlined in Table 1. In a complex emergency situation, individuals will most likely be sheltering in place. People should stock a 2-week supply of shelf-stable foods and foods that do not require refrigeration, cooking, water, or special preparation. Choose salt-free crackers, whole grain cereals, and canned foods with high liquid content. If individuals are following a prescribed diet plan, such as a low-fat, low-cholesterol diet plan for heart disease, they should make every attempt to adhere to it. The minimum adult ration is 1 well-balanced meal per day. Vitamin-mineral supplements, protein drinks, energy bars, or other fortified foods as meal extenders are also options to increase nutrient intake. Water should not be rationed, allowing 1 gallon of water per person per day, but individual needs will vary. For example, children, nursing mothers, and ill people need more water. For infants, if the mother is not breastfeeding, a ready-to-feed formula is the formula of choice. Use concentrated or powder formula only if bottled or boiled water is available. Very hot temperatures can double the amount of water needed. A medical emergency within the household might require additional water. Unlike water, food can be rationed safely, except for children and pregnant women. Table 2 outlines

CLINICAL CONDITIONS WITH NUTRITIONAL IMPLICATIONS REQUIRING IMMEDIATE ATTENTION

Dehydration

Dehydration is a nutrition-related condition that can affect all age groups and is a primary concern after an emergency occurs. At particular risk are infants and young children, older adults, and people with chronic illnesses. Dehydration is most commonly caused by inadequate intake of water during hot weather or exercise but also can occur when emergency situations limit the supply of potable water. Intense diarrhea, vomiting, fever, or excessive sweating greatly increases the risk of dehydration. Heat stress, as well as cold weather stress, can also lead to dehydration. Heat stress lowers mental and physical performance and can cause cramping, heat exhaustion, and heat stroke. Onset of symptoms will be highly variable, but questioning of the individual regarding recent fluid intakes would be helpful in making a diagnosis, lacking other mitigating factors. Table 3 lists the common physical symptoms of dehydration. The treatment for dehydration is, of course, fluid replacement, but the method of replacement varies. A general rule of thumb for the calculation of fluid needs is weight in pounds/2 = water (ounces) per day for hydration.¹¹ For infants and young children, avoid using water as the primary replacement. Fluid freezer pops can be used, or if needs are more critical, use a commercially available electrolyte rehydration solution, such as Pedialyte. Drinking too much fluid at once can bring on vomiting, so fluids should be given in frequent but small amounts. Use a teaspoon or syringe for infants. Sports drinks are not appropriate for rehydration in infants because of their osmolarity and sodium content but may be used for mild

TABLE 2 Nutritional Emergency Supply Kit

√ Minimum 1 gallon water per person per day (keep unopened in original containers)
Recommend 3-d supply for evacuation
Recommend 7-d supply for sheltering in place
√ 2-wk supply of shelf-stable and ready-to-eat food items and 3-d supply for evacuation
√ Infant formula preferably ready-to-feed formula
Recommend 3-d supply for evacuation
Recommend 7-d supply for sheltering in place
√ 7-d supply of medications and/or medical foods
√ Diet-appropriate foods for individuals with chronic illnesses such as diabetes, chronic kidney disease, and congestive heart failure

TABLE 1 Immediate Impact and Nutritional/Health Consequences of Complex Emergencies

Immediate impact	Consequence
Loss of access to safe, adequate water supply	Dehydration; increase risk of delirium: inability to administer medications or keep sterile medical materials
Loss of safe, adequate food supply	Acute protein calorie malnutrition
Lack of access to special foods, nutritional products	Acute undernutrition caused by loss of availability of pureed foods, tube feeding formulas, thickened liquids, other special foods
Loss of access to life-sustaining medical care e.g., insulin injections, dialysis, respiratory support	Deteriorating medical condition, renal toxicity, hyperglycemia, etc.
Emotional trauma	Increased confusion; exacerbated dementia symptoms; poor food intake even if food is available
Loss of basic utilities	Extremes of heat/cold; inability to preserve foods and medications; inability to prepare foods
Damage to or loss of housing	Functional limitations, dysmobility or secondary injuries due to lack of lighting, safe environment

Reprinted with kind permission from Springer Science+Business Media: Bales, CW, Ritchie, CS, eds, *Nutrition and Health: Handbook of Clinical Nutrition and Aging*, 2nd ed, New York, NY: Humana, Minimizing the Impact of complex emergencies on nutrition and geriatric health: planning for prevention is key, 2009, 640, Bales, CW and Tumosa, N, Table 29.4. Copyright © 2009 Springer.

