

The Role of the Long-Term Acute Care Hospital Following Critical Illness—Has the Coronavirus Disease 2019 Pandemic Demonstrated Their Usefulness or Emphasized Their Downside?*

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KEY WORDS: coronavirus disease 2019; coronavirus disease 2019 pandemic; long-term acute care hospital; medicare; postacute care

The provision of medical services for critically ill patients is a complex and expensive challenge. In 2010, the Society of Critical Care Medicine estimated that an average daily cost of an ICU bed was \$4,300, an increase of 61% in a decade (1). In the United Kingdom, a similar estimate of costs from the Welsh Government in 2011 gave a figure of £1,932 per day (2). Compared with the cost of care for a noncritically ill acute inpatient, an ICU bed can cost up to 500% more. In the United States, one solution to this financial challenge has been the creation of the long-term acute care hospital—the LTACH—a type of healthcare facility that came into being during the 1980s, later formalized by the Medicare, Medicaid, and State Children's Health Insurance Program Balanced Budget Refinement Act of 1999 (3). The LTACH is therefore a facility to provide ongoing care to patients requiring more than 25 days of mechanical ventilation who are otherwise clinically stable (4).

In early 2020, an unprecedented worldwide demand for ICU beds and ventilators arose as a result of the coronavirus disease 2019 (COVID-19) pandemic, with some countries running out of ICU beds, ventilators, and even oxygen itself. In parts of the United States, one potential option to expand ICU capacity for COVID-19 patients with ongoing respiratory failure was to use LTACHs. They provide a ready-made resource of beds, ventilators, and healthcare staff that could be deployed, with modifications to standard working practices to mitigate the risks of severe acute respiratory syndrome coronavirus 2 infection (5). In this issue of *Critical Care Medicine*, Saad et al (6) describe the clinical characteristics and outcomes of ventilated COVID-19 patients in two free-standing LTACHs in the Chicago area in the year April 1, 2020, to March 31, 2021. Weaning from ventilation was successful in almost 71% of these patients, whereas overall mortality was 8.9%. Seven-percent of patients were still in the LTACH at the study conclusion date. 86.1% were discharged alive, but only 18.4% were discharged home, the rest being transferred to a rehabilitation facility (44.9%), back to an acute hospital (16.5%), or a nursing home (6.3%). None of the home discharges needed home ventilation. Although this is all very interesting in showing that LTACHs may be uprated to create acute ICU capacity, it tells us nothing about how the outcomes of being ventilated for COVID-19 respiratory failure compare to being ventilated for other causes of acute lung injury (ALI)/acute respiratory distress syndrome (ARDS). The authors were, however, able to case-match the COVID-19 patients with

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non-COVID-19 ALI/ARDS patients. They found in their patient population that the outcomes of the case-matched patients were very similar. Therefore, it seems, the development of ALI/ARDS is the major factor in determining outcome, regardless of the original pathology. This matches the findings of a U.K. study by Camporota et al (7) which looked at ICU mortality rates for ALI/ARDS secondary to COVID-19 compared with a group of non-COVID ALI/ARDS patients—mortality rates were broadly similar, worse with increasing severity of hypoxemia.

The LTACH is a uniquely American type of health-care facility. By comparison, the United Kingdom provides very few specialized weaning facilities, with the bulk of patients ventilated for more than 21 days being cared for in the general ICU. Some U.K. ICUs have dedicated weaning beds, but these are few and far between, typically caring for a different patient population—mainly patients who have failed to wean despite often extensive stays in the “home” ICU. In attempting to find information about what an LTACH is and how it fits within the spectrum of healthcare provision, the first few pages of a Google search are dominated by healthcare providers and insurance companies, upselling the benefits of transfer of the longer term ventilated patient out of the acute hospital ICU to the LTACH. This leaves you to wonder whether this push is based on better clinical outcomes, whether it is cheaper, or whether there is evidence of both or neither being true. Kahn et al (8, 9) and an editorial in the January 2013 edition of “Medical Care” were highly critical as to the clinical and cost-effectiveness of LTACH facilities, calling them “A Clinical, Economic, and Ethical Dilemma” (10). LTACH mortality rates also appear to vary widely, from 8.4% to 48.1% (11). Little seems to have changed over time (12, 13). Concerns have also been raised about standards of care in LTACHs being lower than in ICUs (12, 13).

Outcomes for patients with ALI/ARDS will be different between ICUs and LTACHs, as a significant proportion of such patients will die in the acute ICU, leaving LTACHs to manage a subset of patients with varying degrees of chronicity of their respiratory failure. What cannot be ascertained from the study by Saad et al (6) is whether an LTACH can be used at an earlier stage in the patient pathway. Ventilated LTACH patients will have already survived long enough to have received a tracheostomy and desedation, rather

than remaining intubated and sedated. The skill sets will therefore be different. de Lissovoy et al (10) describe the uneven distribution of LTACHs and note that LTACH developments do not appear to be related to attempts to improve ICU cost-effectiveness and efficiency, perhaps being related more to the 25-day cutoff point for Medicare payments for LTACH rather than ICU beds. There have also been allegations of overcharging by LTACHs (14).

If the outcomes of ALI/ARDS due to COVID-19 are similar to other causes of ALI/ARDS in both ICUs and LTACHs, then it can be said that using an LTACH to extend capacity is a viable one during a pandemic. However, safety concerns about the care provided in LTACHs and the high associated cost (12, 13) may make the use of LTACHs less desirable as either a step-down from an acute ICU or as a means of expanding ICU capacity. In the United Kingdom and several other countries, the response to the increased demand in the pandemic (including in my own hospital) was to temporarily upgrade adjoining wards to be able to manage ventilated patients while creating additional temporary hospital capacity for recovering patients in a series of “Nightingale” hospitals (15). There is a strong case for saying that this strategy was also wasteful, but some of the facilities may persist as an available resource to cope with increased demands during winter or as diagnostic centers. This, however, is limited by the lack of appropriately trained staff across all healthcare professions.

What is important, as the world emerges from the pandemic, is to examine and to learn the lessons of what happens when a healthcare system, faced with a crisis, is underresourced and simultaneously wasteful. Governments must improve their pandemic planning to mitigate the risks exposed by COVID-19. Failure to do so should be regarded as a failure of leadership. Whether an escalation plan based on LTACH upskilling is a viable one remains questionable as it fails to address the fundamental problems of resource deficits, particularly human ones. The LTACH model may be useful, but safety concerns must be addressed.

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Prone Positioning During Venovenous Extracorporeal Membrane Oxygenation*

KEY WORDS: extracorporeal membrane oxygenation; prone position; respiration, artificial; respiratory distress syndrome, adult; ventilator-induced lung injury

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Prone positioning has been used with the goal to improve gas exchange through better ventilation-perfusion matching (**Fig. 1**) since its original description in 1976 (1). The improvement in gas exchange tends to now be interpreted as a window of opportunity to ensure better lung protection through less injurious ventilator settings. Mancebo et al (2) were the first to hypothesize that prone runs would thus need to be prolonged to avoid ventilator-induced lung injury (VILI) during most of the day. They showed that prone positioning led to improved gas exchange and mechanics but failed to demonstrate improved survival. The decrease in mortality was only demonstrated years later in a larger randomized trial (3). This study confirmed that a strategy of prolonged (> 16 hr/d) prone positioning can save lives in patients with moderate-to-severe acute respiratory distress syndrome (ARDS) with a number needed to treat approximately six patients.

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