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Crisis Triage in the Era of COVID-19: Old Tools, New Approaches, and Unanswered Questions*

KEY WORDS: COVID-19; crisis standards of care; disaster; intensive care unit preparedness; surge; triage

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In mid-2001, the Johns Hopkins Center for Health Security in conjunction with the National Security Council of the United States engaged in a table-top exercise to inform debate on the threat posed by biologic agents and to simulate challenges in decision making during times of healthcare strain. Entitled *Operation Dark Winter*, the exercise utilized a smallpox outbreak as its framework, and the findings were presented in October 2001 to the Congressional Subcommittee on Emerging Threats and Capabilities, under the Senatorial Committee on Armed Services. Public awareness of the tragedy of September 11 was still acute, as was the lingering threat of biological attack (letters containing anthrax spores had been sent to congressional and media offices, killing five). *Operation Dark Winter*, uncovered, among many findings, that a major biological event was a national strategic threat. Organizational structures and capabilities of the United States were not suited to the management of a major biologic event, and, most significantly, there was "little to no surge capability" in the US healthcare system, pharmaceutical, or vaccine sectors (1).

As a measure of response and following several particularly challenging influenza seasons and epidemics, the National Academies of Science released Guidance on Crisis Standards of Care in 2012 in the hopes of providing hospitals with a unified framework for designing disaster response plans (2). These Crisis Standards of Care (CSC) were intended to assist hospitals in creating and implementing response plans for prioritizing patient care in the setting of resource scarcity. Using a tiered structure and approach based on the amount of strain on various aspects of hospital capacity, the CSC's goal was to "gracefully degrade services to the minimum degree needed to meet the demands, maintaining maximum patient and provider safety" (3). However, the CSC were designed with the expectation that crises would be relatively short-lived and isolated. No guidance or framework was presented to address the response to a more severe, long-lived, international threat. In the absence of global preparedness, the strain of the COVID-19 pandemic has impacted every aspect of hospital capacity resource in every corner of the world (4–7). Guidance from prior real-world experience was lacking during the early phase of the pandemic. This helped precipitate the crush of regionalized care in

***See also p. 57.**

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both urban and rural healthcare centers, which, in turn, led capacity management administrators to question whether contemporary approaches to hospital preparedness demonstrated sufficient flexibility and adaptability (8–10).

Emergency preparedness data are particularly scarce in resource-limited settings, including rural areas in resource-rich countries, low- and middle-income countries, and geographically isolated islands. Onto this stage, Pommier et al (11) present in this issue of *Critical Care Medicine* the results of real-world implementation of a novel CSC strategy on the island of Guadeloupe, a French protectorate in the Caribbean, during the height of the 2021 Delta variant surge (August 11–September 10). The investigators conducted a retrospective observational study at the University Hospital of Guadeloupe evaluating their COVID-19–specific ICU triage protocol. During the study period, patients were assigned to one of three color-coded ICU admission priority groups based on age, comorbidities, and disease severity: green—ICU admission as soon as possible; orange—admission after all patients in green were admitted; and red—no ICU admission. Three-hundred twenty-eight patients (328) were eligible for ICU admission.

Placement in each eligibility group was evenly divided: 100 patients (30%) were assigned to the green group, 116 (35%) to the orange group, and 112 patients (34%) to the red group. The authors found that no fatalities occurred among the patients in the green group while waiting for ICU admission, yet 14 patients (12%) of those in the orange group died prior to ICU admission. Additionally, differences in 90-day mortality between groups were striking: 24%, 37%, and 78% among those in the green, orange, and red groups, respectively. Multivariate analysis revealed that among patients admitted to the ICU, mortality was independently associated not with the triage group assignment, but with a longer time between ICU referral and admission, Sequential Organ Failure Assessment score, and number of comorbidities (11).

This is the first in-depth description of the application of CSC employed during catastrophic strain in a modern healthcare system during the COVID-19 pandemic. The main strength of this report is the description of the extensive development, adaptation, and assessment of CSC in a specific environment. Similar to approaches used in the military, the authors' creation of three triage priority groups differs from other published CSC algorithms and was designed not to provide the sickest with the highest priority of care, but rather to expedite ICU admission based on those who would have the greatest chance of survival (12). Importantly, the authors utilized prior studies that examined survivability on mechanical ventilation and engaged their ethics committee along with the hospital's intensivist group (13, 14). This highlights that the identification and collaboration of all stakeholders is essential to providing best clinical care during times of strain. The construction of site-specific CSC provided a set framework to alleviate the often-burdensome decisions made solely by physicians on call. The fact that no patients with COVID-19 pneumonia perished who were assigned to the highest priority group (green) is a testament to the utility of this approach. And indeed, timely access to critical care has previously been shown to be a deciding factor for survival in patients with severe pneumonia and with infection from high-consequence pathogens (13–15).

As the authors acknowledge, there are limitations to their study and their approach. A main limitation is the monocentric design, stemming from the fact that Guadeloupe is an isolated island with one tertiary medical center. The French government also provided aeromedical evacuation support for COVID-19 and non-COVID-19 patients to assist with relieving strain—an asset not present nor feasible in many regions of the world. Significantly, as this was an observational study, causality is challenging to infer: a sample size of 328 patients (with 40% admission to the ICU) raises concern of low statistical power. Additionally, most systems designed to prioritize a scarce resource are meant to apply to all patients who meet eligibility. In this case, the system described for access to an ICU bed applied only to patients with COVID-19, and there were significant numbers of non-COVID-19 patients competing for the same beds. The authors noted that CSC also were applied to non-COVID-19 patients, but ICU admission criteria were different (11). To leave these patients out of the allocation equation weakens the overall premise of the study. Last, familial engagement and acceptance of CSC following implementation was not formally studied, although the authors mention that at nearly 1 year following the study period, no legal proceedings against the hospital were forthcoming. This also highlights an important aspect

of disaster response and preparedness: the importance of clear, consistent, and transparent communications with the community.

In conclusion, this important report outlines the complex application of CSC to a select environment during a time of unprecedented healthcare strain. All too often, allocation of scarce resources is something that healthcare systems and workers do not acknowledge, let alone describe in the medical literature. Not only does this work highlight the need for early planning and creation of CSC to identify and engage all appropriate stakeholders, but it also represents an advance in establishing transparency and clarity in how CSC decisions are made. Further, it validates that if such protocols are followed, the maximum number of life years can be saved. We thus make several general recommendations based on this report: First, rather than applying CSC solely based on age or illness severity, optimize outcomes through prioritizing those with the greatest chance of survival. This, in turn, depends upon the development of better prognostic tools to increase the efficient and equitable application of CSC. Second, prolonged time to admission to the ICU was associated in this report with higher mortality, emphasizing the need to have CSC protocols in place before ICU saturation is reached (2–4). And finally, this report can help motivate community hospitals in the United States to explore a similar triage approach for the unfortunate inevitability of future mass casualty events.

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