the essentials of what to include in a Nutritional Emergency Kit. As community-wide or statewide emergency conditions stabilize, food aid will begin to become available. The US Department of Agriculture's Food and Nutrition Service (FNS) coordinates with state, local, and volunteer organizations to provide food for shelters and distribute food packages. As part of the National Response Plan, FNS has the primary responsibility to supply food to disaster relief organizations such as the Red Cross and the Salvation Army for mass feeding or household distribution. In addition, FNS can authorize states to operate a Disaster Supplemental Nutrition Assistance Program. Nationwide, a number of community assistance programs provide an additional layer of support services to seniors, such as Meals on Wheels, Interfaith Ministries, and local civic organizations. These resources should be considered as supplemental to what families and individuals have available in their own emergency plans.

TABLE 3 Symptoms of Dehydration

Dry, sticky mouth
Sleepiness or tiredness
(Children are likely to be less active than usual)
Thirst
Decreased urine output
Muscle weakness
Headache
Dizziness or lightheadedness

dehydration in older children. Gatorade is acceptable for older children as well as adults. Drinks with caffeine and alcohol should also be avoided. For moderate to severe dehydration (very dry mouth, skin and mucous membranes, lack of sweating, little or no urination, sunken eyes, shriveled and dry skin that lacks elasticity, low blood pressure, rapid pulse or fever), intravenous fluids and hospitalization may be necessary. In general, if urine is relatively light and clear, adequate amounts of fluids are being consumed. Low volume and dark urine may be a sign of inadequate fluid intake. Untreated severe dehydration is a medical emergency because it may result in seizures, permanent brain damage, or death.

Malnutrition

Observation and correction of individuals' food and water intake are not primary responsibilities of rescue workers. Thus, recognition of possible symptoms and signs of malnutrition is an important consideration for everyone. Depending on their dietary habits, individuals can display varying signs/symptoms of malnutrition. Some key physical features of malnutrition or poor nutrition include weight loss, fatigue or depression, a weak immune system, poor wound healing, low red blood count, muscle weakness (higher risk for falls and fractures), edema, poor dental health, and increased risk of drug interactions due to polypharmacy. Some of these signs and symptoms can be discerned via questioning, others via laboratory tests or clinical examinations. Another kind of malnutrition to consider would be getting too much sodium, destabilizing blood pressure or worsening heart failure, or excessive carbohydrates, destabilizing blood sugar control in people with diabetes. Obesity, as well as underweight, impedes functionality and independent living. When intensive efforts to encourage adequate intake of an individual's customary diet to preserve body weight and lean mass fail, commercially prepared supplemental foods may be offered. These products provide balanced nutrition, are shelf-stable, require

no preparation, and are available in a variety of formulations to meet a range of disease-specific needs.

Gastrointestinal Symptoms

Disruption of regular routines and stress may impact appetite and feeding behavior, increasing the risk for nausea or vomiting, diarrhea, or constipation. Everyone needs to know that curbing nausea and vomiting, increasing fluid intake, especially clear cool liquids, consuming frequent small meals (cool or room temperature), and consuming foods slowly are important. Similarly, foods with strong odors, overly sweet or greasy foods, and fatty foods should be avoided, if possible. Increased fluid intake is also recommended to reduce diarrhea, and low-osmolar fluids such as broth, sports drink such as Gatorade, and juice diluted with an equal amount of bottled or boiled water are helpful. Intake of soluble fiber is also helpful, such as oatmeal, rice, or canned fruit, as these are shelf-stable products. If available and refrigeration is not an issue, active-culture yogurt preparations may also be helpful. As above for nausea and vomiting, consumption of light foods (not greasy, fatty, or fried) as frequent small meals is recommended. Similarly, constipation may respond to increased fluid, fiber, and exercise. Constipation, especially for elderly individuals, children, and others, can be a real issue when daily patterns are disrupted and they are in unfamiliar surroundings. Those who should not receive food or fluid orally may include individuals with gastrointestinal bleeding, intractable vomiting, and/or diarrhea and will need immediate medical attention because intravenous fluid and/or parenteral or tube feeding may be required.¹¹ For those who lose their appetite, encourage frequent small meals, oral supplements, or replacement drinks and calorically dense and protein-dense foods. Providing prepared meals and snacks will foster encouragement to eat.



