Impact of a Major Hurricane on Surgical Services in a University Hospital

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Hurricane Hugo struck Charleston, South Carolina, on September 21, 1989. This report analyzes the impact this storm had upon surgical care at a university medical center. Although disaster planning began on September 17, hurricane damage by high winds and an 8.7-foot tidal surge led to loss of emergency power and water. Consequently, system failures occurred in air conditioning, vacuum suction, steam and ethylene oxide sterilization, plumbing, central paging, lighting, and refrigeration. The following surgical support services were affected.

In the blood bank, lack of refrigeration meant no platelet packs for 2 days. In radiology, loss of electrical power damaged CT/MRI scanners and flooding ruined patient files, resulting in lost information. In the intensive care unit, loss of electricity meant no monitors and hand ventilation was used for 4 hours. In the operating room, lack of temperature and humidity control (steam, water, and suction supply) halted elective surgery until October 2. Ground and air transportation were limited by unsafe landing sites, impassable roads, and personnel exhaustion.

Surgical planning for a major hurricane should include 1) a fail-safe source of electrical power, 2) evacuation of as many critically ill patients as possible before the storm, 3) cancellation of all elective surgery, and 4) augmented ancillary service staffing with some, although limited, physician support.

HURRICANE HUGO struck the coast of South Carolina on the night of September 21, 1989. The surgical services at the Medical University of South Carolina, located in the coastal city of Charleston, were affected for a period after the storm. The purpose of this report is to point out the problems we experienced in maintaining our surgical services. We hope that our successes, as well as our mistakes, will benefit other medical centers faced with similar storms in the future.

Background

Hurricanes represent the planet's most violent form of weather (Funk, B. Y., National Geographic, 1980; 158: 346–67). As explained by Eliot, these storms form when air warmed by the surface of tropical oceans rises creating an area of low pressure. North of the Equator and as a result of the Earth's rotation, prevailing winds in these storm systems spiral counterclockwise toward the center of the low pressure region. This process perpetuates itself, causing ever stronger winds (Eliot J, *Into the Eye of David.* National Geographic, 1980; 158: 368–71). The storm system is referred to as a hurricane when sustained winds reach 74 miles per hour (mph). Hurricanes are often hundreds of miles in diameter, and winds become increasingly destructive toward the center of the storm. The "eye" of a hurricane is an area of calm in the center of the storm into which the associated winds spiral. Winds approaching the coast push water ahead of them, resulting in flooding well above normal tide levels. This phenomenon is referred to as a tidal surge. Thus, the two major destructive forces are high winds and flooding. Hurricanes are classified by their windspeeds and the degree of flooding according to the Saffir/Simpson Scale (see Table 1).

Hurricane Hugo was a Class IV hurricane with sustained winds of 135 mph and gusts exceeding 180 mph. The maximum tidal surge was in excess of 15 feet. Although reports vary substantially, it has been estimated that this storm spawned as many as 200 tornadoes in the greater Charleston area. Destruction ex-

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