

The Contribution of COVID-19-Forced Transformations in Critical Care Delivery to Patient Mortality: Still an Underexplored Association

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To the Editor

Reports on the outcomes of critically ill patients with coronavirus disease 2019 (COVID-19) during the early phase of the pandemic described very high short-term mortality rates [1-4], compared to patients with other viral pneumonias [5], with decreasing mortality over the next few months [5-8]. The latter trends were generally ascribed to improving clinical experience and standardization of care in individual hospitals and health care systems [7-9].

Pandemic-Induced Transformations in Critical Care Delivery

An earlier perspective piece by Morens and Fauci, reflecting on the 1918 influenza pandemic, noted presciently that the most difficult challenges in the event of future similar public health crisis would be “to increase medical capacity and resource availability (e.g., hospital beds, medical personnel...)...Health care systems could be rapidly overwhelmed by the sheer number of cases” [10]. However, the prognostic implications of the profound transformations in the structure and process of critically care delivery due to COVID-19-related healthcare system strains were generally not directly examined, even when noted [3, 6, 8, 9], in the growing volume of reports on the epidemiology and outcomes of critical illness associated with COVID-19, constraining our understanding of how best to approach the ongoing and future pandemic-level health crises. As clinicians, healthcare systems and policy makers continue to grapple with numerous challenges during the ongoing pandemic, the COVID-19-related transformations in three structure and process areas in the delivery of critical care highlighted below represent some of the key challenges faced by countries and regions irrespective of being considered high- or low-resource in the pre-pandemic era.

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The rapidly evolving shortages of intensive care unit (ICU) beds brought by the surge of COVID-19 patients have led to increasing use of alternative spaces for care of the critically ill, including repurposing for ICU care step-down units, medical/surgical wards, clinical spaces not typically dedicated to inpatient care, and creating ICUs in areas not typically dedicated to health care [11]. The prognostic implications of increased use of critical care spaces beyond those of existing ICUs have been examined in a recent multicenter study by Toth and colleagues on the impact of increased surge in New York City. The investigators found that the odds of in-hospital mortality of COVID-19 patients were 40% higher at high surge levels (defined as use of operating rooms, general wards, and parking spaces), following adjustment for numerous patient-level factors [12]. Importantly, even an admission to an ICU of a different specialty than an “ideal” one (e.g., surgical ICU instead of a medical ICU), termed “boarding” [13], which was used as reference in the study by Toth et al [12], has been found to be associated with increased adjusted risk of death in the general population [13]. It was hypothesized that discoordination and delays of care, and disruption of established team operations related to disrupted geographic co-location contributed to the adverse outcomes of boarding [13]. Several recent studies have included measures of pandemic-related demand for critical care services in their modeling of patient outcomes. However, these were mostly composite proxy measures, such as the number of the pre-pandemic ICU beds [1] or COVID-19 patient occupancy of pre-pandemic ICU beds [14], which do not examine separately the prognostic impact of actual use of alternative care spaces and the local approaches to critical care staff shortages (see below), thus providing actionable insights into neither.

In addition, the corresponding shortage in critical care-trained clinicians was addressed by hospitals through multiple strategies, including among others increased patient/clinician ratios, asking clinicians to work longer hours or extra shifts, and using non-ICU clinicians to “extend” ICU teams [11]. Some of these approaches were previously shown to increase patient mortality [15] and it may be postulated that the other ones may have adversely affected patient outcomes. However, the prognostic implications of the individual strategies used to address COVID-19-related staffing shortages or their combinations remain unknown.

Last, the patient isolation measures mandated by the COVID-19 pandemic were unprecedented in scale and challenges in availability of required personal protective equipment and effects on care processes even in otherwise high-

resource health systems. Lesser measures of patient isolation were shown to reduce, as expected, time of clinicians' interactions with patients and were associated with increased risk of adverse outcomes [16]. It is plausible that COVID-19-related isolation measures had adverse impact on outcomes of the critically ill. Presently, the impact on patients' outcomes of the large scale isolation practices required for care of critically ill COVID-19 patients has not been determined.

Research, Policy, and Practice Implications

It may be hypothesized that decreasing critical care space demands and staffing shortages due to receding COVID-19 case surge during the resolution phase of its first wave coincided with gains in clinical experience and therapeutic options, thus contributing together to the reported reductions in short-term mortality of affected patients. Thus, exploring the role played by changes in each of the aforementioned structure and process areas in the outcomes of critically ill patients with COVID-19 and quantifying their impact during surge periods would be of much interest to epidemiologists and investigators involved in health services research. The optimal approaches to model these structure and process transformations remain to be explored.

However, beyond the scientific interest in the findings of such explorations, a better understanding of the contribution of each of the abovementioned changes in structure and process, overall and over time, to patients' outcomes is essential for both creation of benchmarks and to inform future efforts to identify scalable models for effective responses to the current pandemic and future public health crises.

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Conflict of Interest

None to declare.

Informed Consent

Not applicable.

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Lavi Oud has performed the design of work, acquisition of data, analysis and interpretation, composition, drafting, revising, editing, and final approval.

Data Availability

The author declares that data supporting the findings of this study are available within the article.

Abbreviations

COVID-19: coronavirus disease 2019

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