Diabetes and Kidney Disease

A must for individuals with diabetes and kidney disease is to maintain an up-to-date list of their medications and

TABLE 4 Disaster Preparedness Resource List

Source	Topic	URL
Administration on Aging	Emergency readiness for older adults and caregivers	http://www.aoa.gov/AoARoot/Preparedness_Emergency_Assistance_Guide . Also provides an Emergency Readiness Checklist for Older Adults and Caregivers, available at http://www.aoa.gov or http://www.AgingInStride.org
American Academy of Pediatrics	Breastfeeding	http://www2.aap.org/breastfeeding/files/pdf/DisasterPres.pdf . Educational presentation that provides information on infant feeding in emergencies and natural disasters.
American College of Gastroenterology	GI health and pediatrics	http://patients.gi.org/topics/common-gastrointestinal-problems-in-pediatric-patients . Nice overview article for health professionals.
Academy for Nutrition and Dietetics (formerly the American Dietetic Association)	Food safety	http://www.earthright.org . Manual: <i>Disaster and Emergency Preparedness in Food Service Operations</i> by Ruby Pickett and Charrette Norton. Discusses distribution of food in an emergency situation, establishment of a temporary kitchen, and biological and chemical contamination.
Alzheimer's Association	Dementia Disaster Preparedness Tool Kit	http://www.aoa.gov/aoaroot/Preparedness/Resources_Network/pdf/Toolkit_2_Disaster_Preparedness.pdf . Information on home- and community-based services for people with dementia and their caregivers.
American Lung Association	COPD	http://www.lung.org/lung-disease/copd/living-with-copd/nutrition.html . Consumer-friendly handout on eating well with COPD.
ARC	Emergency preparedness and response	http://www.redcross.org/prepare . Information on how to prepare your home and family, school, and workplace. ARC/FEMA pdf, "Food and Water in an Emergency." See also http://www.rehydrating.org . Download the free ARC earthquake app; go to the Apple app store or the Google Play Store for Android by searching "American Red Cross."
Baylor College of Medicine	Management of elderly disaster victims	http://www.bcm.edu/hcoa/index.cfm?pmid=13820 . PowerPoint slide set focusing on clinical and mental health aspects of disaster care. Prepared by the Texas Consortium Geriatric Education Center.
Centers for Disease and Prevention	Emergency preparedness and response	http://emergency.cdc.gov/hazards-specific.asp . Provides information on what you can do to prepare yourself—"Get a Kit, Make a Plan, Be Informed."
FEMA	Natural disasters	http://www.fema.gov/areyouready . Any in-depth guide to citizen preparedness. Fact sheets on an array of natural disasters to include extreme heat and extreme cold.
Food and Drug Administration	Emergency preparedness	http://www.fda.gov/Drugs/EmergencyPreparedness/default.htm . Provides general information on preparedness and available services.
National Kidney Foundation	Chronic kidney disease	http://www.kidney.org/atoz/pdf/DisasterBrochure.pdf . Guide that provides nutrition and clinical guidance for individuals with chronic kidney disease and those on dialysis.
US Army Center for Health Promotion and Preventative Medicine	Deployment guides	http://phc.amedd.army.mil/topics/emergencyresponse/Pages/default.aspx . Provides a collection of deployment health guides with nutrition guidance for a range of environmental conditions.
US Department of Agriculture	Consumer's guide to food safety	http://www.fsis.usda.gov/pdf/severe_storms_hurricanes_guide.pdf
US Department of Health and Human Services	Emergency preparedness	http://www.breddi.com/bReddi is an app that helps you and your family prepare for natural disasters and other emergencies that may affect your life. It is also a central location to manage your preparedness needs and to create a safety net inside and outside of your community.
Abbreviations: ARC, American Red Cross; COPD, chronic obstructive pulmonary disease; FEMA, Federal Emergency Management Agency; GI, gastrointestinal.		

dosages as well as contact information for their physician and dialysis center. Individuals with diabetes should maintain a constant carbohydrate diet, striving for at least 130 g of carbohydrate per day, and be familiar with the carbohydrate counting diet plan in the event of a shortage of medications, and they should prepare their emergency supplies accordingly. They should thus keep a supply of sugar, honey, instant glucose or glucose tablets, sugared soda, and hard candies in case of low blood sugar reactions. High-potassium fruit juices, such as orange juice, should be avoided. As a rule of thumb, most men with type 2 diabetes can consume approximately 45 to 60 g of carbohydrates per meal, and women can consume 30 to 45 g per meal.¹¹ For patients on insulin therapy, explicit guidelines should be provided regarding storage and use of insulin under emergency conditions (see www.fda.gov/Drugs/EmergencyPreparedness/ucm085213.htm).

