



Commentary

Extreme population exposure: Hurricane Dorian medical response in Great Abaco, Bahamas

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Hurricane Dorian's ensemble of extreme winds, wave action, and pelting rains laid waste to exquisitely vulnerable human settlements throughout the Abaco islands in northwest Bahamas. Dorian, the strongest hurricane ever to impact the Bahamas, pulled a towering storm surge onshore. Combined with 20 inches of rain, vast expanses of Abaco islands were submerged. The system's forward movement slowed to near standstill, creating one of the longest-duration population exposures to a hurricane in history [1]. Atmospheric scientists are observing that, in the era of climate change, Atlantic storms are becoming stronger, wetter, and slower moving as they come over land; Dorian matched this evolving profile, three-for-three [2–4].

Dorian produced catastrophic damage to the Abaco islands' fragile built environment, pummeling a population of 17,500 Bahamian citizens and permanent residents, plus thousands more persons with work permits and nondocumented individuals. Hardest hit were shanty towns situated on the waterfront, with names like The Mudd and Pigeon Peas [1]. These collections of unregulated structures, pieced together from scavenged materials like plywood and sheets of corrugated iron, did not meet Bahamas' stringent building codes. Although slated for demolition, these dwellings were occupied when Dorian moved through. Ricketty construction offered scant protection. Ramshackle habitats collapsed

onto their occupants or disintegrated into projectile debris, contributing to the severity of injuries sustained [1]. In the aftermath, the shattered landscape drew analogies to war zones.

Marsh Harbour, the major population centre, was home to about 7000 residents. As Dorian approached, locals filled Marsh Harbour's primary community shelter to overflowing. Others hunkered down in their dwellings, only to witness their homes being destroyed by Dorian's ferocious winds. Flimsy structures blew apart, directly exposing residents to the ravaging forces of Dorian [1]. Sixty Abaco islanders were killed during Dorian's assault; countless others were swept away in floodwaters and remain unfound months afterward.

Remarkably, Marsh Harbour Medical Centre (MHMC), remained operational during and after Dorian's passage. In the immediate aftermath, MHMC was swarmed with hundreds of displaced survivors seeking shelter. A skeleton crew of physician and nursing staff saw 30 critical patients requiring evacuation. As winds died down, a massive patient surge – estimated at 1000 – flooded into MHMC. Patient flow, consisting mainly of lower-acuity injuries and illnesses, was punctuated by the sporadic arrival of severe medical trauma cases. Staff treated lacerations, fractures, blunt trauma from flying debris, amputating and crush injuries from structural collapse, and aspiration injuries from near drownings.

In the immediate aftermath, Project Hope and Americares provided volunteer health professionals. Direct Relief supplied pharmaceuticals. Bahamas Ministry of Health staffed medical facilities, but damage to housing stock and infrastructure prevented these personnel from filling more permanent onsite positions.

The University of Miami Miller School of Medicine (UM) is providing intermediate medical and psychiatric support to MHMC and clinics in Abaco islands. UM staff are observing three salient patterns. First, medical trauma during Dorian's landfall was unusually severe compared to most Atlantic hurricanes. This is attributed to extreme storm hazards colliding with an exceptionally vulnerable population – and then stalling. Rarely has a hurricane so completely devastated

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the built environment, leaving many residents exposed, mid-storm, to the fury of the elements [1]. Currently, as the islands repopulate, and recovery efforts are underway, a new wave of medical trauma is occurring with steep increases in construction and motor vehicle injuries, some requiring advanced emergency care and evacuation.

Second, storm damage – compounded by loss of electrical power – crippled healthcare services, impeding access to providers, medications, and vital treatments. Consequently, months after Dorian's passage, patients flowing through MHMC are presenting with inadequately managed chronic disease symptoms. Uncontrolled hypertension, type 2 diabetes, and cardiovascular disease are especially prominent. Needs for higher level care, including hospitalization and life-sustaining treatments like renal dialysis, require relocation of patients to Nassau.

Third, almost universally, patients present with a psychological overlay to their medical conditions. New-onset, hurricane-related psychopathology is prevalent [5,6]. Complaints of distress and sleep disorders are common. Patients spontaneously recount terrifying, life-threatening (“I thought I was going to die”) experiences during Dorian's impact. Some describe the day-long, body-shaking “freight train” roar of Dorian's winds [1]. Survivors who lost home and possessions are at elevated risk for major depression [5,6]. Islanders who lost a loved one grapple with complicated grief and traumatic bereavement. Others continue searching for still-missing family members. There is urgent need for mental health support [5,6].

UM clinicians express concern for the well-being of their Bahamian counterparts who are staffing MHMC and area clinics. These professionals endured the stress of working shifts as Dorian tore apart their homes and communities. They treated an overwhelming patient surge that included uncharacteristically severe medical trauma. Post-impact, working under such austere conditions and unrelenting duress cannot be sustained without respite. Professionals who continue to serve, while trying to paste their own homes and lives back together, do so with astonishing resilience. Along with the patients they treat, these professionals are re-experiencing traumatic memories of Dorian, not sleeping well, and dealing with irreplaceable losses.

Beyond intermediate clinical support, UM is committed to long-term capacity building, pulling from multiple disciplines and a network of partners to build back resilient healthcare services. One component involves structuring a stepped-care approach for mental health and psychosocial support [7,8]. Community outreach, screening for common mental disorders, psychoeducation, and evidence-based mental health interventions can be provided once a structure is in place. Regarding workforce protection for Bahamas clinical and public health professionals on the front lines, development of stress management and team resilience training is underway [9].

Declaration of Competing Interest

Authors declare no conflict of interest.

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