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Surge Capacity For the Perfect Storm

On October 29, a late season hurricane and an early season Nor'easter collided over the Northeast United States. The combined forces of the storm affected 24 states, making "Sandy" the largest Atlantic hurricane ever recorded, but it saved its full fury for New York and New Jersey. Aided by a global rise in sea levels, a full moon, and record-setting low barometric pressures, it caused an unprecedented 13-foot coastal surge around lower Manhattan, flooding subways, tunnels, streets, and homes, along with several major hospitals and nursing homes. The storm also added new meaning to the concept of "surge capacity."

Thinking about the medical consequences of natural and man-made disasters in NYC over five decades, I wondered what new lessons we would learn from this one. A year ago, an unusually strong Hurricane Irene struck New York on August 27-28, preceded by some sensible and effective government-mandated evacuations of homes and hospitals in flood zones. But an article in the New York Times on August 28, 2011, noted that "Most New Yorkers emerged from their makeshift bunkers to find little of the widespread devastation the authorities had feared." I recall thinking how much more difficult it would be to convince people to leave their homes the next time. In fact, many people did not heed the evacuation

requests this time, resulting in avoidable injuries and deaths.

Ironically, the greatest miscalculation of all was by the same officials who mandated the evacuations last year. Prior to this storm, they repeatedly warned the public to leave their endangered homes—only this year, they didn't mandate pre-storm evacuations of several flood-zone hospitals. The subsequent storm surge incapacitated 6 hospitals due to either preemptive power-grid shutdowns and failures, or severe damage to the hospitals' own back-up generators and infrastructure.

Three prominent medical centers on Manhattan's East Side—NYU Langone, Bellevue, and the Manhattan VA—were so severely damaged by the storm surge that they will probably remain closed for extended periods. Last year, NYU was one of the hospitals evacuated prior to Hurricane Irene, but this year it and Bellevue remained open as the storm struck. Afterward, critically ill adults and children had to be carried down dark, slippery stairways and then transported by ambulances, with no (electronic) medical records available, to other facilities. (In contrast to its two neighbors, the Manhattan VA had wisely elected to evacuate its patients prior to the storm's arrival). Miraculously, all of the patients survived the perilous evacuations and transfers.

For the fortunate hospitals still functioning after the storm and on the receiving end of large influxes of patients, a more traditional test of "surge capacity" was just beginning. As soon as transportation became possible, thousands of elderly and chronically ill residents of high-rise buildings were brought by ambulance to nearby hospitals. During one peak period, as many as 38 ambulances arrived at our ED in one hour, turning us into a temporary shelter as well as an acute care facility. In addition, 20 dialysis patients arrived after following recorded instructions on a citywide information number to come to our hospital if their dialysis center had lost power. Miraculously again, our Rogosin Institute managed to dialyze all in need. At present (mid-November), Manhattan EDs and hospitals continue struggling to care for record numbers of patients and admissions—problems that will almost certainly persist for months to come.

Lessons learned? Though we are now able to predict weather patterns with almost pinpoint accuracy, we often continue to ignore the evidence before us. First, we need to take every precaution to protect human life. Second, we need to recognize that aging buildings, like aging people, typically have little or no reserve capacity. Then, we need to rebuild, replace, or get out of the way. **EM**