Individuals with chronic kidney disease should be familiar with the National Kidney Foundation's guide "Planning for Emergencies."¹² This guide provides a 3-day emergency grocery list and meal plan for patients on dialysis, as it is important to follow a limited diet if dialysis has to be missed. The guide also contains a 3-day emergency meal plan for people with both diabetes and chronic kidney disease. If usual dialysis routine is not feasible, the daily protein intake should be restricted to 40 to 50 g/d. Also noted are fluid restrictions of 16 oz/d, along with low-potassium (1500 mg/d) and low-sodium (1500 mg/d) foods. Limit calcium and high-phosphorus foods/beverages and maintain phosphate binder regimen. Ample distilled water should be kept on hand. The Kidney Community Emergency Response Coalition, which was formed from more than 50 governmental agencies and private organizations after the 2005 hurricane season, has issued recommendations for patients, dialysis facilities, and providers on how to improve care of kidney patients in future domestic disasters.^{13,14} Additional guidelines are also available from the National Kidney Association at www.kidney.org.

Pulmonary Disease

The American Lung Association estimates that more than 12.1 million Americans have chronic obstructive pulmonary disease (COPD). Chronic obstructive pulmonary disease, which includes emphysema and chronic bronchitis, is the leading cause of death in the United States (www.lungusa.org). Pulmonary complications are common after natural disasters and can result from direct insults to the lung or may be indirect, such as overcrowding in community shelters and compromised healthcare delivery systems. Direct insults include inhalation of airborne particles, smoke, or other toxic gases; aspiration of water and waterborne pathogens; direct trauma to the chest; and psychological effects causing respiratory symptoms. Respiratory infections, alongside enteric infections, are common in the weeks after a

flood or tsunami. Acute respiratory infections are a major cause of illness and death among displaced populations and often occur in the first 3 to 5 days after a major disaster. Transmission of pulmonary tuberculosis is also increased in displaced populations after natural disasters. Data from the 2004 National Hospital Ambulatory Medical Care Survey in the United States identified that the most likely chronic respiratory disease requirements for a disaster were bronchodilators, oral steroids, and antibiotics.¹⁵ Individuals living with chronic pulmonary disease typically have high energy needs to prevent wasting or weakening of the diaphragm and other pulmonary muscles involved in respiration. A person with COPD might require 10 times as many calories breathing as a healthy person does (my.clevelandclinic.org). Nutrition care guidelines for individuals with respiratory diseases follow those for most of those with chronic disease: Follow a balanced meal plan, eat frequent smaller meals, and consume ample fluids. Optimal levels of carbohydrates, protein, and fat intake have not been defined for individuals with COPD. Patients found to be at risk should receive nutritional surveillance, be provided with adequate protein (>1.7 g/kg/d) and energy ($1.4\text{--}2.2 \times$ Resting Energy Expenditure (REE)) as needed, and encouraged to include food sources rich in antioxidants and omega-3-fatty acids.¹⁶ However, a patient with severe COPD under stress with an acute episode (such as exacerbation of chronic bronchitis) may need to consume higher levels of fat and protein and decrease carbohydrate intake in an effort to decrease carbon dioxide production and lessen the workload on the lungs. Commercial food supplements targeted at patients with COPD are relatively low in carbohydrates and high in protein and fat and may be an appropriate alternative food source during an emergency situation to help maintain weight and support immune function. Some patients with COPD may also have excessive phlegm production, but liberal drinking of water may allow the body to thin the mucus or phlegm and cough it out. Therefore, water should not be rationed especially for those individuals with COPD.

Immune Compromised Disease Conditions

Individuals living with cancer, HIV/AIDS, or other immune compromised conditions are at high nutritional risk. Malabsorption of nutrients and metabolic abnormalities affect whether individuals can ingest enough calories and nutrients to maintain health. For these individuals, adequate hydration is extremely important because of high medication usage and if diarrhea and/or vomiting are present. Shelf-stable foods with high nutrient density, such as canned lean meats or fish, beans, peanut butter, and nuts, that can be consumed in small meals throughout the day will help maintain caloric needs. Additional supplementation to meet energy and micronutrient needs may be required through specialized formula preparations. Access to potable water

and adherence to food safety guidelines are critical for those living with immune compromised conditions.

