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Provision of critical care in austere conditions: staff, supplies and space

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In a recent issue of *Intensive Care Medicine*, Proudfoot et al. [1] describe a cohort of invasively ventilated patients with coronavirus disease 2019 (COVID-19) cared for at Nightingale Hospital London (NHL), a critical care unit constructed in a London conference centre. It is commendable that outcomes were comparable to a national cohort of patients with similar characteristics and severity of illness. Provision of critical care requires significant infrastructure, including specialized personnel and equipment [2], which were rapidly mobilized to provide exceptional care.

The authors note two key logistical challenges, including no predefined organizational structure or staffing model and lack of existing oxygen supply. We similarly identified staffing, equipment, and space as common themes mapped in our recently conducted unpublished scoping review surrounding the provision of critical care in austere environments during non-pandemic civilian disaster situations. Our search for and screening of English publications indexed from 1990 to April 8 2020 yielded 14 publications describing actual or theoretical field hospitals and mobile units with critical care capacity in developed countries (Supplementary materials). Publications acknowledged critical care healthcare providers as the most valuable resource, and emphasized the importance of adhering to intensivist-led models and having predefined plans in place for organizational structure. Resource considerations included strategies to optimize oxygen supply, and pharmaceuticals needed to manage chronic diseases. A significant proportion of patients require treatment for population health

conditions. Capacity for respiratory isolation and climate control were highlighted. Equipose was noted between adherence to the detail-oriented quality routines of established critical care units and inevitable modifications. No studies of actual events reported the need to make triage decisions related to limitations of therapy, but no scenarios were as devastating as the COVID-19 pandemic. Proudfoot et al. do not describe whether NHL adhered to routine protocols, or if compromises were (understandably) necessary with the significant strain on resources.

When local resources are overwhelmed following a natural disaster or mass casualty event, preparedness for evacuation and patient diversion may be adequate [3]. Local epidemics may be supported sufficiently by surge capacity planning for staff, supplies, and space, with contingency response (100% above baseline) similarly relying on regional collaboration [3, 4]. However, the COVID-19 pandemic has taught us that these strategies are insufficient when healthcare infrastructure is compromised on a wider scale. Surge crisis response (200% above baseline) requires mobilization of national and sometimes international aid [3, 4]. The worldwide nature of this disaster has resulted in an inability to access these resources. Even in well-prepared areas, maximal surge capacity has been exceeded due to high case rates and the prolonged nature of the pandemic. This has resulted in provision of critical care under austere conditions, including field hospitals staffed by non-critical care trained healthcare providers, and resource allocation necessitating reverse triage. There is much to be learned from studying the rapid mobilization of resources and provision of critical care in austere environments such as NHL and those identified by our review. In the future, we can be better prepared for global pandemic response.

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Author contributions

JP and KK designed the study. JP developed the search strategy. JP, KR, and JG screened articles and extracted data. All authors contributed to the interpretation of data. JP and KK drafted the manuscript. All authors critically reviewed the manuscript and approved the final version.

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