Pollution From Radioactive Fallout and Dietary Supplement Use

In response to the nuclear power plant explosions in Japan in March 2011, the CDC saw a rise in the use of potassium iodide (KI) tablets by Americans in the belief that they could protect themselves against radioactive fallout. Potassium iodide blocks radioactive iodine from being taken up by the thyroid gland, thereby protecting the thyroid from injury. After nuclear accidents, a daily pharmacological dose of KI is recommended for people directly exposed to radiation until the risk of significant exposure ends. However, KI should be used only upon the advice of emergency management or public health officials because there are health risks associated with taking it. After the nuclear power plant explosions in Japan, the CDC recommended against the use of KI supplements by individuals in the United States. The Food and Drug Administration (FDA) has approved 2 different forms of KI—tablets and liquid that people can take by mouth after a nuclear radiation emergency. The use of non-FDA-approved iodine supplements cannot be guaranteed for safety or efficacy because these products do not have an FDA-approved dosing schedule. Additional guidance regarding dosage schedule and the use of KI can be found at the FDA Web site: <http://fda.gov/Drugs/EmergencyPreparedness> as well as the CDC Web site at <http://emergency.cdc.gov/radiation/ki.asp>.

FOOD SAFETY DURING DISASTERS

One of the most frequent consequences of protracted or recurrent disasters is the loss of power and the lack of refrigeration. Thus, loss of power typically raises a major concern for adequate safety of perishable foods. A number of food safety documents and guides are available on the Web, such as the US Department of Agriculture Guide to Food Safety,¹⁷ and these can be found in Table 4. Briefly, in the event of a power outage, keep the refrigerator and freezer doors closed as much as possible. The refrigerator will keep food cold for about 4 hours if it is unopened and kept at 40°F or below. Perishable foods should be consumed first, followed by foods from the freezer. Next, consume nonperishable stable foods that do not require refrigeration, cooking, water, or special preparation. When power is restored, check the temperature inside the refrigerator and freezer with an appliance thermometer. If the freezer thermometer reads 40°F or below, the food is safe and may be refrozen. If a freezer thermometer has not been used, check each container of food; if ice crystals are present, then the food is safe to refreeze or cook. Refrigerated food should be safe as long as the power was out for no more than 4 hours. Discard any perishable foods (such as

meat, poultry, fish, eggs, or leftovers) that have been above 40°F for 2 hours or more. Do not consume food that may have come in contact with flood water. Discard beverage containers with screw-caps, snap lids, crimped cans (soda bottles), twist caps, and flip tops; foods packed in plastic, paper, and cardboard; and home canned foods if they have come in contact with flood water. You cannot rely on appearance or odor to know if the food is safe.

Everyone is a caretaker and everyone has the responsibility for someone, primarily themselves. Complex emergencies are typically not expected and can occur anywhere at any time. The references and Web sites cited in this article should help health professionals prepare clients to minimize the stress and illness associated with such events. Similarly, individuals and families can use the references and Web sites in Table 4 as resources in preparing their own emergency preparedness plans. Start the conversation! “Get A Kit, Make a Plan, Be Informed.” For first responders in the public health service or the military, refer to the Food and Nutrition Guide for Deployment for more detailed information at www.usphs.gov or the Deployment Health Guides published by the US Army Center for Health Promotion and Preventive Medicine and available at <http://usachppm.amedd.army.mil>.

REFERENCES

1. Matsuoka Y, Nishi D, Najkaya N, et al. Attenuating posttraumatic distress with omega-3 polyunsaturated fatty acids among disaster medical assistance team members after the Great East Japan earthquake: the APOP randomized controlled trial. *BMC Psychiatry*. 2011;11:132–139.
2. Bethel JW, Foreman AN, Burke SC. Disaster preparedness among medically vulnerable populations. *Am J Prev Med*. 2011;40:139–143.
3. Miller AC, Arquilla B. Chronic diseases and natural hazards: impact of disasters on diabetic, renal, and cardiac patients. *Prehosp Disast Med*. 2008;23:185–194.
4. Holt EW, Purpura L, Krousel-Wood M. Hurricane Katrina related experiences and blood pressure control in older adults: findings from COSMO. *J Invest Med*. 2012;60:354.
5. Hameed I, Moscona J, Kakoulides S, et al. Acute myocardial infarction before and after the storm: hurricane Katrina. *J Invest Med*. 2012;60:401.
6. U.S. Department of Agriculture and US Department of Health and Human Services. *Dietary Guidelines for Americans*. 2010. 7th ed. Washington, DC: US Government Printing Office; 2010.
7. American Academy of Pediatrics. Infant nutrition disaster. Breastfeeding and other options. American Academy of Pediatrics Web site. <http://www.aap.org/breastfeeding/files/pdf>. Accessed May 24, 2012.
8. Morin KH. Disaster planning and infant nutrition. *Infant Nutr*. 2008;22:258.
9. American Academy of Pediatrics. Infant nutrition during a disaster: breastfeeding and other options. American Academy of Pediatrics Web site. <http://www2.aap.org/breastfeeding/files/pdf/InfantNutritionDisaster.pdf>. Accessed May 20, 2012.
10. US Government Accountability Office. *Nutrition Assistance. Additional Efficiencies Could Improve Services to Older Adults*. Washington, DC: US Government Printing Office; 2011. GAO-11-782T.
11. USPHS. Dietitian/Nutritionist Professional Advisory Committee. Food and Nutrition Guide for Deployment. 2009. Contact the Chief Dietitian Officer at www.usphs.gov.

12. National Kidney Foundation. Planning for emergencies. A guide for people with chronic kidney disease. 2010. National Kidney Foundation Web Site. http://www.kidney.org/atoz/pdf/disaster_preparedness.pdf. Accessed May 24, 2012.
13. Kopp JB, Ball LK, Cohen A, et al. Kidney patient care in disasters: lessons from the hurricanes and earthquake of 2005. *Clin J Am Soc Nephrol*. 2007;2:814–824.
14. Kopp JB, Ball LK, Cohen A, et al. Kidney patient care in disasters: emergency planning for patients and dialysis facilities. *Clin J Am Soc Nephrol*. 2007;2:825–838.
15. Robinson B, Alatas MT, Robertson A, et al. Natural disasters and the lung. *Respirology*. 2001;16:386–395.
16. McKenzie DS, Gray-Donald K. Nutrition and chronic obstructive pulmonary disease. In: Bales, CW, Ritchie, CS, eds. *Nutrition and Health: Handbook of Clinical Nutrition and Aging*. 2nd ed. New York, NY: Humana Press; 2009:373–402.
17. USDA Food Safety and Inspection Service. A consumer's guide to food safety. Severe storms and hurricanes. Rev. 2007. US Department of Agriculture Web Site. http://www.fsis.usda.gov/pdf/severe_storms_and_hurricanes_guide.pdf. Accessed March 20, 2012.

SIX MONTHS OF FISH OIL MAY REVERSE LIVER DISEASE IN CHILDREN WITH INTESTINAL FAILURE

There may be hope for children who have intestinal failure, which is often caused by a shortened or dysfunctional bowel, who are unable to consume food orally. In the past, their treatment consisted of a nutritional cocktail of sugar, protein, and fat made from soybean oil, which was fed intravenously. The soybean oil, which provides essential fatty acids and calories, is suspected of possibly being associated with a complication known as intestinal failure–associated liver disease, which may require a liver and/or intestinal transplant. Previous studies suggested that replacing soybean oil with fish oil in intravenous nutrition reversed intestinal failure–associated liver disease. However, how long the fish oil treatment was needed was unclear. This clinical trial found that, compared with soybean oil, a limited duration (24 weeks) of fish oil is safe and effective in reversing liver disease in children with intestinal failure who require intravenous nutrition. Researchers believed that fish oil might also decrease the need for liver and/or intestinal transplants—and mortality—associated with this disease. For the study, intravenous soybean oil was replaced with intravenous fish oil in 10 patients between the ages of 2 weeks and 18 years who had advanced intestinal failure–associated liver disease and who were at high risk for death and/or transplant. These patients were compared with 20 historical controls who had received soybean oil. The children receiving fish oil had a much higher rate of reversal of liver disease than did those who received the standard soybean oil. In fact, after 17 weeks of fish oil, nearly 80% of patients experienced a reversal of their liver disease, whereas only 5% of the soybean patients saw a reversal. However, the numbers of patients studied was very small. Larger studies are needed, and the children also need follow-up for 5 years or more after they stop fish oil to determine if their liver disease returns and if transplant rates are truly decreased. It remains to be seen what the final result is, but there is now a glimmer of hope for some children whose treatment options are limited.

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